2003P039

FINAL DRAINAGE REPORT
FOR
WIGWAM CREEK PHASE 2
MARICOPA COUNTY, ARIZONA

May 9, 2001
1st Revision: February 28, 2002
2nd Revision: March 21, 2002
3rd Revision: July 31, 2003
4th Revision: August 18, 2003

Registered Professional Engineer (Civil)
CERTIFICATE NO.
37325
RYAN
WEED
Date Signed 8/19/03
ARIZONA, U.S.A.

Coe & Van Loo Consultants, Inc.
4550 North 12th Street
Phoenix, Arizona 85014

CVL Project No. 00-0046-03-08

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Prepared for:

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CVL Project No. 00-0046-03-08

CVL

Final Drainage Report
for
Wigwam Creek Phase 2
Maricopa County, Arizona

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1.0 INTRODUCTION

1.1 Scope

Coe & Van Loo Consultants, Inc. (CVL), has been contracted by the Continental Homes, Inc. to provide engineering services in support of Wigwam Creek Phase 2. The purpose of this report is to provide hydrologic and hydraulic analyses of Phase 2 of the site. In addition, this report addresses off-site drainage, on-site drainage and retention.

This report is focused on providing practical design information, evaluation, and calculations for statistical flood events up to and including the 100-year frequency flood. The procedures used herein are derived from, and performed with, currently accepted engineering methodologies and practices. Additionally, the criteria for this evaluation conforms to currently applicable ordinances, regulations and policies effected by the appropriate jurisdictional regulatory authorities for the referenced site.

The analysis presented herein focuses on evaluating stormwater runoff resulting from a statistical evaluation of storm events of particular duration and frequency up to and including a 100-year frequency event. A storm event exceeding the 100-year event may cause or create the risk of greater flood impact than is addressed and presented in this assessment. However, the scope of this assessment does not include, neither did CVL's client request that, evaluation of stormwater runoff resulting from storm events exceeding the 100-year frequency event.

1.2 Site Description

The site is located in the western part of the Phoenix metropolitan area on the northwest corner of Camelback Road and El Mirage Road, in Maricopa County, Arizona (Figures 1 and 2). The entire Wigwam development is bounded by Camelback Road on the south, El Mirage Road on the east, Bethany Home Road on the north and a residential development on the west. The site's location can be further described as within the eastern portion of Section 14, Township 2 North, Range 1 West, of the Gila and Salt River Meridian, Maricopa County, Arizona.

The site (Phase 2) is currently undeveloped and encompasses approximately 170 acres. The Airline Canal, a concrete lined irrigation channel passes through the northwest portion of the site and along the west site boundary. This channel conveys irrigation water through the site to users downstream. The man-made, east-west aligned Colter Channel passes through the site and intercepts sheet flow that moves downslope from the north.

1.3 Development

The site will be developed as a single-family residential subdivision with lots of varying sizes. Open space, as retention basins, will be provided in locations throughout the site, positioned to reduce the need for storm drain systems. Camelback Road, El Mirage Road and Bethany Home Road will provide ingress and egress to the site.

1.4 Regulatory Jurisdiction

The site is currently situated within the jurisdiction of Maricopa County. The site is designed to meet the Flood Control District of Maricopa County (FCDMC) standards as described in the *Drainage Design Manual for Maricopa County, Volumes I and II* (References 1 and 2).

2.0 HYDROLOGIC SETTING

2.1 Topography

The site is located in an alluvial basin that is typical of the central and southern Arizona basin and range physiographic provence. The site location can be found on the United States Geological Survey 7.5 minute quadrangle map entitled El Mirage (Reference 3). The elevations range from approximately 1065 feet to 1032 feet. Existing ground slopes downward generally to the southeast at approximately 0.7 percent.

2.2 Regional Hydrology

Regional drainage patterns direct stormwater runoff generally to the east and southeast toward the Agua Fria River located approximately 1 mile east of the site. The historical land use is agricultural but is currently undergoing a transformation to a mix of agricultural, residential, and commercial uses.

The Flood Control District of Maricopa County (FCDMC) has conducted watershed-planning studies that address the hydrologic and hydraulic conditions of the area. The results of these studies are presented in the Reference 4, *White Tanks Agua Fria Area Drainage Master Study* (WTADMS). The WTADMS was later modified for the Colter Channel design and two reports were produced: *Hydrology of Colter Channel* (Reference 5) and *Recommendation Report, Colter Channel Project* (Reference 6).

3.0 MANAGEMENT OF OFF-SITE STORMWATER RUNOFF

Off-site flows were addressed in the Wigwam Creek Preliminary Drainage Report (Reference 8). Off-site flows entering the site from the north and west , north of Colter Channel, will be carried in the Greenbelt Channel to Colter Channel and then conveyed to the Agua Fria River. Flows along 127th Avenue, south of the Colter Channel, are intercepted by an existing canal that directs these flows south to MCDOT Channel adjacent to Camelback Road. See Appendix G for the Greenbelt Channel calculations and Appendix I for the off-site drainage plan.

It is anticipated that Phase 2 and Phase 2B will be constructed simultaneously. In the fully developed condition (Phase 2 and 2B), off-site flows will be intercepted by a drainage channel adjacent to 127th Avenue located in Phase 2B. A masonry wall will be constructed as part of Phase 2 along the boundary between Phase 2B and Phase 2. Wall openings, located where the drainage channels will be constructed as part of Phase 2B, allow on-site drainage from Phase 2B flows to enter the local streets within Phase 2.

4.0 MANAGEMENT OF ON-SITE STORMWATER RUNOFF

4.1 On-Site Hydrology

The on-site hydrology is based on the rational method criteria as recommended by the FCDMC Hydrology Manual (Reference 1). Drainage sub-basins have been delineated based on the parcel lot layout and the final grading plans. Times of concentration have been based on FCDMC equation (Eqn. 3.2. Reference 1). For the on-site area, a runoff coefficient "C" value of 0.52 was applied for the 10-year and 0.65 for the 100-year storm event. Refer to Plates 1, 2, 3 and 4 for on-site drainage patterns, and Appendix A for on-site hydrology.

4.2 On-Site Stormwater Runoff Management Plan

Runoff from the site is from the lots to the adjacent interior streets. Phase 2 outfalls at several locations and is divided into four major drainage areas as shown on Plates 1, 2 and 3. Drainage Area 1 outfalls at CP-13 into Retention Basin R2 via SD # 1. Flows are intercepted at CP-8 via SD #0 and are also discharged into retention basin R2. Drainage Area 2 outfalls to the El Mirage Channel via scuppers at CP-15, CP-22, CP-29, CP-34, CP-34A and CP-44. Flows are intercepted at CP-39 via SD #2 and discharged into the El Mirage Channel. Drainage Area 3 outfalls to the El Mirage Channel via scuppers at CP-49 and CP-53. Drainage Area 4 outfalls to the greenbelt channel via depressed curbs at CP-62, CP-65 and CP-72.

The streets within the project have been designed to convey the 10-year storm below top of curb per Maricopa County requirements (Reference 2). Where the 10-year flow exceeds the capacity of the street (6-inch curb), supplemental storm drain will be provided to intercept the excess flow. In addition, the 100-year flow will be less than 100 cfs in the street, with a maximum velocity of 10 feet per second. The 100-year flow depth will be at least 1 foot below finish floor elevations. Refer to Appendix A for street hydraulics calculations.

1st flush or treatment?

4.3 On-site Retention

For areas north of the Colter Channel, retention basins are not required. Runoff will be discharged to the Colter Channel via the Greenbelt Channel. For areas south of Colter Channel, basins will be designed to retain the 100-year, 2-hour storm event and to drain in 36 hours as per Maricopa County design specifications. A portion of Phase 2, south of the Colter

Channel, drains into Retention Basin R2. Retention Basin R2 is equalized with R1 to provide adequate retention volume. Discharge will occur through a combination of ground percolation and a bleed off system. See Appendix D for Retention Basin and bleed off Calculations.

5.0 FLOOD ZONE INFORMATION

The Maricopa County, Arizona and Incorporated Areas Flood Insurance Rate Map (FIRM) panel number 04013C1615J, dated July 19, 2001 (Reference 7), indicates (Figure 4) the subject site falls within Zones X (shaded) and Zone A.

Zone A is defined by FEMA as:

> "A special flood hazard area inundated by the 100-year flood with no base flood elevations determined."

Zone X (shaded) is defined by FEMA as:

> "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 the 100-year flood."

The Zone A designated area is the ponding area behind the Airline Canal and this flood zone will be removed through FEMA CLOMR/LOMR process. The ponding will be removed by relocating the canal flow in a storm drain (Figure 5). Therefore, no other measures of flood proofing other than those mentioned in the on-site stormwater runoff management plan (Section 4.2) will be required.

6.0 SUMMARY AND CONCLUSIONS

1. The site is protected from off-site flows by a channel along 127th Avenue, a greenbelt channel that discharges into Colter channel, and Colter channel.
2. For areas requiring on-site retention, basins have been designed to retain runoff from the 100-year, 2-hour storm.
3. The 10-year flow is to be conveyed within the street sections below the top of the curb. The 100-year flow is contained at an elevation that is 1 foot below the finish floor elevations and does not exceed an elevation of 0.5 foot above the crown of the road at any location.
4. The design of this project has been based on generally accepted engineering practices and in accordance with the Flood Control District of Maricopa County requirements.
5. The ponding area behind the Airline Canal, designated as Zone A, will be removed through the FEMA CLOMR/LOMR process.

7.0 REFERENCES

1. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology,* January 1995.

2. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics,* January 1996.

3. United States Geological Survey (U.S.G.S.) 7.5-minute quadrangle topographic map, *El Mirage, Arizona*, 1957 (photo revised 1982).

4. The WLB Group, Inc, *White Tanks/Agua Fria Area Drainage Master Study Technical Data Notebook*: by, May 1992.

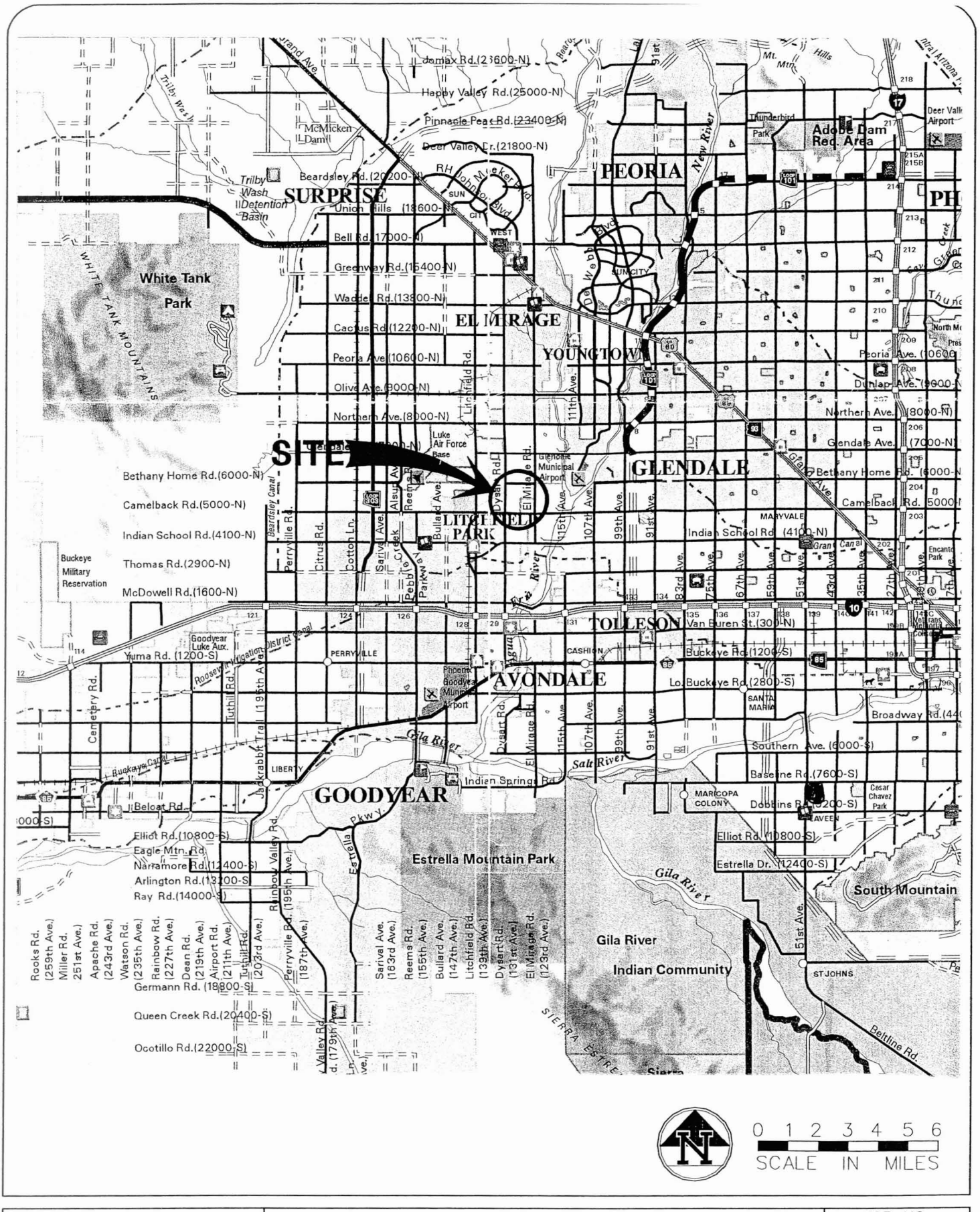
5. Flood Control District of Maricopa County, *Hydrology of Colter Channel Contributory Drainage Area*; July 1992

6. CRSS Civil Engineers, Inc., and Wood, Patel & Associates, Inc., *Recommendation Report*, *Colter Channel Project,* November 1992.

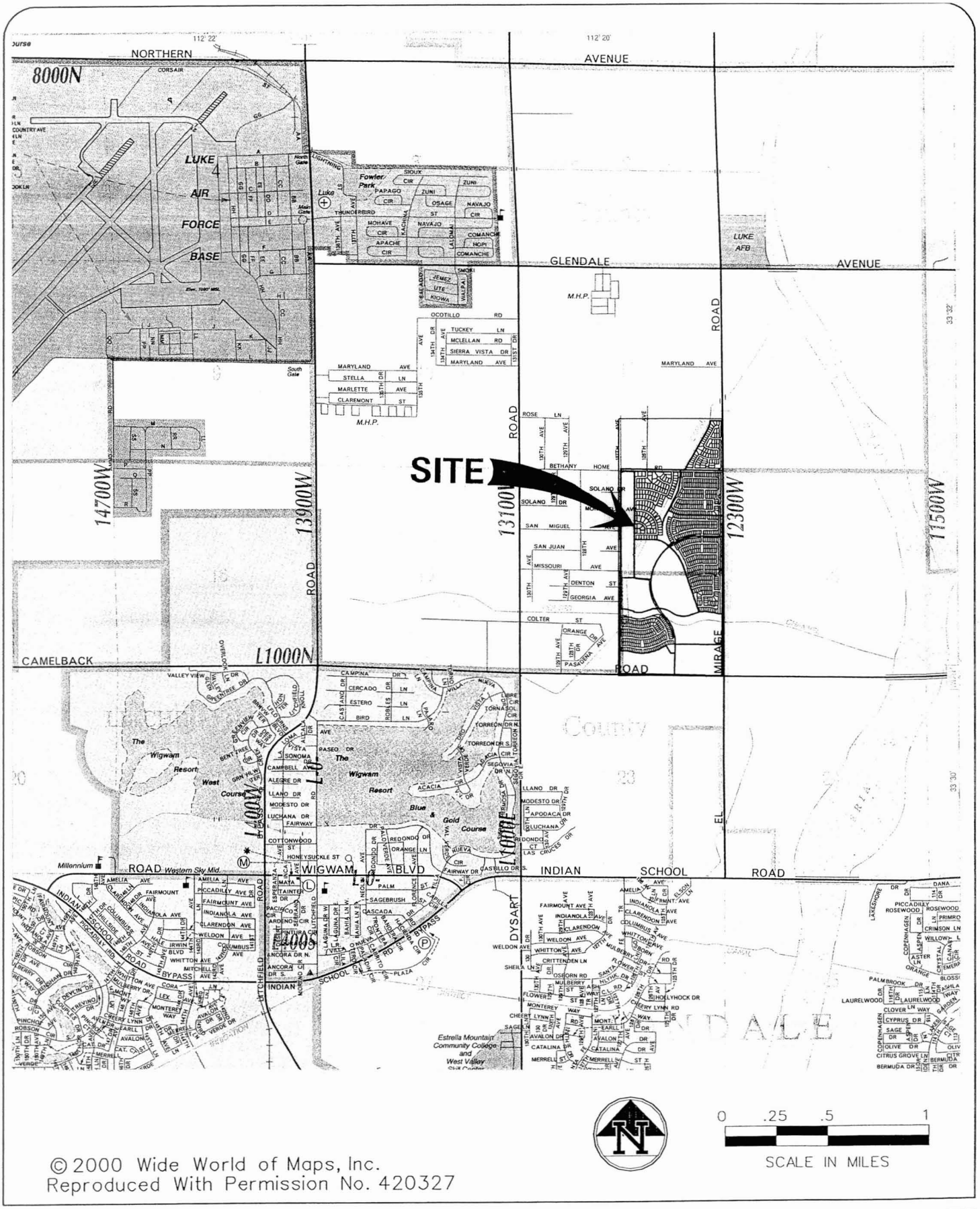
7. Federal Emergency Management Agency, *Flood Insurance Rate Map* (FIRM) Maricopa County, Arizona and Incorporated Areas, Panel Number 04013C1615**J** dated July 19, 2001.

8. Coe & Van Loo, *Preliminary Drainage Report for Wigwam Creek*, August 17, 1999.

FIGURES



VICINITY MAP	WIGWAM CREEK PHASE 2	JOB NO 000046–03
4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014 TELEPHONE (602) 264-6831	COE & VAN LOO PLANNING•ENGINEERING•LANDSCAPE ARCHITECTURE	FIGURE 1



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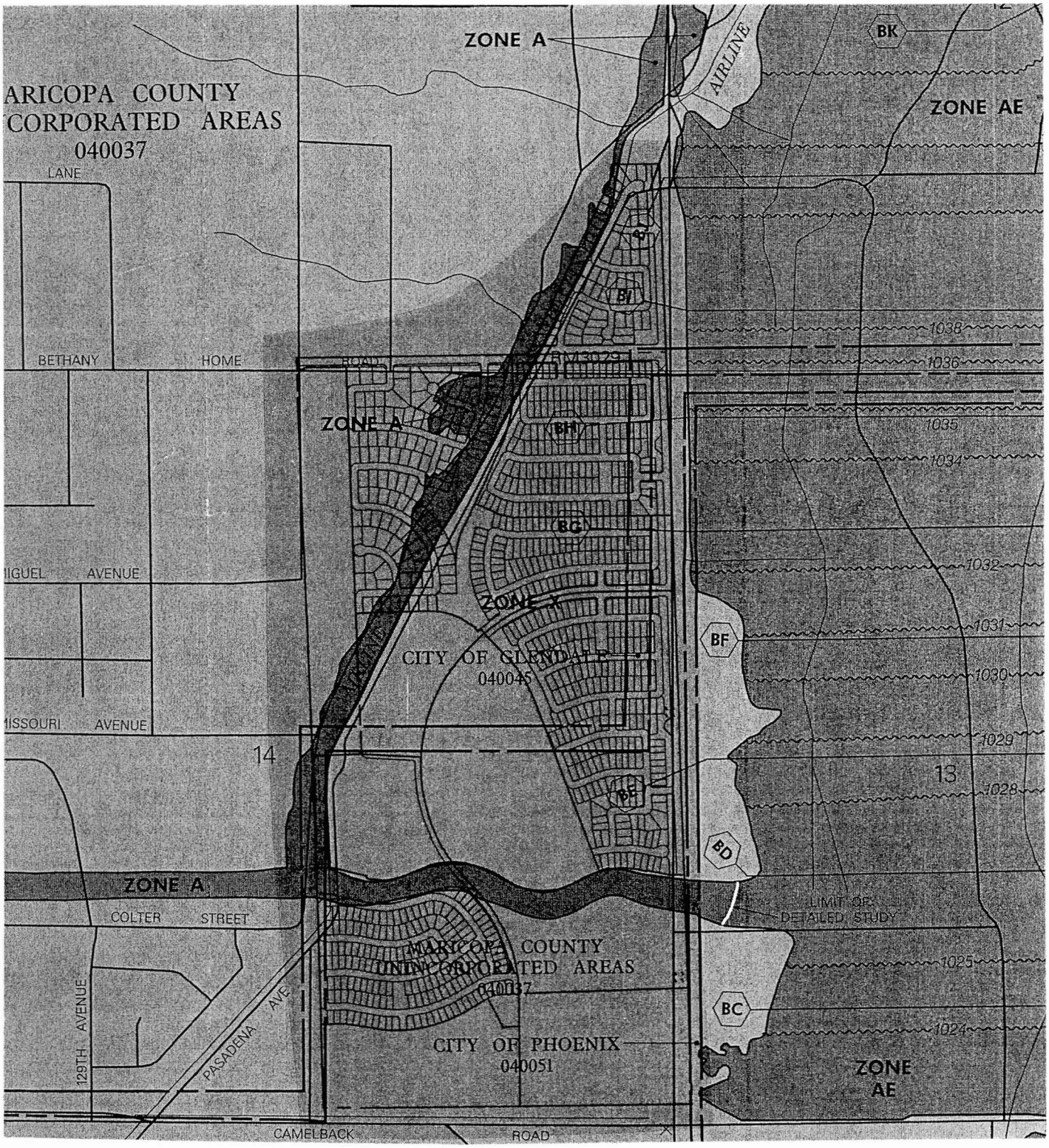
LOCATION MAP	WIGWAM CREEK PHASE 2	JOB NO 000046-03
4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014 TELEPHONE (602) 264-6831	COE & VAN LOO PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE	FIGURE 2



MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS
04013C1615 J REV. JULY 19,2001

1000' 500' 0 1000'
SCALE IN FEET

FLOOD INSURANCE RATE MAP	WIGWAM CREEK PHASE 2	JOB NO 000046-03
4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014 TELEPHONE (602) 264-6831	COE & VAN LOO PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE	FIGURE 3

APPENDIX A

Hydrology and Street Hydraulics Calculations

CVL

SUMMARY OF RATIONAL METHOD PEAK FLOW HYDROLOGY
WIGWAM CREEK – PHASE 2

Concentration Point	Basin Area (acres)	Cumulative Area (acres)	Weighted Runoff Coefficient			Time of Concentration (min)			Intensity (in/hr)			Peak Flow Rate			Street Slope (%)	Capacity (cfs)		(ft) 100-year
			Return Period			Return Period			Return Period			Return Period				4" Curb	6" Curb	
			10-Year	50-Year	100-Year	10-Year	50-Year	100-Year	10-Year	50-Year	100-Year	10-Year	50-Year	100-Year		10-Year	10-Year	
1	4.98	4.98	0.52	0.62	0.65	12.3	10.6	10.0	3.9	5.8	6.8	10	18	22	0.6	14.8	47.7	0.38
2	3.45	3.45	0.52	0.62	0.65	8.5	7.4	7.0	4.6	6.7	7.8	8	14	17	0.71	8.9	28.7	0.41
3	2.31	5.76	0.52	0.62	0.65	11.8	10.2	9.7	4.0	5.9	6.9	12	21	26	0.56	8.9	28.7	0.48
4	4.22	4.22	0.52	0.62	0.65	10.6	9.2	8.7	4.2	6.2	7.2	9	16	20	0.52	9.3	30.1	0.43
5	0.96	5.18	0.52	0.62	0.65	12.1	10.5	9.9	4.0	5.9	6.8	11	19	23	0.33	9.3	30.1	0.45
6	0.18	11.12	0.52	0.62	0.65	11.7	10.1	9.5	4.0	6.0	6.9	23	41	50	0.33	9.3	30.1	0.64
7	0.74	11.86	0.52	0.62	0.65	13.0	11.1	10.5	3.9	5.7	6.6	24	42	51	0.33	9.3	30.1	0.64
8	0.17	17.01	0.52	0.62	0.65	12.8	11.0	10.4	3.9	5.8	6.7	34	61	74	0.83	14.8	47.7	0.62
9	0.91	17.92	0.52	0.62	0.65	14.3	12.2	11.6	3.7	5.5	6.4	34	61	74	0.48	11.2	36.3	0.69
10	4.67	4.67	0.52	0.62	0.65	12.4	10.6	10.1	3.9	5.8	6.8	10	17	21	0.38	10	32.3	0.42
11	2.39	7.06	0.52	0.62	0.65	15.2	13.0	12.3	3.6	5.4	6.2	13	24	29	0.38	10	32.3	0.48
12	0.19	25.17	0.52	0.62	0.65	14.6	12.5	11.8	3.6	5.4	6.3	48	85	103	0.38	10	32.3	0.83
13	0.32	26.43*	0.52	0.62	0.65	15.1	13.0	12.3	3.6	5.4	6.2	49	88	107	0.38	10	32.3	0.84
14	1.04	1.04	0.52	0.62	0.65	5.3	5.0	5.0	5.3	7.7	8.7	3	5	6	0.25	8.1	26.2	0.3
15	3.13	12.07**	0.52	0.62	0.65	16.7	14.3	13.5	3.4	5.1	6.0	21	39	47	1.1	17	54.9	0.47
16	2.58	2.58	0.52	0.62	0.65	6.8	6.0	5.6	5.1	7.3	8.4	7	12	14	0.2	7.3	23.4	0.41
17	2.69	2.69	0.52	0.62	0.65	6.3	5.5	5.2	5.2	7.5	8.6	7	13	15	0.25	8.1	26.2	0.4
18	1.15	6.42	0.52	0.62	0.65	7.9	6.8	6.5	4.8	6.9	8.0	16	28	33	0.2	7.3	23.4	0.61
19	0.82	7.24	0.52	0.62	0.65	10.2	8.8	8.3	4.3	6.3	7.3	16	28	34	0.2	7.3	23.4	0.61
20	2.91	2.91	0.52	0.62	0.65	6.7	5.8	5.5	5.1	7.3	8.4	8	13	16	0.55	12	38.8	0.36
21	1.53	4.44	0.52	0.62	0.65	8.1	7.1	6.7	4.7	6.8	7.9	11	19	23	0.65	13.1	42.2	0.4
22	-	11.56	0.52	0.62	0.65	10.0	8.6	8.2	4.3	6.4	7.3	26	46	55	-	-	-	-
23	3.11	3.11	0.52	0.62	0.65	11.4	9.9	9.3	4.1	6.0	7.0	7	12	14	0.58	12.4	40	0.35
24	2.01	5.12	0.52	0.62	0.65	13.0	11.2	10.6	3.8	5.7	6.6	10	18	22	0.49	11.3	36.6	0.41
25A	2.97	2.97	0.52	0.62	0.65	8.8	7.7	7.2	4.6	6.6	7.7	7	12	15	0.56	12.1	39.2	0.42
25	2.36	5.33	0.52	0.62	0.65	11.1	9.6	9.0	4.1	6.1	7.1	11	20	24	0.25	8.1	26.2	0.48
26	4.15	4.15	0.52	0.62	0.65	9.4	8.1	7.7	4.5	6.5	7.5	10	17	20	0.43	10.6	34.3	0.41
27	2.44	6.59	0.52	0.62	0.65	13.7	11.8	11.1	3.8	5.6	6.5	13	23	28	0.25	8.1	26.2	0.53
28	0.31	12.23	0.52	0.62	0.65	15.2	13.0	12.3	3.6	5.3	6.2	23	41	49	0.25	8.1	26.2	0.67
29	-	17.35	0.52	0.62	0.65	14.9	12.8	12.1	3.6	5.4	6.3	33	58	71	-	-	-	-
30	3.14	3.14	0.52	0.62	0.65	7.7	6.7	6.3	4.8	7.0	8.0	8	14	16	0.64	13	41.9	0.35
31	6.05	9.19	0.52	0.62	0.65	15.6	13.4	12.6	3.5	5.3	6.1	17	30	37	0.4	10.3	33.1	0.54
32	2.84	2.84	0.52	0.62	0.65	6.7	5.8	5.5	5.1	7.3	8.4	8	13	16	0.25	8.1	26.2	0.41
33	4.10	6.94	0.52	0.62	0.65	13.9	11.9	11.3	3.7	5.6	6.5	13	24	29	0.25	8.1	26.2	0.54
34	-	16.13	0.52	0.62	0.65	14.9	12.8	12.1	3.6	5.4	6.3	30	54	66	-	-	-	-
35	3.59	3.59	0.52	0.62	0.65	8.7	7.6	7.2	4.6	6.7	7.7	9	15	18	0.25	8.1	26.2	0.42
36	4.00	7.59	0.52	0.62	0.65	13.6	11.7	11.0	3.8	5.6	6.5	15	27	32	0.25	8.1	26.2	0.57
37	4.06	4.06	0.52	0.62	0.65	8.1	7.1	6.7	4.7	6.8	7.9	10	17	21	0.45	10.9	35.1	0.41
38	2.28	6.34	0.52	0.62	0.65	11.2	9.7	9.1	4.1	6.1	7.0	14	24	29	0.25	8.1	26.2	0.54
39	-	13.93	0.52	0.62	0.65	12.9	11.7	10.5	3.9	5.7	6.7	28	50	60	0.25	8.1	26.2	0.72
40	3.58	3.58	0.52	0.62	0.65	8.3	7.2	6.8	4.7	6.8	7.8	9	15	18	0.72	13.8	44.4	0.36

*Includes 0.94 acres from CP-12A
**Includes 7.90 acres from Wigwam Creek Phase 1

SUMMARY OF RATIONAL METHOD PEAK FLOW HYDROLOGY
WIGWAM CREEK – PHASE 2

Concentration Point	Basin Area (acres)	Cumulative Area (acres)	Weighted Runoff Coefficient			Time of Concentration (min)			Intensity (in/hr)			Peak Flow Rate			Street Slope (%)	Capacity (cfs)		(ft) 100-year
			Return Period			Return Period			Return Period			Return Period				4" Curb	6" Curb	
			10-Year	50-Year	100-Year	10-Year	50-Year	100-Year	10-Year	50-Year	100-Year	10-Year	50-Year	100-Year		10-Year	10-Year	
41	2.16	5.74	0.52	0.62	0.65	11.5	9.9	9.4	4.1	6.0	7.0	12	22	26	0.25	8.1	26.2	0.5
42	5.11	5.11	0.52	0.62	0.65	8.9	7.7	7.3	4.6	6.6	7.7	12	21	25	0.56	12.1	39.2	0.42
43	0.73	5.84	0.52	0.62	0.65	11.2	9.6	9.1	4.1	6.1	7.0	13	22	27	0.25	8.1	26.2	0.52
44	-	11.58	0.52	0.62	0.65	10.8	9.3	8.8	4.2	6.2	7.1	25	44	54	-	-	-	-
45	3.61	3.61	0.52	0.62	0.65	7.5	6.6	6.2	4.9	7.0	8.1	9	16	19	0.93	15.6	50.5	0.35
46	1.42	1.42	0.52	0.62	0.65	5.0	5.0	5.0	5.7	7.7	8.7	4	7	8	0.25	8.1	26.2	0.33
47	0.28	5.31	0.52	0.62	0.65	8.2	7.1	6.7	4.7	6.8	7.9	13	23	27	0.25	8.1	26.2	0.52
48	1.36	6.67	0.52	0.62	0.65	9.7	8.4	7.9	4.4	6.4	7.4	15	27	32	0.25	8.1	26.2	0.57
49	1.54	1.54	0.52	0.62	0.65	5.0	5.0	5.0	5.7	7.7	8.7	5	7	9	0.25	8.1	26.2	0.34
50	1.64	1.64	0.52	0.62	0.65	6.4	5.6	5.3	5.2	7.4	8.5	4	8	9	0.22	7.6	24.6	0.35
51	1.00	2.64	0.52	0.62	0.65	5.4	5.0	5.0	5.5	7.7	8.7	8	12	15	0.39	10.1	32.7	0.29
52	3.88	6.52	0.52	0.62	0.65	12.6	10.9	10.3	3.9	5.8	6.7	13	24	28	0.25	8.1	26.2	0.53
53	-	13.19	0.52	0.62	0.65	12.2	10.5	9.9	4.0	5.9	6.8	27	48	58	-	-	-	-
54	1.66	1.66	0.52	0.62	0.65	5.7	5.0	5.0	5.4	7.7	8.7	5	8	9	1.96	22.7	73.3	0.23
55	3.65	3.65	0.52	0.62	0.65	5.2	5.0	5.0	5.6	7.7	8.7	11	18	21	1.83	21.9	70.8	0.32
56	0.38	5.69	0.52	0.62	0.65	5.8	5.1	5.0	5.4	7.7	8.7	16	27	32	0.25	8.1	26.2	0.57
57	2.50	2.50	0.52	0.62	0.65	7.3	6.4	6.1	4.9	7.1	8.2	6	11	13	0.25	8	26.2	0.38
58	2.17	2.17	0.52	0.62	0.65	7.7	6.7	6.3	4.8	7.0	8.0	5	9	11	1.5	20	64.5	0.26
59	6.41	6.41	0.52	0.62	0.65	9.9	8.6	8.1	4.3	6.4	7.4	14	25	31	1.5	20	64.5	0.29
60	1.11	3.28	0.52	0.62	0.65	8.4	7.3	6.9	4.7	6.8	7.8	8	14	17	1.3	18.5	59.7	0.32
61	0.97	6.66	0.52	0.62	0.65	7.5	6.5	6.2	4.9	7.0	8.1	17	29	35	0.25	8.1	26.2	0.59
62	-	9.94	0.52	0.62	0.65	8.0	6.9	6.5	4.8	6.9	8.0	25	43	51	-	-	-	-
63	7.22	7.22	0.45	0.54	0.56	8.4	7.3	6.9	4.7	6.8	7.8	18	30	37	1.92	22.5	72.5	0.48
64	0.93	7.34	0.52	0.62	0.65	11.2	9.7	9.2	4.1	6.1	7.0	16	28	33	0.76	14.1	45.6	0.35
65	-	14.56	0.46	0.55	0.58	8.1	7.0	6.7	4.7	6.9	7.9	36	62	73	-	-	-	-
66	3.93	3.93	0.52	0.62	0.65	7.1	6.2	5.9	5.0	7.2	8.2	10	18	21	0.44	10.8	34.7	0.41
67	2.10	6.03	0.52	0.62	0.65	9.6	8.3	7.9	4.4	6.4	7.4	14	24	29	0.38	10	32.3	0.48
68	6.67	6.67	0.52	0.62	0.65	8.0	7.0	6.6	4.8	6.9	7.9	16	29	34	0.25	8	26.2	0.69
69	1.36	1.36	0.52	0.62	0.65	5.0	5.0	5.0	5.7	7.7	8.7	4	7	8	1.9	22.4	72.1	0.21
70	0.17	8.20	0.52	0.62	0.65	8.8	7.6	7.2	4.6	6.7	7.7	20	34	41	1.12	17.2	55.4	0.55
71	1.59	9.79	0.52	0.62	0.65	9.7	8.4	8.0	4.4	6.4	7.4	22	39	47	0.3	8.9	28.7	0.74
72	-	15.82	0.52	0.62	0.65	9.5	8.3	7.8	4.4	6.5	7.5	36	64	77	-	-	-	-
12A	0.94	0.94	0.95	0.95	0.95	9.4	8.2	7.7	4.4	6.5	7.5	4	6	7	-	-	-	-
34A	3.04	3.04	0.95	0.95	0.95	16.2	13.9	13.1	3.5	5.2	6.0	10	15	17	0.3	-	26.7	0.5
0-1	2.60	2.60	0.72	0.86	0.9	10.7	9.2	8.7	4.2	6.2	7.2	8	14	17	0.24	-	24	0.5
0-2	2.70	5.30	0.72	0.86	0.9	14.3	12.3	11.6	3.7	5.5	6.4	14	25	30	0.48	-	33	0.5
0-3	1.60	1.60	0.72	0.86	0.9	16.1	13.8	13.1	3.5	5.2	6.1	4	7	9	0.25	-	24	0.5
0-4	2.10	2.10	0.72	0.86	0.9	20.3	17.3	16.3	3.1	4.7	5.5	5	9	10	0.25	-	24	0.5
0-4A	0.81	0.81	0.72	0.86	0.9	22.9	19.5	18.4	2.9	4.4	5.2	2	3	4	0.25	-	24	0.5
0-5	2.70	2.70	0.72	0.86	0.9	23.9	20.4	19.2	2.8	4.3	5.1	6	10	12	0.25	-	24	0.5

*Includes 0.94 acres from CP-12A
**Includes 7.90 acres from Wigwam Creek Phase 1

RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 1

Location: On-Site

Drainage Basin Data

Water Course Length: 1330.00 ft

Basin Area: 4.980 acres

High Elevation: 1044.60 ft

Low Elevation: 1036.58 ft

Average Slope: 0.0060 ft/ft

Roughness, Kb: 0.0356 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	8	10	14	18	22
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	15.0	13.2	12.3	11.2	10.6	10.0
i (in/hr)	2.3	3.3	3.9	5.1	5.8	6.8

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 2

Location: On-Site

Drainage Basin Data

Water Course Length: 779.00 ft

Basin Area: 3.450 acres

High Elevation: 1044.60 ft

Low Elevation: 1039.06 ft

Average Slope: 0.0071 ft/ft

Roughness, Kb: 0.0366 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	5	7	8	12	14	17
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	10.4	9.1	8.5	7.8	7.4	7.0
i (in/hr)	2.8	3.9	4.6	5.9	6.7	7.8

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 3

Location: On-Site

Drainage Basin Data

Water Course Length: 1205.00 ft

Basin Area: 5.760 acres

High Elevation: 1044.60 ft

Low Elevation: 1037.86 ft

Average Slope: 0.0056 ft/ft

Roughness, Kb: 0.0352 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	7	10	12	17	21	26
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	14.4	12.7	11.8	10.8	10.2	9.7
i (in/hr)	2.4	3.3	4.0	5.2	5.9	6.9

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 4

Location: On-Site

Drainage Basin Data

Water Course Length: 831.00 ft

Basin Area: 4.220 acres

High Elevation: 1041.60 ft

Low Elevation: 1038.04 ft

Average Slope: 0.0043 ft/ft

Roughness, Kb: 0.0361 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	8	9	13	16	20
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	12.9	11.4	10.6	9.7	9.2	8.7
i (in/hr)	2.5	3.5	4.2	5.4	6.2	7.2

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 5

Location: On-Site

Drainage Basin Data

Water Course Length: 1001.00 ft

Basin Area: 5.180 acres

High Elevation: 1041.60 ft

Low Elevation: 1037.66 ft

Average Slope: 0.0039 ft/ft

Roughness, Kb: 0.0355 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	9	11	15	19	23
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	14.8	13.0	12.1	11.0	10.5	9.9
i (in/hr)	2.4	3.3	4.0	5.1	5.9	6.8

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 6

Location: On-Site

Drainage Basin Data

Water Course Length: 1258.00 ft

Basin Area: 11.120 acres

High Elevation: 1044.60 ft

Low Elevation: 1037.42 ft

Average Slope: 0.0057 ft/ft

Roughness, Kb: 0.0335 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	14	19	23	33	41	50
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	14.2	12.5	11.7	10.6	10.1	9.5
i (in/hr)	2.4	3.4	4.0	5.2	6.0	6.9

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 7

Location: On-Site

Drainage Basin Data

Water Course Length: 1445.00 ft

Basin Area: 11.860 acres

High Elevation: 1044.60 ft

Low Elevation: 1036.84 ft

Average Slope: 0.0054 ft/ft

Roughness, Kb: 0.0333 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	14	20	24	34	42	51
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	15.8	13.9	13.0	11.8	11.1	10.5
i (in/hr)	2.3	3.2	3.9	5.0	5.7	6.6

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 8

Location: On-Site

Drainage Basin Data

Water Course Length: 1498.00 ft

Basin Area: 17.010 acres

High Elevation: 1044.60 ft

Low Elevation: 1036.22 ft

Average Slope: 0.0056 ft/ft

Roughness, Kb: 0.0323 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	20	28	34	49	61	74
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	15.6	13.7	12.8	11.6	11.0	10.4
i (in/hr)	2.3	3.2	3.9	5.0	5.8	6.7

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 9

Location: On-Site

Drainage Basin Data

Water Course Length: 1748.00 ft

Basin Area: 17.920 acres

High Elevation: 1044.60 ft

Low Elevation: 1035.25 ft

Average Slope: 0.0053 ft/ft

Roughness, Kb: 0.0322 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	20	28	34	49	61	74
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	17.4	15.3	14.3	12.9	12.2	11.6
i (in/hr)	2.2	3.1	3.7	4.7	5.5	6.4

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 10

Location: On-Site

Drainage Basin Data

Water Course Length: 1160.00 ft

Basin Area: 4.670 acres

High Elevation: 1042.00 ft

Low Elevation: 1036.40 ft

Average Slope: 0.0048 ft/ft

Roughness, Kb: 0.0358 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	8	10	14	17	21
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	15.1	13.3	12.4	11.2	10.6	10.1
i (in/hr)	2.3	3.3	3.9	5.1	5.8	6.8

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 11

Location: On-Site

Drainage Basin Data

Water Course Length: 1590.00 ft

Basin Area: 7.060 acres

High Elevation: 1042.00 ft

Low Elevation: 1034.95 ft

Average Slope: 0.0044 ft/ft

Roughness, Kb: 0.0347 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	8	11	13	19	24	29
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	18.6	16.3	15.2	13.8	13.0	12.3
i (in/hr)	2.1	3.0	3.6	4.6	5.4	6.2

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 12

Location: On-Site

Drainage Basin Data

Water Course Length: 1880.00 ft

Basin Area: 25.170 acres

High Elevation: 1044.60 ft

Low Elevation: 1034.46 ft

Average Slope: 0.0054 ft/ft

Roughness, Kb: 0.0312 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	28	39	48	68	85	103
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	17.8	15.7	14.6	13.2	12.5	11.8
i (in/hr)	2.1	3.0	3.6	4.7	5.4	6.3

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 13

Location: On-Site

Drainage Basin Data

Water Course Length: 1940.00 ft

Basin Area: 26.430 acres

High Elevation: 1044.60 ft

Low Elevation: 1034.71 ft

Average Slope: 0.0051 ft/ft

Roughness, Kb: 0.0311 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	29	41	49	70	88	107
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	18.5	16.3	15.1	13.8	13.0	12.3
i (in/hr)	2.1	3.0	3.6	4.6	5.4	6.2

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 14

Location: On-Site

Drainage Basin Data

Water Course Length: 320.00 ft

Basin Area: 1.040 acres

High Elevation: 1035.80 ft

Low Elevation: 1033.44 ft

Average Slope: 0.0074 ft/ft

Roughness, Kb: 0.0399 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	2	3	3	4	5	6
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	6.4	5.6	5.3	5.0	5.0	5.0
i (in/hr)	3.4	4.7	5.6	6.7	7.7	8.7

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 15

Location: On-Site

Drainage Basin Data

Water Course Length: 2130.00 ft

Basin Area: 12.070 acres

High Elevation: 1040.00 ft

Low Elevation: 1029.05 ft

Average Slope: 0.0051 ft/ft

Roughness, Kb: 0.0332 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	13	18	21	30	39	47
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	20.5	17.9	16.7	15.2	14.3	13.5
i (in/hr)	2.0	2.8	3.4	4.4	5.1	6.0

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 16

Location: On-Site

Drainage Basin Data

Water Course Length: 600.00 ft

Basin Area: 2.580 acres

High Elevation: 1035.70 ft

Low Elevation: 1030.36 ft

Average Slope: 0.0089 ft/ft

Roughness, Kb: 0.0374 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	4	6	7	9	12	14
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	8.3	7.3	6.8	6.3	6.0	5.6
i (in/hr)	3.1	4.2	5.1	6.3	7.3	8.4

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 17

Location: On-Site

Drainage Basin Data

Water Course Length: 550.00 ft

Basin Area: 2.690 acres

High Elevation: 1035.90 ft

Low Elevation: 1030.50 ft

Average Slope: 0.0098 ft/ft

Roughness, Kb: 0.0373 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	4	6	7	10	13	15
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	7.6	6.7	6.3	5.8	5.5	5.2
i (in/hr)	3.2	4.4	5.2	6.5	7.5	8.6

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 18

Location: On-Site

Drainage Basin Data

Water Course Length: 740.00 ft

Basin Area: 6.423 acres

High Elevation: 1035.70 ft

Low Elevation: 1030.09 ft

Average Slope: 0.0076 ft/ft

Roughness, Kb: 0.0350 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	10	13	16	22	28	33
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	9.5	8.4	7.9	7.2	6.8	6.5
i (in/hr)	2.9	4.0	4.8	6.0	6.9	8.0

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 19

Location: On-Site

Drainage Basin Data

Water Course Length: 1000.00 ft

Basin Area: 7.240 acres

High Elevation: 1035.70 ft

Low Elevation: 1029.70 ft

Average Slope: 0.0060 ft/ft

Roughness, Kb: 0.0346 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	10	13	16	23	28	34
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	12.4	10.9	10.2	9.3	8.8	8.3
i (in/hr)	2.6	3.6	4.3	5.5	6.3	7.3

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 20

Location: On-Site

Drainage Basin Data

Water Course Length: 570.00 ft

Basin Area: 2.913 acres

High Elevation: 1036.30 ft

Low Elevation: 1031.37 ft

Average Slope: 0.0086 ft/ft

Roughness, Kb: 0.0371 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	5	6	8	11	13	16
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	8.1	7.1	6.7	6.1	5.8	5.5
i (in/hr)	3.1	4.3	5.1	6.4	7.3	8.4

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 21

Location: On-Site

Drainage Basin Data

Water Course Length: 800.00 ft

Basin Area: 4.444 acres

High Elevation: 1036.30 ft

Low Elevation: 1029.70 ft

Average Slope: 0.0082 ft/ft

Roughness, Kb: 0.0360 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	7	9	11	15	19	23
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	9.9	8.7	8.1	7.4	7.1	6.7
i (in/hr)	2.8	4.0	4.7	6.0	6.8	7.9

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 22

Location: On-Site

Drainage Basin Data

Water Course Length: 1000.00 ft

Basin Area: 11.560 acres

High Elevation: 1035.70 ft

Low Elevation: 1029.70 ft

Average Slope: 0.0060 ft/ft

Roughness, Kb: 0.0334 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	16	22	26	37	46	55
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	12.1	10.7	10.0	9.1	8.6	8.2
i (in/hr)	2.6	3.6	4.3	5.5	6.4	7.3

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 23

Location: On-Site

Drainage Basin Data

Water Course Length: 945.00 ft

Basin Area: 3.110 acres

High Elevation: 1036.85 ft

Low Elevation: 1032.62 ft

Average Slope: 0.0045 ft/ft

Roughness, Kb: 0.0369 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	4	5	7	9	12	14
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	13.9	12.3	11.4	10.4	9.9	9.3
i (in/hr)	2.4	3.4	4.1	5.2	6.0	7.0

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 24

Location: On-Site

Drainage Basin Data

Water Course Length: 1290.00 ft

Basin Area: 5.120 acres

High Elevation: 1036.85 ft

Low Elevation: 1030.50 ft

Average Slope: 0.0049 ft/ft

Roughness, Kb: 0.0356 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	8	10	14	18	22
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	15.9	14.0	13.0	11.8	11.2	10.6
i (in/hr)	2.3	3.2	3.8	4.9	5.7	6.6

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 25A

Location: On-Site

Drainage Basin Data

Water Course Length: 715.00 ft

Basin Area: 2.970 acres

High Elevation: 1036.33 ft

Low Elevation: 1032.20 ft

Average Slope: 0.0058 ft/ft

Roughness, Kb: 0.0370 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	4	6	7	10	12	15
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	10.7	9.5	8.8	8.1	7.7	7.2
i (in/hr)	2.7	3.8	4.6	5.8	6.6	7.7

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 25

Location: On-Site

Drainage Basin Data

Water Course Length: 1040.00 ft

Basin Area: 5.330 acres

High Elevation: 1036.85 ft

Low Elevation: 1031.30 ft

Average Slope: 0.0053 ft/ft

Roughness, Kb: 0.0355 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	7	10	11	16	20	24
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	13.5	11.9	11.1	10.1	9.6	9.0
i (in/hr)	2.5	3.4	4.1	5.3	6.1	7.1

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 26

Location: On-Site

Drainage Basin Data

Water Course Length: 810.00 ft

Basin Area: 4.150 acres

High Elevation: 1037.80 ft

Low Elevation: 1033.14 ft

Average Slope: 0.0058 ft/ft

Roughness, Kb: 0.0361 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	8	10	13	17	20
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	11.4	10.0	9.4	8.6	8.1	7.7
i (in/hr)	2.7	3.7	4.5	5.7	6.5	7.5

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 27

Location: On-Site

Drainage Basin Data

Water Course Length: 1390.00 ft

Basin Area: 6.595 acres

High Elevation: 1037.80 ft

Low Elevation: 1031.28 ft

Average Slope: 0.0047 ft/ft

Roughness, Kb: 0.0349 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	8	11	13	18	23	28
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	16.8	14.7	13.7	12.5	11.8	11.1
i (in/hr)	2.2	3.1	3.8	4.8	5.6	6.5

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 28

Location: On-Site

Drainage Basin Data

Water Course Length: 1660.00 ft

Basin Area: 12.234 acres

High Elevation: 1037.80 ft

Low Elevation: 1030.50 ft

Average Slope: 0.0044 ft/ft

Roughness, Kb: 0.0332 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	13	19	23	32	41	49
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	18.6	16.3	15.2	13.8	13.0	12.3
i (in/hr)	2.1	3.0	3.6	4.6	5.3	6.2

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 29

Location: On-Site

Drainage Basin Data

Water Course Length: 1660.00 ft

Basin Area: 17.350 acres

High Elevation: 1037.80 ft

Low Elevation: 1030.50 ft

Average Slope: 0.0044 ft/ft

Roughness, Kb: 0.0323 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	19	27	33	46	58	71
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	18.2	16.0	14.9	13.5	12.8	12.1
i (in/hr)	2.1	3.0	3.6	4.6	5.4	6.3

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 30

Location: On-Site

Drainage Basin Data

Water Course Length: 645.00 ft

Basin Area: 3.140 acres

High Elevation: 1039.40 ft

Low Elevation: 1034.85 ft

Average Slope: 0.0071 ft/ft

Roughness, Kb: 0.0369 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	5	7	8	11	14	16
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	9.3	8.2	7.7	7.1	6.7	6.3
i (in/hr)	2.9	4.0	4.8	6.1	7.0	8.0

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 31

Location: On-Site

Drainage Basin Data

Water Course Length: 1685.00 ft

Basin Area: 9.195 acres

High Elevation: 1039.40 ft

Low Elevation: 1032.03 ft

Average Slope: 0.0044 ft/ft

Roughness, Kb: 0.0340 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	10	14	17	24	30	37
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	19.1	16.7	15.6	14.1	13.4	12.6
i (in/hr)	2.1	2.9	3.5	4.5	5.3	6.1

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 32

Location: On-Site

Drainage Basin Data

Water Course Length: 610.00 ft

Basin Area: 2.838 acres

High Elevation: 1039.90 ft

Low Elevation: 1033.97 ft

Average Slope: 0.0097 ft/ft

Roughness, Kb: 0.0372 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	5	6	8	10	13	16
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	8.1	7.1	6.7	6.1	5.8	5.5
i (in/hr)	3.1	4.3	5.1	6.4	7.3	8.4

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 33

Location: On-Site

Drainage Basin Data

Water Course Length: 1500.00 ft

Basin Area: 6.938 acres

High Elevation: 1039.30 ft

Low Elevation: 1031.64 ft

Average Slope: 0.0051 ft/ft

Roughness, Kb: 0.0347 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	8	11	13	19	24	29
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	17.0	14.9	13.9	12.6	11.9	11.3
i (in/hr)	2.2	3.1	3.7	4.8	5.6	6.5

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 34

Location: On-Site

Drainage Basin Data

Water Course Length: 1685.00 ft

Basin Area: 16.133 acres

High Elevation: 1039.40 ft

Low Elevation: 1031.75 ft

Average Slope: 0.0045 ft/ft

Roughness, Kb: 0.0325 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	18	25	30	43	54	66
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	18.3	16.0	14.9	13.5	12.8	12.1
i (in/hr)	2.1	3.0	3.6	4.6	5.4	6.3

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 35

Location: On-Site

Drainage Basin Data

Water Course Length: 690.00 ft

Basin Area: 3.590 acres

High Elevation: 1039.30 ft

Low Elevation: 1035.50 ft

Average Slope: 0.0055 ft/ft

Roughness, Kb: 0.0365 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	5	7	9	12	15	18
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	10.6	9.3	8.7	8.0	7.6	7.2
i (in/hr)	2.8	3.8	4.6	5.8	6.7	7.7

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 36

Location: On-Site

Drainage Basin Data

Water Course Length: 1425.00 ft

Basin Area: 7.593 acres

High Elevation: 1041.00 ft

Low Elevation: 1033.96 ft

Average Slope: 0.0049 ft/ft

Roughness, Kb: 0.0345 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	9	12	15	21	27	32
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	16.6	14.6	13.6	12.3	11.7	11.0
i (in/hr)	2.2	3.1	3.8	4.9	5.6	6.5

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 37

Location: On-Site

Drainage Basin Data

Water Course Length: 785.00 ft

Basin Area: 4.060 acres

High Elevation: 1041.40 ft

Low Elevation: 1035.08 ft

Average Slope: 0.0081 ft/ft

Roughness, Kb: 0.0362 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	8	10	14	17	21
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	9.9	8.7	8.1	7.5	7.1	6.7
i (in/hr)	2.8	3.9	4.7	6.0	6.8	7.9

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 38

Location: On-Site

Drainage Basin Data

Water Course Length: 1180.00 ft

Basin Area: 6.340 acres

High Elevation: 1041.40 ft

Low Elevation: 1034.09 ft

Average Slope: 0.0062 ft/ft

Roughness, Kb: 0.0350 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	8	11	14	19	24	29
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	13.6	12.0	11.2	10.2	9.7	9.1
i (in/hr)	2.5	3.4	4.1	5.3	6.1	7.0

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 39

Location: On-Site

Drainage Basin Data

Water Course Length: 1425.00 ft

Basin Area: 13.933 acres

High Elevation: 1041.40 ft

Low Elevation: 1033.96 ft

Average Slope: 0.0052 ft/ft

Roughness, Kb: 0.0328 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	17	23	28	40	50	60
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	15.7	13.8	12.9	11.7	11.1	10.5
i (in/hr)	2.3	3.2	3.9	5.0	5.7	6.7

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 40

Location: On-Site

Drainage Basin Data

Water Course Length: 740.00 ft

Basin Area: 3.587 acres

High Elevation: 1040.95 ft

Low Elevation: 1035.78 ft

Average Slope: 0.0070 ft/ft

Roughness, Kb: 0.0365 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	5	7	9	12	15	18
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	10.1	8.9	8.3	7.6	7.2	6.8
i (in/hr)	2.8	3.9	4.7	5.9	6.8	7.8

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 41

Location: On-Site

Drainage Basin Data

Water Course Length: 1120.00 ft

Basin Area: 5.745 acres

High Elevation: 1040.95 ft

Low Elevation: 1034.89 ft

Average Slope: 0.0054 ft/ft

Roughness, Kb: 0.0353 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	7	10	12	17	22	26
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	14.0	12.3	11.5	10.4	9.9	9.4
i (in/hr)	2.4	3.4	4.1	5.2	6.0	7.0

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 42

Location: On-Site

Drainage Basin Data

Water Course Length: 975.00 ft

Basin Area: 5.105 acres

High Elevation: 1044.00 ft

Low Elevation: 1035.51 ft

Average Slope: 0.0087 ft/ft

Roughness, Kb: 0.0356 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	7	10	12	17	21	25
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	10.8	9.5	8.9	8.1	7.7	7.3
i (in/hr)	2.7	3.8	4.6	5.8	6.6	7.6

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 43

Location: On-Site

Drainage Basin Data

Water Course Length: 1300.00 ft

Basin Area: 5.835 acres

High Elevation: 1044.00 ft

Low Elevation: 1034.41 ft

Average Slope: 0.0074 ft/ft

Roughness, Kb: 0.0352 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	7	10	13	18	22	27
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	13.6	12.0	11.2	10.2	9.6	9.1
i (in/hr)	2.5	3.4	4.1	5.3	6.1	7.0

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 44

Location: On-Site

Drainage Basin Data

Water Course Length: 1300.00 ft

Basin Area: 11.580 acres

High Elevation: 1044.00 ft

Low Elevation: 1034.41 ft

Average Slope: 0.0074 ft/ft

Roughness, Kb: 0.0334 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	15	21	25	35	44	54
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	13.1	11.6	10.8	9.8	9.3	8.8
i (in/hr)	2.5	3.5	4.2	5.4	6.2	7.1

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 45

Location: On-Site

Drainage Basin Data

Water Course Length: 775.00 ft

Basin Area: 3.610 acres

High Elevation: 1043.70 ft

Low Elevation: 1036.04 ft

Average Slope: 0.0099 ft/ft

Roughness, Kb: 0.0365 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	8	9	13	16	19
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	9.1	8.1	7.5	6.9	6.6	6.2
i (in/hr)	2.9	4.1	4.9	6.1	7.0	8.1

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 46

Location: On-Site

Drainage Basin Data

Water Course Length: 360.00 ft

Basin Area: 1.425 acres

High Elevation: 1039.90 ft

Low Elevation: 1036.37 ft

Average Slope: 0.0098 ft/ft

Roughness, Kb: 0.0390 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	3	4	4	5	7	8
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	6.1	5.4	5.0	5.0	5.0	5.0
i (in/hr)	3.5	4.7	5.7	6.7	7.7	8.7

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 47

Location: On-Site

Drainage Basin Data

Water Course Length: 860.00 ft

Basin Area: 5.314 acres

High Elevation: 1043.70 ft

Low Elevation: 1036.05 ft

Average Slope: 0.0089 ft/ft

Roughness, Kb: 0.0355 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	8	11	13	18	23	27
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	9.9	8.8	8.2	7.5	7.1	6.7
i (in/hr)	2.8	3.9	4.7	5.9	6.8	7.9

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 48

Location: On-Site

Drainage Basin Data

Water Course Length: 1060.00 ft

Basin Area: 6.668 acres

High Elevation: 1043.70 ft

Low Elevation: 1035.56 ft

Average Slope: 0.0077 ft/ft

Roughness, Kb: 0.0349 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	9	13	15	21	27	32
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	11.8	10.4	9.7	8.8	8.4	7.9
i (in/hr)	2.6	3.7	4.4	5.6	6.4	7.4

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 49

Location: On-Site

Drainage Basin Data

Water Course Length: 315.00 ft

Basin Area: 1.539 acres

High Elevation: 1041.30 ft

Low Elevation: 1038.00 ft

Average Slope: 0.0105 ft/ft

Roughness, Kb: 0.0388 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	3	4	5	6	7	9
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	5.5	5.0	5.0	5.0	5.0	5.0
i (in/hr)	3.6	4.9	5.7	6.7	7.7	8.7

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Author: Frank M. Gu, P.E.
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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 50

Location: On-Site

Drainage Basin Data

Water Course Length: 390.00 ft

Basin Area: 1.639 acres

High Elevation: 1039.90 ft

Low Elevation: 1037.75 ft

Average Slope: 0.0055 ft/ft

Roughness, Kb: 0.0387 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	3	4	4	6	8	9
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	7.8	6.9	6.4	5.9	5.6	5.3
i (in/hr)	3.1	4.3	5.2	6.4	7.4	8.5

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 51

Location: On-Site

Drainage Basin Data

Water Course Length: 385.00 ft

Basin Area: 2.640 acres

High Elevation: 1041.00 ft

Low Elevation: 1037.48 ft

Average Slope: 0.0091 ft/ft

Roughness, Kb: 0.0374 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	5	6	8	10	13	15
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	6.3	5.6	5.2	5.0	5.0	5.0
i (in/hr)	3.4	4.7	5.6	6.7	7.7	8.7

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 52

Location: On-Site

Drainage Basin Data

Water Course Length: 1250.00 ft

Basin Area: 6.519 acres

High Elevation: 1041.40 ft

Low Elevation: 1035.25 ft

Average Slope: 0.0049 ft/ft

Roughness, Kb: 0.0349 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	8	11	13	19	24	28
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	15.4	13.6	12.6	11.5	10.9	10.3
i (in/hr)	2.3	3.2	3.9	5.0	5.8	6.7

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 53

Location: On-Site

Drainage Basin Data

Water Course Length: 1250.00 ft

Basin Area: 13.187 acres

High Elevation: 1041.40 ft

Low Elevation: 1035.25 ft

Average Slope: 0.0049 ft/ft

Roughness, Kb: 0.0330 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	16	23	27	38	48	58
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	14.9	13.1	12.2	11.1	10.5	9.9
i (in/hr)	2.4	3.3	4.0	5.1	5.9	6.8

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 54

Location: On-Site

Drainage Basin Data

Water Course Length: 505.00 ft

Basin Area: 1.663 acres

High Elevation: 1046.30 ft

Low Elevation: 1040.45 ft

Average Slope: 0.0116 ft/ft

Roughness, Kb: 0.0386 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	3	4	5	6	8	9
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	6.9	6.1	5.7	5.3	5.0	5.0
i (in/hr)	3.3	4.5	5.4	6.6	7.7	8.7

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 55

Location: On-Site

Drainage Basin Data

Water Course Length: 565.00 ft

Basin Area: 3.654 acres

High Elevation: 1049.50 ft

Low Elevation: 1040.37 ft

Average Slope: 0.0162 ft/ft

Roughness, Kb: 0.0365 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	9	11	14	18	21
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	6.3	5.6	5.2	5.0	5.0	5.0
i (in/hr)	3.4	4.7	5.6	6.7	7.7	8.7

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 56

Location: On-Site

Drainage Basin Data

Water Course Length: 650.00 ft

Basin Area: 5.694 acres

High Elevation: 1049.50 ft

Low Elevation: 1040.06 ft

Average Slope: 0.0145 ft/ft

Roughness, Kb: 0.0353 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	10	13	16	22	27	32
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	7.0	6.2	5.8	5.4	5.1	5.0
i (in/hr)	3.3	4.5	5.4	6.6	7.7	8.7

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 57

Location: On-Site

Drainage Basin Data

Water Course Length: 495.00 ft

Basin Area: 2.497 acres

High Elevation: 1054.40 ft

Low Elevation: 1051.74 ft

Average Slope: 0.0054 ft/ft

Roughness, Kb: 0.0375 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	4	5	6	9	11	13
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	8.9	7.9	7.3	6.7	6.4	6.1
i (in/hr)	3.0	4.1	4.9	6.2	7.1	8.2

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 58

Location: On-Site

Drainage Basin Data

Water Course Length: 895.00 ft

Basin Area: 2.167 acres

High Elevation: 1053.30 ft

Low Elevation: 1042.12 ft

Average Slope: 0.0125 ft/ft

Roughness, Kb: 0.0379 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	3	5	5	8	9	11
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	9.3	8.2	7.7	7.1	6.7	6.3
i (in/hr)	2.9	4.0	4.8	6.1	7.0	8.0

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 59

Location: On-Site

Drainage Basin Data

Water Course Length: 1400.00 ft

Basin Area: 6.410 acres

High Elevation: 1057.50 ft

Low Elevation: 1041.60 ft

Average Slope: 0.0114 ft/ft

Roughness, Kb: 0.0350 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	9	12	14	20	25	31
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	12.0	10.6	9.9	9.0	8.6	8.1
i (in/hr)	2.6	3.6	4.3	5.5	6.4	7.4

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 60

Location: On-Site

Drainage Basin Data

Water Course Length: 1095.00 ft

Basin Area: 3.280 acres

High Elevation: 1053.30 ft

Low Elevation: 1039.00 ft

Average Slope: 0.0131 ft/ft

Roughness, Kb: 0.0368 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	5	7	8	11	14	17
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	10.2	9.0	8.4	7.7	7.3	6.9
i (in/hr)	2.8	3.9	4.7	5.9	6.8	7.8

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 61

Location: On-Site

Drainage Basin Data

Water Course Length: 885.00 ft

Basin Area: 6.657 acres

High Elevation: 1049.50 ft

Low Elevation: 1039.40 ft

Average Slope: 0.0114 ft/ft

Roughness, Kb: 0.0349 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	10	14	17	23	29	35
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	9.1	8.0	7.5	6.9	6.5	6.2
i (in/hr)	2.9	4.1	4.9	6.1	7.0	8.1

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 62

Location: On-Site

Drainage Basin Data

Water Course Length: 1095.00 ft

Basin Area: 9.937 acres

High Elevation: 1053.30 ft

Low Elevation: 1039.00 ft

Average Slope: 0.0131 ft/ft

Roughness, Kb: 0.0338 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	15	21	25	34	43	51
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	9.6	8.5	8.0	7.3	6.9	6.5
i (in/hr)	2.9	4.0	4.8	6.0	6.9	8.0

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 63

Location: On-Site

Drainage Basin Data

Water Course Length: 1130.00 ft

Basin Area: 7.220 acres

High Elevation: 1053.00 ft

Low Elevation: 1039.00 ft

Average Slope: 0.0124 ft/ft

Roughness, Kb: 0.0346 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	11	15	18	24	30	37
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	10.2	9.0	8.4	7.7	7.3	6.9
i (in/hr)	2.8	3.9	4.7	5.9	6.8	7.8

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 64

Location: On-Site

Drainage Basin Data

Water Course Length: 1700.00 ft

Basin Area: 7.341 acres

High Elevation: 1057.50 ft

Low Elevation: 1039.00 ft

Average Slope: 0.0109 ft/ft

Roughness, Kb: 0.0346 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	9	13	16	22	28	33
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	13.7	12.0	11.2	10.2	9.7	9.2
i (in/hr)	2.4	3.4	4.1	5.3	6.1	7.0

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 65

Location: On-Site

Drainage Basin Data

Water Course Length: 1130.00 ft

Basin Area: 14.560 acres

High Elevation: 1053.00 ft

Low Elevation: 1039.00 ft

Average Slope: 0.0124 ft/ft

Roughness, Kb: 0.0327 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	22	30	36	50	62	75
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	9.8	8.7	8.1	7.4	7.0	6.7
i (in/hr)	2.8	4.0	4.7	6.0	6.9	7.9

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 65

Location: On-Site

Drainage Basin Data

Water Course Length: 2400.00 ft

Basin Area: 21.380 acres

High Elevation: 1091.00 ft

Low Elevation: 1039.00 ft

Average Slope: 0.0217 ft/ft

Roughness, Kb: 0.0317 (A)

10-Year Runoff Coefficient: 0.480

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	26	37	44	62	78	94
C	0.480	0.480	0.480	0.528	0.576	0.600
Tc (min)	12.3	10.8	10.1	9.2	8.8	8.3
i (in/hr)	2.6	3.6	4.3	5.5	6.3	7.3

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 66

Location: On-Site

Drainage Basin Data

Water Course Length: 805.00 ft

Basin Area: 3.926 acres

High Elevation: 1049.35 ft

Low Elevation: 1039.64 ft

Average Slope: 0.0121 ft/ft

Roughness, Kb: 0.0363 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	9	10	14	18	21
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	8.6	7.6	7.1	6.6	6.2	5.9
i (in/hr)	3.0	4.2	5.0	6.2	7.2	8.2

Computed by: MLOMAKEMA, COE & VAN LOO
Friday, April 13, 2001 2:38:52 p

File: N:\980098\HYDRO\RATIONAL\PHASE2.RAT

Author: Frank M. Gu, P.E.
Email: frank@netcom.com
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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 67

Location: On-Site

Drainage Basin Data

Water Course Length: 1200.00 ft

Basin Area: 6.029 acres

High Elevation: 1049.35 ft

Low Elevation: 1037.85 ft

Average Slope: 0.0096 ft/ft

Roughness, Kb: 0.0351 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	8	12	14	19	24	29
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	11.7	10.3	9.6	8.8	8.3	7.9
i (in/hr)	2.6	3.7	4.4	5.6	6.4	7.4

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Friday, April 13, 2001 2:38:53 p

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 68

Location: On-Site

Drainage Basin Data

Water Course Length: 990.00 ft

Basin Area: 6.670 acres

High Elevation: 1052.00 ft

Low Elevation: 1040.73 ft

Average Slope: 0.0114 ft/ft

Roughness, Kb: 0.0348 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	10	14	16	23	29	34
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	9.7	8.6	8.0	7.4	7.0	6.6
i (in/hr)	2.9	4.0	4.8	6.0	6.9	7.9

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Thursday, November 01, 2001 3:45:50 p

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Author: Frank M. Gu, P.E.
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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 69

Location: On-Site

Drainage Basin Data

Water Course Length: 390.00 ft

Basin Area: 1.365 acres

High Elevation: 1046.40 ft

Low Elevation: 1040.70 ft

Average Slope: 0.0146 ft/ft

Roughness, Kb: 0.0392 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	3	3	4	5	7	8
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	5.5	5.0	5.0	5.0	5.0	5.0
i (in/hr)	3.6	4.9	5.7	6.7	7.7	8.7

Computed by: MLOMAKEMA, COE & VAN LOO
Friday, April 13, 2001 2:38:53 p

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 70

Location: On-Site

Drainage Basin Data

Water Course Length: 1100.00 ft

Basin Area: 8.200 acres

High Elevation: 1052.00 ft

Low Elevation: 1040.73 ft

Average Slope: 0.0102 ft/ft

Roughness, Kb: 0.0343 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	12	16	20	27	34	41
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	10.7	9.4	8.8	8.0	7.6	7.2
i (in/hr)	2.7	3.8	4.6	5.8	6.7	7.7

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Thursday, November 01, 2001 3:45:38 p

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 71

Location: On-Site

Drainage Basin Data

Water Course Length: 1350.00 ft

Basin Area: 9.790 acres

High Elevation: 1052.00 ft

Low Elevation: 1037.70 ft

Average Slope: 0.0106 ft/ft

Roughness, Kb: 0.0338 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	13	19	22	31	39	47
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	11.8	10.4	9.7	8.9	8.4	8.0
i (in/hr)	2.6	3.7	4.4	5.6	6.4	7.4

Computed by: MLOMAKEMA, COE & VAN LOO
Thursday, November 01, 2001 3:45:26 p

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Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 72

Location: On-Site

Drainage Basin Data

Water Course Length: 1350.00 ft

Basin Area: 15.820 acres

High Elevation: 1052.00 ft

Low Elevation: 1037.80 ft

Average Slope: 0.0105 ft/ft

Roughness, Kb: 0.0325 (A)

10-Year Runoff Coefficient: 0.520

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	22	30	36	51	64	77
C	0.520	0.520	0.520	0.572	0.624	0.650
Tc (min)	11.6	10.2	9.5	8.7	8.3	7.8
i (in/hr)	2.6	3.7	4.4	5.6	6.5	7.5

Computed by: MLOMAKEMA, COE & VAN LOO
Wednesday, July 30, 2003 1:08:19 p

File: N:\980098\HYDRO\RATIONAL\Phase2.rat

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 12A

Location: Wigwam Creek Parkway

Drainage Basin Data

Water Course Length: 815.00 ft

Basin Area: 0.940 acres

High Elevation: 1040.23 ft

Low Elevation: 1034.65 ft

Average Slope: 0.0068 ft/ft

Roughness, Kb: 0.0402 (A)

10-Year Runoff Coefficient: 0.950

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	2	3	4	5	6	7
C	0.950	0.950	0.950	0.950	0.950	0.950
Tc (min)	11.5	10.1	9.4	8.6	8.2	7.7
i (in/hr)	2.7	3.7	4.4	5.7	6.5	7.5

Computed by: MLOMAKEMA, COE & VAN LOO
Friday, April 13, 2001 3:29:11 p

File: N:\980098\HYDRO\RATIONAL\PHASE2.RAT

Author: Frank M. Gu, P.E.
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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: Wigwam Creek - Phase 2

Project Description: On-Site Peak Flows

Drainage Point: 34A

Location: Wigwam Creek Parkway

Drainage Basin Data

Water Course Length: 1300.00 ft

Basin Area: 3.040 acres

High Elevation: 1037.11 ft

Low Elevation: 1033.24 ft

Average Slope: 0.0030 ft/ft

Roughness, Kb: 0.0370 (A)

10-Year Runoff Coefficient: 0.950

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	6	8	10	13	15	17
C	0.950	0.950	0.950	0.950	0.950	0.950
Tc (min)	19.9	17.5	16.2	14.7	13.9	13.1
i (in/hr)	2.0	2.9	3.5	4.5	5.2	6.0

Computed by: MLOMAKEMA, COE & VAN LOO
Friday, April 13, 2001 3:29:40 p

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: WIGWAM CREEK

Project Description: INFRASTRUCTURE DRAINAGE

Drainage Point: O-1

Location: INFRASTRUCTURE

Drainage Basin Data

Water Course Length: 1625.00 ft

Basin Area: 2.600 acres

High Elevation: 65.32 ft

Low Elevation: 43.80 ft

Average Slope: 0.0132 ft/ft

Roughness, Kb: 0.0374 (A)

10-Year Runoff Coefficient: 0.720

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	5	7	8	11	14	17
C	0.720	0.720	0.720	0.792	0.864	0.900
Tc (min)	13.0	11.4	10.7	9.7	9.2	8.7
i (in/hr)	2.5	3.5	4.2	5.4	6.2	7.2

Computed by: SG, COE AND VAN LOO CONSULTANTS
Friday, August 31, 2001 1:24:31 p

File: N:\980098\HYDRO\RATIONAL\INFRA.RAT

Author: Frank M. Gu, P.E.
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URL: http://www.he.net/~esc/rational.html

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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: WIGWAM CREEK

Project Description: INFRASTRUCTURE DRAINAGE

Drainage Point: O-2

Location: INFRASTRUCTURE

Drainage Basin Data

Water Course Length: 2545.00 ft

Basin Area: 5.300 acres

High Elevation: 65.32 ft

Low Elevation: 36.11 ft

Average Slope: 0.0115 ft/ft

Roughness, Kb: 0.0355 (A)

10-Year Runoff Coefficient: 0.720

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	8	12	14	20	25	30
C	0.720	0.720	0.720	0.792	0.864	0.900
Tc (min)	17.5	15.3	14.3	13.0	12.3	11.6
i (in/hr)	2.2	3.0	3.7	4.7	5.5	6.4

Computed by: SG, COE AND VAN LOO CONSULTANTS
Friday, August 31, 2001 2:56:08 p

File: N:\980098\HYDRO\RATIONAL\INFRA.RAT

Author: Frank M. Gu, P.E.
Email: frank@netcom.com
URL: http://www.he.net/~esc/rational.html

RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: WIGWAM CREEK

Project Description: INFRASTRUCTURE DRAINAGE

Drainage Point: O-3

Location: INFRASTRUCTURE

Drainage Basin Data

Water Course Length: 1250.00 ft

Basin Area: 1.600 acres

High Elevation: 39.66 ft

Low Elevation: 35.83 ft

Average Slope: 0.0031 ft/ft

Roughness, Kb: 0.0387 (A)

10-Year Runoff Coefficient: 0.720

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	2	3	4	6	7	9
C	0.720	0.720	0.720	0.792	0.864	0.900
Tc (min)	19.8	17.4	16.1	14.7	13.8	13.1
i (in/hr)	2.0	2.9	3.5	4.5	5.2	6.1

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Friday, August 31, 2001 1:24:31 p

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URL: http://www.he.net/~esc/rational.html

RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: WIGWAM CREEK

Project Description: INFRASTRUCTURE DRAINAGE

Drainage Point: O-4

Location: INFRASTRUCTURE

Drainage Basin Data

Water Course Length: 1680.00 ft

Basin Area: 2.100 acres

High Elevation: 36.33 ft

Low Elevation: 31.91 ft

Average Slope: 0.0026 ft/ft

Roughness, Kb: 0.0380 (A)

10-Year Runoff Coefficient: 0.720

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	4	5	7	9	10
C	0.720	0.720	0.720	0.792	0.864	0.900
Tc (min)	25.0	21.9	20.3	18.5	17.3	16.3
i (in/hr)	0.6	2.5	3.1	4.0	4.7	5.5

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Friday, August 31, 2001 1:24:31 p

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Flood Control District of Maricopa County Rational Method

Project Information

Project Name: WIGWAM CREEK

Project Description: INFRASTRUCTURE DRAINAGE

Drainage Point: O-4A

Location: INFRASTRUCTURE

Drainage Basin Data

Water Course Length: 640.00 ft

Basin Area: 0.810 acres

High Elevation: 30.90 ft

Low Elevation: 30.61 ft

Average Slope: 0.0005 ft/ft

Roughness, Kb: 0.0406 (A)

10-Year Runoff Coefficient: 0.720

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	1	1	2	2	3	4
C	0.720	0.720	0.720	0.792	0.864	0.900
Tc (min)	28.3	24.8	22.9	20.9	19.5	18.4
i (in/hr)	1.7	2.4	2.9	3.7	4.4	5.2

Computed by: SG, COE AND VAN LOO CONSULTANTS
Monday, November 19, 2001 10:42:30 a

File: N:\980098\HYDRO\RATIONAL\INFRA.RAT

Author: Frank M. Gu, P.E.
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RATIONAL FOR WINDOWS

Flood Control District of Maricopa County Rational Method

Project Information

Project Name: WIGWAM CREEK

Project Description: INFRASTRUCTURE DRAINAGE

Drainage Point: O-5

Location: INFRASTRUCTURE

Drainage Basin Data

Water Course Length: 1430.00 ft

Basin Area: 2.700 acres

High Elevation: 30.90 ft

Low Elevation: 29.06 ft

Average Slope: 0.0013 ft/ft

Roughness, Kb: 0.0373 (A)

10-Year Runoff Coefficient: 0.720

10-Year 6 Hour Rainfall Depth: 2.00 inches

Hydrological Summary Table

Parameter	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Q (cfs)	3	5	6	8	10	12
C	0.720	0.720	0.720	0.792	0.864	0.900
Tc (min)	29.7	25.7	23.9	21.9	20.4	19.2
i (in/hr)	1.6	2.3	2.8	3.6	4.3	5.1

Computed by: SG, COE AND VAN LOO CONSULTANTS
Monday, November 19, 2001 10:42:38 a

File: N:\980098\HYDRO\RATIONAL\INFRA.RAT

Author: Frank M. Gu, P.E.
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Table
Rating Table for Irregular Channel

Project Description	
Project File	n:\980098\hydro\haestad\local st.fm2
Worksheet	Wigwam Local St 4" Roll Curb
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Water Surface Elevation	0.33 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.002000	0.020000	0.000200 ft/ft

Rating Table

Channel Slope (ft/ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
0.002000	0.015	7.25	1.32
0.002200	0.015	7.60	1.38
0.002400	0.015	7.94	1.44
0.002600	0.015	8.27	1.50
0.002800	0.015	8.58	1.56
0.003000	0.015	8.88	1.62
0.003200	0.015	9.17	1.67
0.003400	0.015	9.45	1.72
0.003600	0.015	9.73	1.77
0.003800	0.015	9.99	1.82
0.004000	0.015	10.25	1.87
0.004200	0.015	10.51	1.91
0.004400	0.015	10.75	1.96
0.004600	0.015	11.00	2.00
0.004800	0.015	11.23	2.04
0.005000	0.015	11.46	2.09
0.005200	0.015	11.69	2.13
0.005400	0.015	11.91	2.17
0.005600	0.015	12.13	2.21
0.005800	0.015	12.35	2.25
0.006000	0.015	12.56	2.28
0.006200	0.015	12.77	2.32
0.006400	0.015	12.97	2.36
0.006600	0.015	13.17	2.40
0.006800	0.015	13.37	2.43
0.007000	0.015	13.57	2.47

Table
Rating Table for Irregular Channel

Rating Table			
Channel Slope (ft/ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
0.007200	0.015	13.76	2.50
0.007400	0.015	13.95	2.54
0.007600	0.015	14.13	2.57
0.007800	0.015	14.32	2.60
0.008000	0.015	14.50	2.64
0.008200	0.015	14.68	2.67
0.008400	0.015	14.86	2.70
0.008600	0.015	15.04	2.73
0.008800	0.015	15.21	2.77
0.009000	0.015	15.38	2.80
0.009200	0.015	15.55	2.83
0.009400	0.015	15.72	2.86
0.009600	0.015	15.89	2.89
0.009800	0.015	16.05	2.92
0.010000	0.015	16.21	2.95
0.010200	0.015	16.38	2.98
0.010400	0.015	16.53	3.01
0.010600	0.015	16.69	3.04
0.010800	0.015	16.85	3.06
0.011000	0.015	17.01	3.09
0.011200	0.015	17.16	3.12
0.011400	0.015	17.31	3.15
0.011600	0.015	17.46	3.18
0.011800	0.015	17.61	3.20
0.012000	0.015	17.76	3.23
0.012200	0.015	17.91	3.26
0.012400	0.015	18.05	3.28
0.012600	0.015	18.20	3.31
0.012800	0.015	18.34	3.34
0.013000	0.015	18.49	3.36
0.013200	0.015	18.63	3.39
0.013400	0.015	18.77	3.41
0.013600	0.015	18.91	3.44
0.013800	0.015	19.05	3.46
0.014000	0.015	19.18	3.49
0.014200	0.015	19.32	3.51
0.014400	0.015	19.46	3.54
0.014600	0.015	19.59	3.56
0.014800	0.015	19.72	3.59
0.015000	0.015	19.86	3.61
0.015200	0.015	19.99	3.64
0.015400	0.015	20.12	3.66
0.015600	0.015	20.25	3.68
0.015800	0.015	20.38	3.71
0.016000	0.015	20.51	3.73

Table
Rating Table for Irregular Channel

Rating Table			
Channel Slope (ft/ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
0.016200	0.015	20.64	3.75
0.016400	0.015	20.76	3.78
0.016600	0.015	20.89	3.80
0.016800	0.015	21.02	3.82
0.017000	0.015	21.14	3.85
0.017200	0.015	21.26	3.87
0.017400	0.015	21.39	3.89
0.017600	0.015	21.51	3.91
0.017800	0.015	21.63	3.93
0.018000	0.015	21.75	3.96
0.018200	0.015	21.87	3.98
0.018400	0.015	21.99	4.00
0.018600	0.015	22.11	4.02
0.018800	0.015	22.23	4.04
0.019000	0.015	22.35	4.07
0.019200	0.015	22.47	4.09
0.019400	0.015	22.58	4.11
0.019600	0.015	22.70	4.13
0.019800	0.015	22.81	4.15
0.020000	0.015	22.93	4.17

Table
Rating Table for Irregular Channel

Project Description	
Project File	n:\980098\hydro\haestad\local st.fm2
Worksheet	Wigwam Local St 6" Curb
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Water Surface Elevation	0.50 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.002000	0.020000	0.000200 ft/ft

Rating Table

Channel Slope (ft/ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
0.002000	0.015	23.40	2.10
0.002200	0.015	24.55	2.20
0.002400	0.015	25.64	2.30
0.002600	0.015	26.68	2.39
0.002800	0.015	27.69	2.48
0.003000	0.015	28.66	2.57
0.003200	0.015	29.60	2.66
0.003400	0.015	30.51	2.74
0.003600	0.015	31.40	2.82
0.003800	0.015	32.26	2.89
0.004000	0.015	33.10	2.97
0.004200	0.015	33.91	3.04
0.004400	0.015	34.71	3.11
0.004600	0.015	35.49	3.18
0.004800	0.015	36.26	3.25
0.005000	0.015	37.00	3.32
0.005200	0.015	37.74	3.38
0.005400	0.015	38.46	3.45
0.005600	0.015	39.16	3.51
0.005800	0.015	39.85	3.57
0.006000	0.015	40.54	3.64
0.006200	0.015	41.21	3.70
0.006400	0.015	41.87	3.76
0.006600	0.015	42.51	3.81
0.006800	0.015	43.15	3.87
0.007000	0.015	43.78	3.93

Table
Rating Table for Irregular Channel

Rating Table			
Channel Slope (ft/ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
0.007200	0.015	44.40	3.98
0.007400	0.015	45.02	4.04
0.007600	0.015	45.62	4.09
0.007800	0.015	46.22	4.15
0.008000	0.015	46.81	4.20
0.008200	0.015	47.39	4.25
0.008400	0.015	47.96	4.30
0.008600	0.015	48.53	4.35
0.008800	0.015	49.09	4.40
0.009000	0.015	49.65	4.45
0.009200	0.015	50.19	4.50
0.009400	0.015	50.74	4.55
0.009600	0.015	51.27	4.60
0.009800	0.015	51.81	4.65
0.010000	0.015	52.33	4.69
0.010200	0.015	52.85	4.74
0.010400	0.015	53.37	4.79
0.010600	0.015	53.88	4.83
0.010800	0.015	54.38	4.88
0.011000	0.015	54.89	4.92
0.011200	0.015	55.38	4.97
0.011400	0.015	55.87	5.01
0.011600	0.015	56.36	5.06
0.011800	0.015	56.85	5.10
0.012000	0.015	57.33	5.14
0.012200	0.015	57.80	5.18
0.012400	0.015	58.27	5.23
0.012600	0.015	58.74	5.27
0.012800	0.015	59.21	5.31
0.013000	0.015	59.67	5.35
0.013200	0.015	60.12	5.39
0.013400	0.015	60.58	5.43
0.013600	0.015	61.03	5.47
0.013800	0.015	61.48	5.51
0.014000	0.015	61.92	5.55
0.014200	0.015	62.36	5.59
0.014400	0.015	62.80	5.63
0.014600	0.015	63.23	5.67
0.014800	0.015	63.66	5.71
0.015000	0.015	64.09	5.75
0.015200	0.015	64.52	5.79
0.015400	0.015	64.94	5.83
0.015600	0.015	65.36	5.86
0.015800	0.015	65.78	5.90
0.016000	0.015	66.19	5.94

Table
Rating Table for Irregular Channel

Rating Table			
Channel Slope (ft/ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
0.016200	0.015	66.61	5.97
0.016400	0.015	67.02	6.01
0.016600	0.015	67.42	6.05
0.016800	0.015	67.83	6.08
0.017000	0.015	68.23	6.12
0.017200	0.015	68.63	6.16
0.017400	0.015	69.03	6.19
0.017600	0.015	69.43	6.23
0.017800	0.015	69.82	6.26
0.018000	0.015	70.21	6.30
0.018200	0.015	70.60	6.33
0.018400	0.015	70.99	6.37
0.018600	0.015	71.37	6.40
0.018800	0.015	71.75	6.44
0.019000	0.015	72.13	6.47
0.019200	0.015	72.51	6.50
0.019400	0.015	72.89	6.54
0.019600	0.015	73.26	6.57
0.019800	0.015	73.64	6.61
0.020000	0.015	74.01	6.64

Table
Rating Table for Irregular Channel

Project Description	
Project File	n:\980098\hydro\haestad\local st.fm2
Worksheet	Wigwam Creek Parkway
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Water Surface Elevation	0.50 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.002000	0.010000	0.000200 ft/ft

Rating Table

Channel Slope (ft/ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
0.002000	0.015	21.80	1.74
0.002200	0.015	22.86	1.82
0.002400	0.015	23.88	1.90
0.002600	0.015	24.85	1.98
0.002800	0.015	25.79	2.06
0.003000	0.015	26.70	2.13
0.003200	0.015	27.57	2.20
0.003400	0.015	28.42	2.27
0.003600	0.015	29.24	2.33
0.003800	0.015	30.05	2.40
0.004000	0.015	30.83	2.46
0.004200	0.015	31.59	2.52
0.004400	0.015	32.33	2.58
0.004600	0.015	33.06	2.64
0.004800	0.015	33.77	2.69
0.005000	0.015	34.46	2.75
0.005200	0.015	35.15	2.80
0.005400	0.015	35.82	2.86
0.005600	0.015	36.47	2.91
0.005800	0.015	37.12	2.96
0.006000	0.015	37.75	3.01
0.006200	0.015	38.38	3.06
0.006400	0.015	38.99	3.11
0.006600	0.015	39.60	3.16
0.006800	0.015	40.19	3.21
0.007000	0.015	40.78	3.25

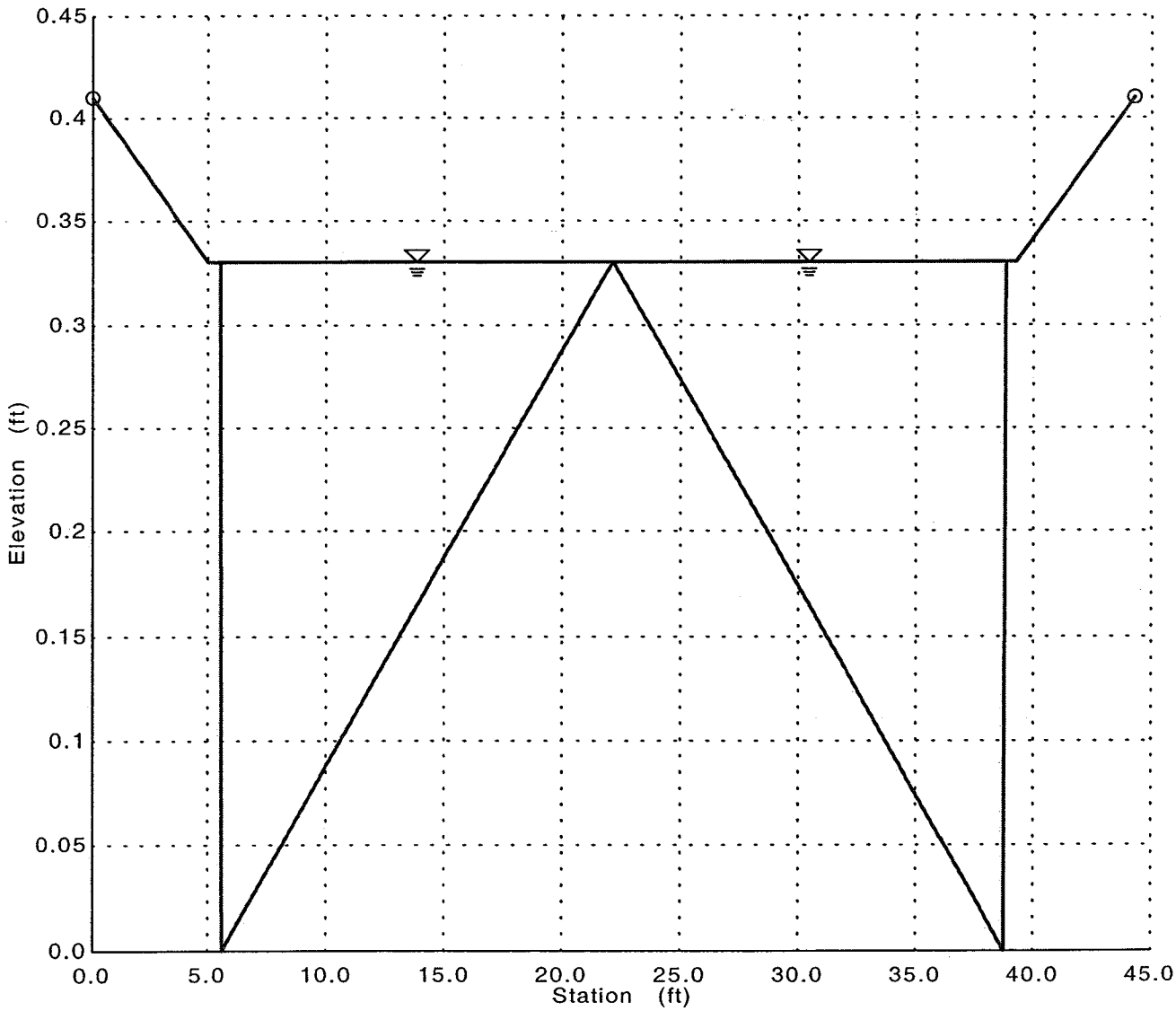
Table
Rating Table for Irregular Channel

Rating Table			
Channel Slope (ft/ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
0.007200	0.015	41.36	3.30
0.007400	0.015	41.93	3.34
0.007600	0.015	42.49	3.39
0.007800	0.015	43.05	3.43
0.008000	0.015	43.59	3.48
0.008200	0.015	44.14	3.52
0.008400	0.015	44.67	3.56
0.008600	0.015	45.20	3.60
0.008800	0.015	45.72	3.65
0.009000	0.015	46.24	3.69
0.009200	0.015	46.75	3.73
0.009400	0.015	47.26	3.77
0.009600	0.015	47.76	3.81
0.009800	0.015	48.25	3.85
0.010000	0.015	48.74	3.89

Cross Section 4" Roll Curb
Cross Section for Irregular Channel

Project Description	
Project File	n:\980098\hydro\haestad\local st.fm2
Worksheet	Wigwam Local St 4" Roll Curb
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

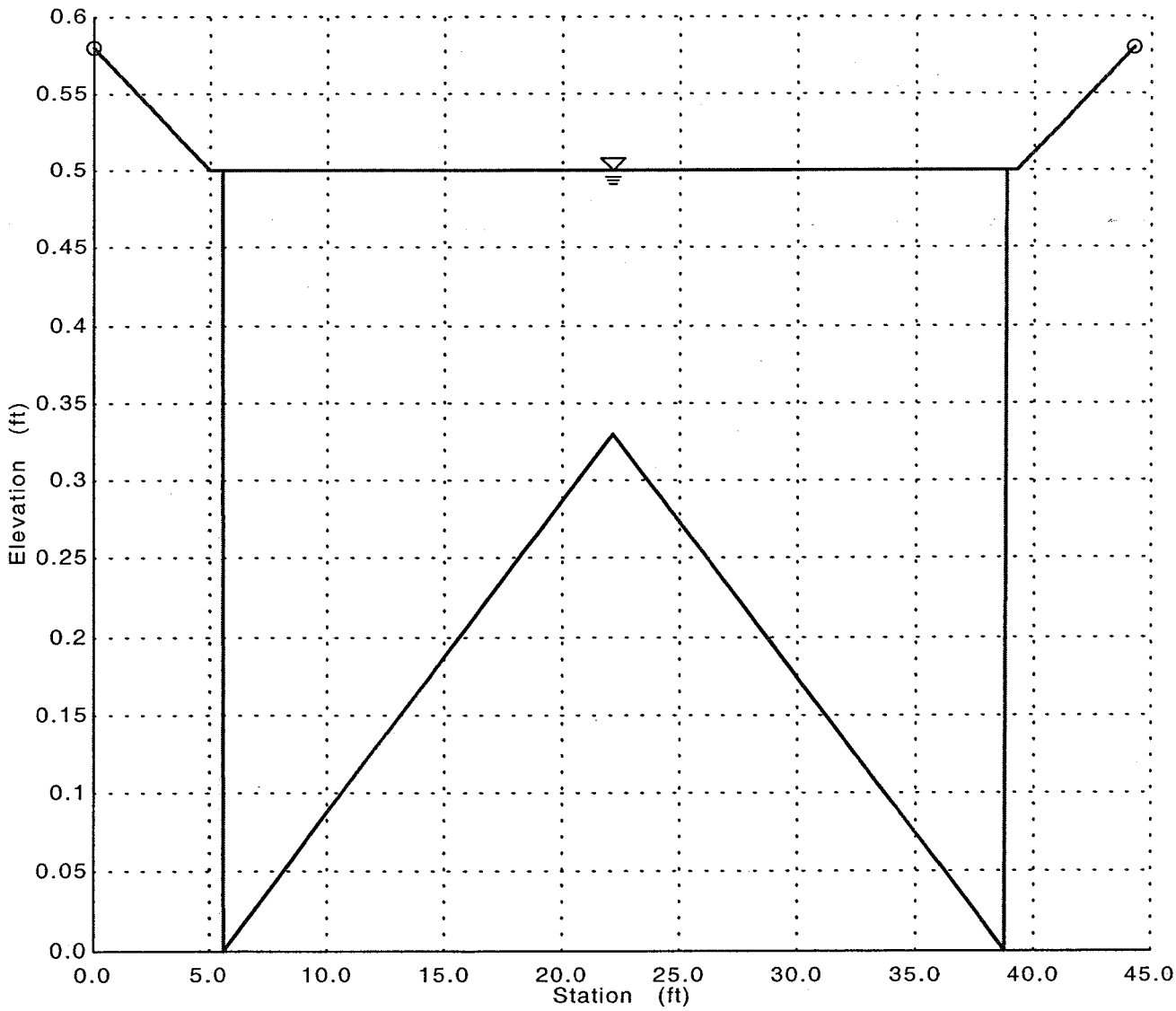
Section Data		
Wtd. Mannings Coefficient	0.015	
Channel Slope	0.002000	ft/ft
Water Surface Elevation	0.33	ft
Discharge	7.25	cfs



Cross Section 6" Vertical Curb
Cross Section for Irregular Channel

Project Description	
Project File	n:\980098\hydro\haestad\local st.fm2
Worksheet	Wigwam Local St 6" Curb
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data		
Wtd. Mannings Coefficient	0.015	
Channel Slope	0.002500	ft/ft
Water Surface Elevation	0.50	ft
Discharge	26.17	cfs



APPENDIX B

Catch Basin, Depressed Curb, & Scupper Calculations

CVL

WIGWAM CREEK PHASE 2 (00-0046-03)
STORM DRAIN #0
CATCH BASIN CALCULATIONS

CP - 8 - CATCH BASIN NO.(s) 2-0-1,2-0-2

"Flow-by" Catch Basin Interception Capacity

Q10 @ CP- 8 = (34 cfs) /2 = 17.0 cfs (per half street)

Qd = Qdesign = 17.0 cfs, street slope = 0.48 %
D = Depth of flow = 0.50 ft

a) W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
T = Spread = 17.4 ft
W/T = 1.42 / 17.4 = 0.081

b) Sw' = Cross-slope of gutter section = 2 inch (depression)/ 17 inch ≅ 0.118 ft/ft
Sx = Pavement cross-slope = 0.020 ft/ft
Sw = Sw' + Sx = 0.138
Sw/Sx = 0.138 / 0.020 = 6.90

c) Eo = 0.20 (Fig. 3.23) ♦

d) Se = Sx + Sw'*Eo
= 0 0.020 + (0.118)*(0.20)
= 0 0.044

e) Qd = 17.0 cfs
Lt = 32.3 ft (Fig. 3.20) ♦
Adjust for clogging = 32.3 ft * 1.25 = 40.3 ft

For Design
Use single wing MAG Std Detail No. 533-1,
Lt = 10 ft
Total Opening Length = 13 ft

f) E = Efficiency of Inlet
= 1-(1-L/Lt)^1.8 (Eqn 3.5) ♦
= 1 - (1 - 13 / 40.3)^1.8
= 1 - (1 - 0.32)^1.8
= 1 - (0.68)^1.8
= 1 - (0.50)
= 0.50

g) Flow intercepted = Q*E = 17.0 cfs * 0.50 = 8.50 cfs = 8.50 cfs

h) Flow-by = Qd - Qintercepted = (17.0 cfs - 8.5 cfs) * 2 = 17.0 cfs

So: Total flow-by @ CP - 8 = 17.0 cfs

Total flow intercepted = (8.5 cfs) * 2 = 17.0 cfs @ CP - 8 (for the 10-year flow)

♦ MCFCD Volume II Hydraulics, Reference 2

WIGWAM CREEK PHASE 2(00-0046-03)
STORM DRAIN #1
CATCH BASIN CALCULATIONS

CP - 13 - CATCH BASIN NO.(s) 2-1-1,2-1-2

Using combination curb inlet/grated inlet - sump condition calculation of total interception capacity is based on the combined grate inlet and curb inlet interception capacity.

Design 1

Compute "sump" condition interception capacity for grated inlet portion; weir flow:

Q @ CP-13(49cfs) - Flow in SD#1 (17cfs) = 32/2 = 16cfs per half street

So: Qig = CwPd^1.5 * Cg (Weir Flow Eqn, Eqn. 3.17) ♦

Where:
Qig = Amount of Street Flow Intercepted (cfs)
Cwg = Weir Coefficient for Grate = 3.0
P = Perimeter of Grate (Minus side along curb) = 1.65 + 1.65 + 2.02 = 5.32 ft
d = Ponding Depth at Curb = 0.50 ft
Cg = Clogging Factor Applied to Qi (per Table 3.2) ♦ = 0.65

Qig = (3.0) * (5.32) * (0.50)^1.5*(0.65) = 3.67 ≅ 3.7 cfs

Design 2

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qic = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Qic = Amount of street flow caught by an inlet (cfs)
Cwc = Weir Coefficient for Curb Inlet = 2.3
L = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.65
d = Ponding depth at curb = 0.50 ft

Calculate flow to be picked up = (16.0) - (3.7) = 12.3 cfs

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qic}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{12.3 \text{ cfs}}{0.65 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 20.8 \text{ ft}$$

For Design: For catch basins(s) use double wing MAG Std Detail No. 533-1, total curb opening, L1 = 10 ft
L2 = 10 ft

Design catch basin interception capacity >= required capacity of the Q10 in the half street at CP - 13

So: Total flow intercepted = (32 cfs @ CP - 13)

♦ MCFCD Volume II Hydraulics, Reference 2

WIGWAM CREEK PHASE 2 (00-0046-03)
STORM DRAIN #2
CATCH BASIN CALCULATIONS

CP - 39 - CATCH BASIN NO.(s) 2-2-1,2-2-2

Using combination curb inlet/grated inlet - sump condition calculation of total interception capacity is based on the combined grate inlet and curb inlet interception capacity.

Design 1

Compute "sump" condition interception capacity for grated inlet portion; weir flow:

Q10 @ CP- 39 = (13.5 cfs) /2 = 6.8 cfs (per half street)

So: Qig = CwPd^1.5 * Cg (Weir Flow Eqn, Eqn. 3.17) ♦

Where:
Qig = Amount of Street Flow Intercepted (cfs)
Cwg = Weir Coefficient for Grate = 3.0
P = Perimeter of Grate (Minus side along curb) = 1.65 + 1.65 + 2.02 = 5.32 ft
d = Ponding Depth at Curb = 0.50 ft
Cg = Clogging Factor Applied to Qi (per Table 3.2) ♦ = 0.65

Qig = (3.0) * (5.32) * (0.50)^1.5*(0.65) = 3.67 ≅ 3.7 cfs

Design 2

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qic = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Qic = Amount of street flow caught by an inlet (cfs)
Cwc = Weir Coefficient for Curb Inlet = 2.3
L = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.65
d = Ponding depth at curb = 0.50 ft

Calculate flow to be picked up = (6.8) - (3.7) = 3.1 cfs

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qic}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{3.1 \text{ cfs}}{0.65 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 3.3 \text{ ft}$$

For Design: For catch basins(s) use single wing MAG Std Detail No. 533-1, total curb opening, L = 3 ft

Design scupper interception capacity >= required capacity of the Q10 in the half street at CP - 39

So: Total flow intercepted = (6.8 cfs) 2 = 13.5 cfs @ CP - 39

♦ MCFCD Volume II Hydraulics, Reference 2

WIGWAM CREEK PHASE 2 (00-0046-03)
STORM DRAIN #2
CATCH BASIN CALCULATIONS

CP - 36/38 - CATCH BASIN NO.(s) 2-2-3

Using combination curb inlet/grated inlet - sump condition calculation of total interception capacity is based on the combined grate inlet and curb inlet interception capacity.

Design 1

Compute "sump" condition interception capacity for grated inlet portion; weir flow:

Q10 @ CP- 36/38 = 14.5 cfs (half street flow)

So: Qig = CwPd^1.5 * Cg (Weir Flow Eqn, Eqn. 3.17) ♦

Where:
Qig = Amount of Street Flow Intercepted (cfs)
Cwg = Weir Coefficient for Grate = 3.0
P = Perimeter of Grate (Minus side along curb) = 1.65 + 1.65 + 2.02 = 5.32 ft
d = Ponding Depth at Curb = 0.50 ft
Cg = Clogging Factor Applied to Qi (per Table 3.2) ♦ = 0.65

Qig = (3.0) * (5.32) * (0.50)^1.5*(0.65) = 3.67 ≅ 3.7 cfs

Design 2

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qic = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Qic = Amount of street flow caught by an inlet (cfs)
Cwc = Weir Coefficient for Curb Inlet = 2.3
L = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.65
d = Ponding depth at curb = 0.50 ft

Calculate flow to be picked up = (14.5) - (3.7) = 10.8 cfs

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qic}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{10.8 \text{ cfs}}{0.65 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 17.9 \text{ ft}$$

For Design: For catch basins(s) use single wing MAG Std Detail No. 533-1, total curb opening, L = 17 ft

Design scupper interception capacity >= required capacity of the Q10 in the street at CP - 36/38

So: Total flow intercepted = (14.5 cfs) 1 = 14.5 cfs @ CP - 36/38

♦ MCFCD Volume II Hydraulics, Reference 2

WIGWAM CREEK PHASE 2 (00-0046-03)
STORM DRAIN 4
CATCH BASIN CALCULATIONS

CP - 62 - CATCH BASIN NO.(s) 2-4-1,2-4-2

Using combination curb inlet/grated inlet - sump condition calculation of total interception capacity is based on the combined grate inlet and curb inlet interception capacity.

Design 1

Compute "sump" condition interception capacity for grated inlet portion; weir flow:

Q10 @ CP- 62 = (25 cfs) /2 = 12.5 cfs (per half street)

So: Qig = CwPd^1.5 * Cg (Weir Flow Eqn, Eqn. 3.17) ♦

Where:
Qig = Amount of Street Flow Intercepted (cfs)
Cwg = Weir Coefficient for Grate = 3.0
P = Perimeter of Grate (Minus side along curb) = 1.65 + 1.65 + 2.02 = 5.32 ft
d = Ponding Depth at Curb = 0.50 ft
Cg = Clogging Factor Applied to Qi (per Table 3.2) ♦ = 0.65

Qig = (3.0) * (5.32) * (0.50)^1.5*(0.65) = 3.67 ≅ 3.7 cfs

Design 2

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qic = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Qic = Amount of street flow caught by an inlet (cfs)
Cwc = Weir Coefficient for Curb Inlet = 2.3
L = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.65
d = Ponding depth at curb = 0.50 ft

Calculate flow to be picked up = (12.5) - (3.7) = 8.8 cfs

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qic}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{8.8 \text{ cfs}}{0.65 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 14.2 \text{ ft}$$

For Design: For catch basins(s) use single wing MAG Std Detail No. 533-1, total curb opening, L = 17 ft

Design catch basin interception capacity >= required capacity of the Q10 in the half street at CP - 62

So: Total flow intercepted = (13 cfs) 2 = 25 cfs @ CP - 62

♦ MCFCD Volume II Hydraulics, Reference 2

WIGWAM CREEK PHASE 2 (00-0046-03)
STORM DRAIN 5
CATCH BASIN CALCULATIONS

CP - 65 - CATCH BASIN NO.(s) 2-5-1,2-5-2

Using combination curb inlet/grated inlet - sump condition calculation of total interception capacity is based on the combined grate inlet and curb inlet interception capacity.

Design 1

Compute "sump" condition interception capacity for grated inlet portion; weir flow:

Q10 @ CP- 65 = (32 cfs) /2 = 16.0 cfs (per half street)

So: Qig = CwPd^1.5 * Cg (Weir Flow Eqn, Eqn. 3.17) ♦

Where:
Qig = Amount of Street Flow Intercepted (cfs)
Cwg = Weir Coefficient for Grate = 3.0
P = Perimeter of Grate (Minus side along curb) = 1.65 + 1.65 + 2.02 = 5.32 ft
d = Ponding Depth at Curb = 0.50 ft
Cg = Clogging Factor Applied to Qi (per Table 3.2) ♦ = 0.65

Qig = (3.0) * (5.32) * (0.50)^1.5*(0.65) = 3.67 ≅ 3.7 cfs

Design 2

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qic = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Qic = Amount of street flow caught by an inlet (cfs)
Cwc = Weir Coefficient for Curb Inlet = 2.3
L = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.65
d = Ponding depth at curb = 0.50 ft

Calculate flow to be picked up = (16.0) - (3.7) = 12.3 cfs

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qic}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{12.3 \text{ cfs}}{0.65 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 20.8 \text{ ft}$$

For Design: For catch basins(s) use double wing MAG Std Detail No. 533-1, total curb opening, L1 = 10 ft
L2 = 10 ft

Design catch basin interception capacity >= required capacity of the Q10 in the half street at CP - 65

So: Total flow intercepted = (16 cfs) 2 = 32 cfs @ CP - 65

♦ MCFCD Volume II Hydraulics, Reference 2

WIGWAM CREEK PHASE 2 (00-0046-03)
STORM DRAIN 6
CATCH BASIN CALCULATIONS

CP - 72 - CATCH BASIN NO.(s) 2-6-1,2-6-2

Using combination curb inlet/grated inlet - sump condition calculation of total interception capacity is based on the combined grate inlet and curb inlet interception capacity.

Design 1

Compute "sump" condition interception capacity for grated inlet portion; weir flow:

Q10 @ CP- 72 = (36 cfs) /2 = 18.0 cfs (per half street)

So: Qig = CwPd^1.5 * Cg (Weir Flow Eqn, Eqn. 3.17) ♦

Where:
Qig = Amount of Street Flow Intercepted (cfs)
Cwg = Weir Coefficient for Grate = 3.0
P = Perimeter of Grate (Minus side along curb) = 1.65 + 1.65 + 2.02 = 5.32 ft
d = Ponding Depth at Curb = 0.50 ft
Cg = Clogging Factor Applied to Qi (per Table 3.2) ♦ = 0.65

Qig = (3.0) * (5.32) * (0.50)^1.5*(0.65) = 3.67 ≅ 3.7 cfs

Design 2

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qic = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Qic = Amount of street flow caught by an inlet (cfs)
Cwc = Weir Coefficient for Curb Inlet = 2.3
L = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.65
d = Ponding depth at curb = 0.50 ft

Calculate flow to be picked up = (18.0) - (3.7) = 14.3 cfs

Estimate Required Length of Curb Opening

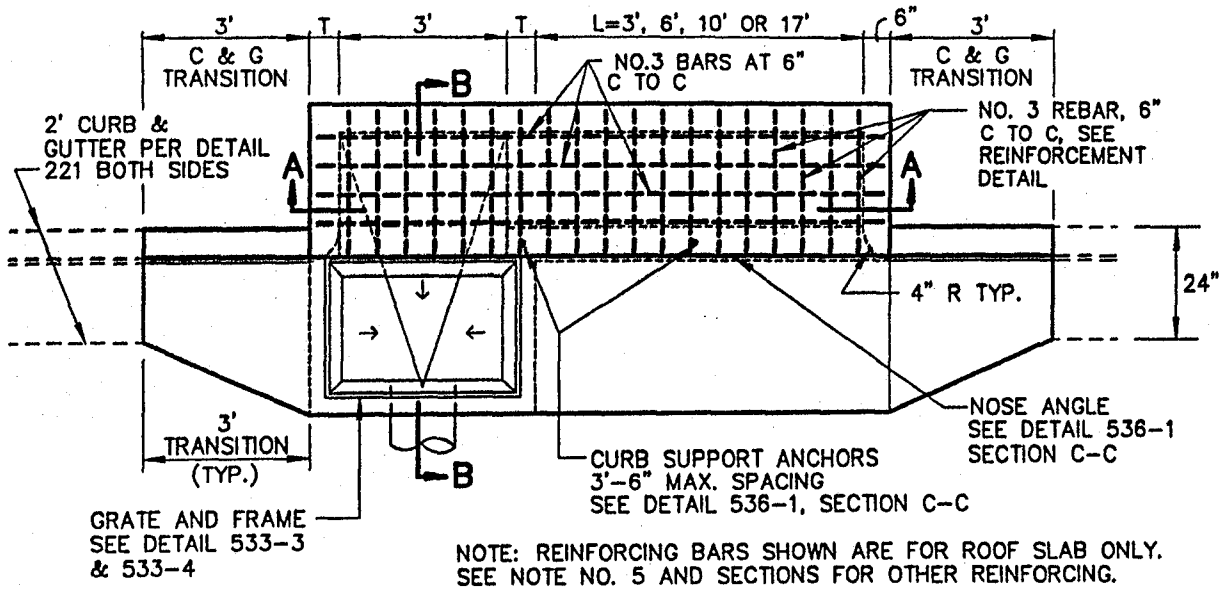
$$L = \left[\frac{Qic}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{14.3 \text{ cfs}}{0.65 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 24.6 \text{ ft}$$

For Design: For catch basins(s) use double wing MAG Std Detail No. 533-1, total curb opening, L1 = 10 ft
L2 = 17 ft

Design catch basin interception capacity >= required capacity of the Q10 in the half street at CP - 72

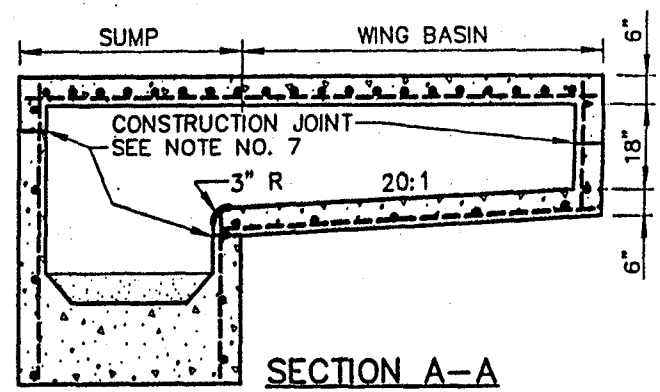
So: Total flow intercepted = (18 cfs) 2 = 36 cfs @ CP - 72

♦ MCFCD Volume II Hydraulics, Reference 2



NOTE: REINFORCING BARS SHOWN ARE FOR ROOF SLAB ONLY. SEE NOTE NO. 5 AND SECTIONS FOR OTHER REINFORCING.

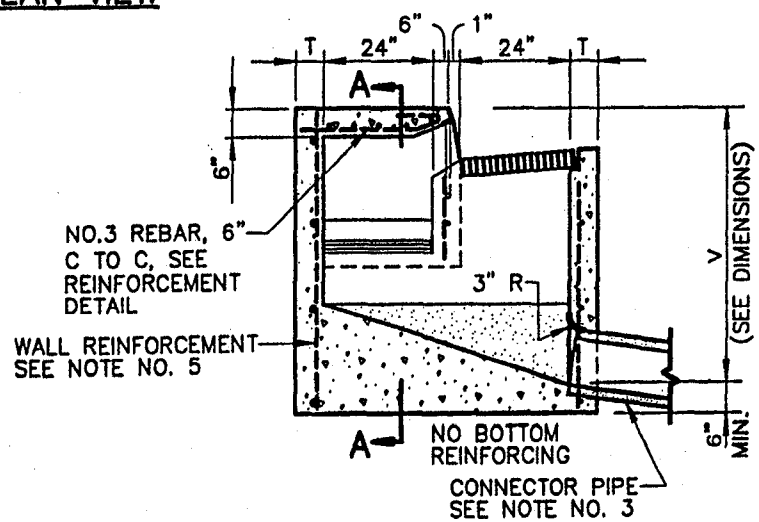
PLAN VIEW



SECTION A–A

NOTES:

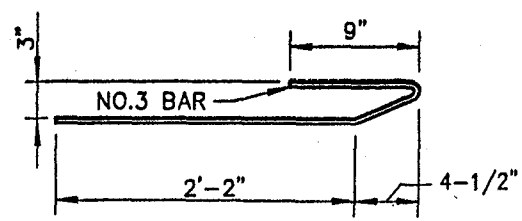
1. SINGLE C.B. (ILLUSTRATED), SUMP WITH WING BASIN UPSTREAM.
2. DOUBLE C.B. SUMP WITH SYMMETRICAL WING BASINS EACH SIDE.
3. PIPES CAN BE PLACED IN ANY WALL EXCEPT WALL ADJACENT TO A WING BASIN. PIPE SHALL BE TRIMMED TO FINAL SHAPE AND LENGTH BEFORE CONCRETE IS PLACED.
4. SUMP FLOOR SHALL HAVE A WOOD TROWEL FINISH AND A MIN. SLOPE OF 4:1 IN ALL DIRECTIONS TOWARD OUTLET PIPE.
5. ALL REFORCING BARS SHALL BE NO.4 18" C TO C BOTH WAYS AND 1-1/2" CLEAR TO INSIDE OF WALLS AND OUTSIDE WING BASIN FLOOR EXCEPT AS SHOWN. SEE SECT. 727.
6. ALL CONCRETE SHALL BE CLASS 'A', PER SECT. 725.
7. CONSTRUCTION JOINTS SHALL BE PLACED TO MEET FIELD CONDITIONS.
8. ALL EXPOSED STEEL SHALL BE GALVANIZED OR PAINTED WITH ONE SHOP COAT OF #1 PAINT AND TWO FIELD COATS OF #10 PAINT.



SECTION B–B

DIMENSIONS

V = 3'-3" MIN. WHEN L = 3'
V = 3'-5" MIN. WHEN L = 6'
V = 3'-7" MIN. WHEN L = 10'
V = 4'-0" MIN. WHEN L = 17'
T = 6" WHEN V IS LESS THAN 8'
T = 8" WHEN V IS EQUAL TO OR GREATER THAN 8'
H = CURB HEIGHT PRIOR TO THE TRANSITION



REINFORCEMENT DETAIL

DETAIL NO.		STANDARD DETAIL		REVISED	DETAIL NO.
533-1	MARICOPA ASSOCIATION of GOVERNMENTS	ENGLISH	CATCH BASIN TYPE 'D		533-1

Wigwam Phase 2 (00-0046-03)
DEPRESSED CURB CALCULATIONS

CP - 22 - DEPRESSED CURB NO.(s) 1

Using inlet - sump condition calculation of total interception capacity.

Q10 @ CP- 22 = 26 cfs

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qi = Cw (L)d^1.5 (Weir Flow Eqn, Eqn. 3.9) ♦

Where:
Cw = Weir Coefficient for Curb Inlet = 3.0
Lt = Length of Curb Opening (ft)
d = Ponding depth at curb = 0.50 ft
Qi = Amount of street flow caught by an inlet (cfs)

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qi}{Cw * d^{1.5}}\right] = \left[\frac{26.00 \text{ cfs}}{3.00 * 0.50^{1.5}}\right] = 24.5 \text{ ft}$$

For Design: For depressed curb, total curb opening = 26 ft

Design depressed curb interception capacity >= required capacity of the Q10 in the street at CP - 22

♦ MCFCD Volume II Hydraulics, Reference 2

WIGWAM CREEK - PHASE 2 (00-0046-03)
SCUPPER CALCULATIONS

CP - 15 - SCUPPER NO.(s) 2

Using inlet - sump condition calculation of total interception capacity.

Q10 @ CP- 15 = 21 cfs

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qi = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Cw = Weir Coefficient for Curb Inlet = 2.3
Lt = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.80
d = Ponding depth at curb = 0.50 ft
Qi = Amount of street flow caught by an inlet (cfs)

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qi}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{21.0 \text{ cfs}}{0.80 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 29.7 \text{ ft}$$

For Design: For scupper(s) use MAG Std Detail No. 206.2 - total curb opening, Lt = 32 ft

Design scupper interception capacity >= required capacity of the Q10 in the street at CP - 15

♦ MCFCD Volume II Hydraulics, Reference 2

WIGWAM CREEK - PHASE 2 (00-0046-03)
SCUPPER CALCULATIONS

CP - 29 - SCUPPER NO.(s) 3

Using inlet - sump condition calculation of total interception capacity.

Q10 @ CP- 29 = 33 cfs

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qi = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Cw = Weir Coefficient for Curb Inlet = 2.3
Lt = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.80
d = Ponding depth at curb = 0.50 ft
Qi = Amount of street flow caught by an inlet (cfs)

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qi}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{33.0 \text{ cfs}}{0.80 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 48.2 \text{ ft}$$

For Design: For scupper(s) use MAG Std Detail No. 206.2 - total curb opening, Lt = 48 ft

Design scupper interception capacity >= required capacity of the Q10 in the street at CP - 29

♦ MCFCD Volume II Hydraulics, Reference 2

WIGWAM CREEK - PHASE 2 (00-0046-03)
SCUPPER CALCULATIONS

CP - 34 - SCUPPER NO.(s) 4

Using inlet - sump condition calculation of total interception capacity.

Q10 @ CP- 34 = 30 cfs

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qi = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Cw = Weir Coefficient for Curb Inlet = 2.3
Lt = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.80
d = Ponding depth at curb = 0.50 ft
Qi = Amount of street flow caught by an inlet (cfs)

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qi}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{30.0 \text{ cfs}}{0.80 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 43.6 \text{ ft}$$

For Design: For scupper(s) use MAG Std Detail No. 206.2 - total curb opening, Lt = 44 ft

Design scupper interception capacity >= required capacity of the Q10 in the street at CP - 34

♦ MCFCD Volume II Hydraulics, Reference 2

WIGWAM CREEK - PHASE 2 (00-0046-03)
SCUPPER CALCULATIONS

CP - 44 - SCUPPER NO.(s) 5

Using inlet - sump condition calculation of total interception capacity.

Q10 @ CP- 44 = 25 cfs

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qi = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Cw = Weir Coefficient for Curb Inlet = 2.3
Lt = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.80
d = Ponding depth at curb = 0.50 ft
Qi = Amount of street flow caught by an inlet (cfs)

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qi}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{25.0 \text{ cfs}}{0.80 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 35.9 \text{ ft}$$

For Design: For scupper(s) use MAG Std Detail No. 206.2 - total curb opening, Lt = 36 ft

Design scupper interception capacity >= required capacity of the Q10 in the street at CP - 44

♦ MCFCD Volume II Hydraulics, Reference 2

WIGWAM CREEK - PHASE 2 (00-0046-03)
SCUPPER CALCULATIONS

CP - 53 - SCUPPER NO.(s) 6

Using inlet - sump condition calculation of total interception capacity.

Q10 @ CP- 53 = 27 cfs

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qi = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Cw = Weir Coefficient for Curb Inlet = 2.3
Lt = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.80
d = Ponding depth at curb = 0.50 ft
Qi = Amount of street flow caught by an inlet (cfs)

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qi}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{27.0 \text{ cfs}}{0.80 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 39.0 \text{ ft}$$

For Design: For scupper(s) use MAG Std Detail No. 206.2 - total curb opening, Lt = 40 ft

Design scupper interception capacity >= required capacity of the Q10 in the street at CP - 53

♦ MCFCD Volume II Hydraulics, Reference 2

WIGWAM CREEK - PHASE 2 (00-0046-03)
SCUPPER CALCULATIONS

CP - 49 - SCUPPER NO.(s) 7

Using inlet - sump condition calculation of total interception capacity.

Q10 @ CP- 49 = 5 cfs

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qi = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Cw = Weir Coefficient for Curb Inlet = 2.3
Lt = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.80
d = Ponding depth at curb = 0.50 ft
Qi = Amount of street flow caught by an inlet (cfs)

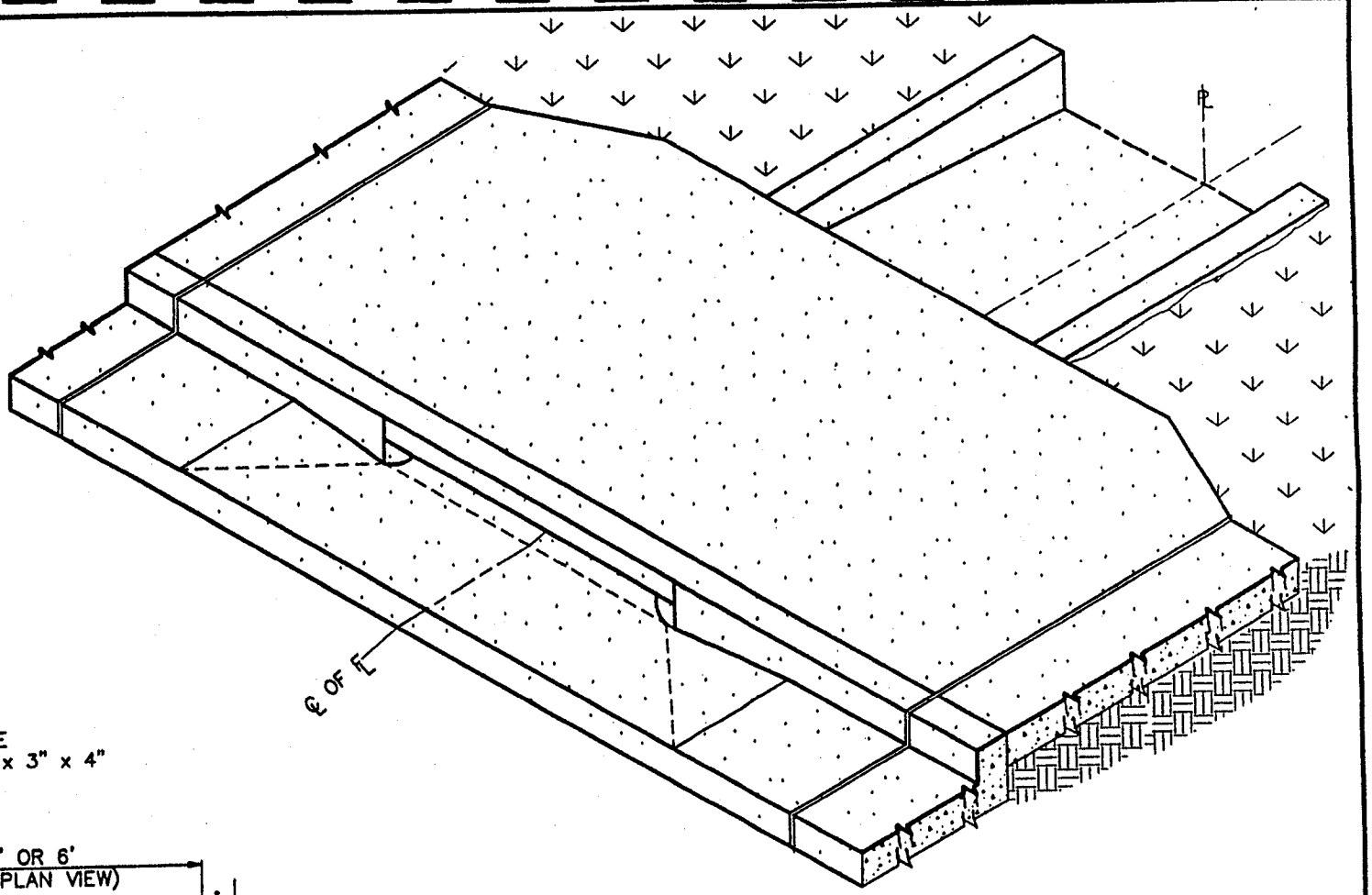
Estimate Required Length of Curb Opening

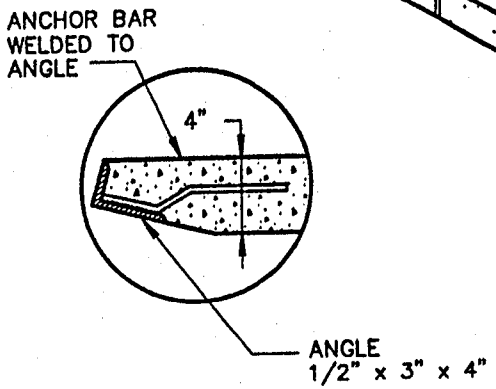
$$L = \left[\frac{Qi}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{5.0 \text{ cfs}}{0.80 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 5.1 \text{ ft}$$

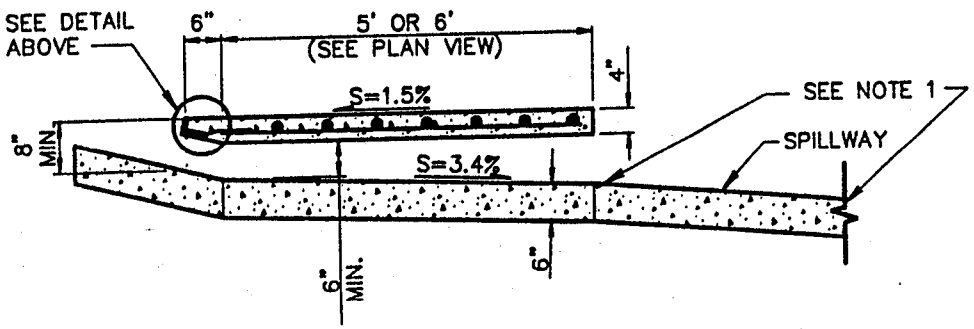
For Design: For scupper(s) use MAG Std Detail No. 206.2 - total curb opening, Lt = 8 ft

Design scupper interception capacity >= required capacity of the Q10 in the street at CP - 49

♦ MCFCD Volume II Hydraulics, Reference 2







SECTION D–D

NOTES:

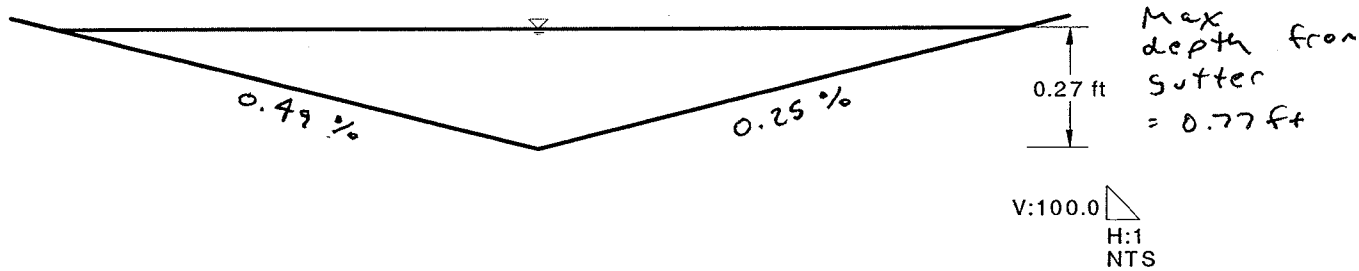
1. TRANSITION TO SPILLWAY/CHANNEL AS PER APPROVED PLANS.
2. A CENTER WALL SHALL BE INSTALLED IN SCUPPERS WIDER THAN 4' OR IF MORE THAN 1 SCUPPER IS BUILT IN SERIES.
3. EXPANSION JOINT FILLER SHALL BE 1/2" BITUMINOUS TYPE PREFORMED EXPANSION JOINT FILLER, A.S.T.M. D–1751.
4. UNLESS OTHERWISE NOTED, CONCRETE SHALL BE CLASS 'B' PER SECTION 725.

DETAIL NO.				REVISED	DETAIL NO.
206–2	MARICOPA ASSOCIATION of GOVERNMENTS	STANDARD DETAIL ENGLISH	CONCRETE SCUPPER		206–2

Cross Section
Cross Section for Sharp Crested V-Notch Weir

Project Description	
Worksheet	Weir - 1
Type	Sharp Crested V-Notch We
Solve For	Headwater Elevation

Section Data		
Discharge	38.00	cfs
Headwater Elevation	0.77	ft
Crest Elevation	0.50	ft
Tailwater Elevation	0.00	ft
V-Notch Weir Coefficient	0.58	
Notch Angle	179.71	degrees



1. Flow at CP-29 has the greatest 10-yr flow
2. The scupper was designed to intercept the 10-year flow of 33 cfs
3. The weir represents the curb above the scupper
4. The 100-year flow at CP-29 is 71 cfs the weir flow (over the scupper) was taken as the difference between the 100-year and 10 year flow (71 - 33 = 38 cfs)

APPENDIX C

Storm Drain Calculations

CVL

Wigwam Creek - Parcel & Job # (00-0046-03) - Analysis for Proposed Storm Drain #0
Storm Drain Capacity Calculation Record

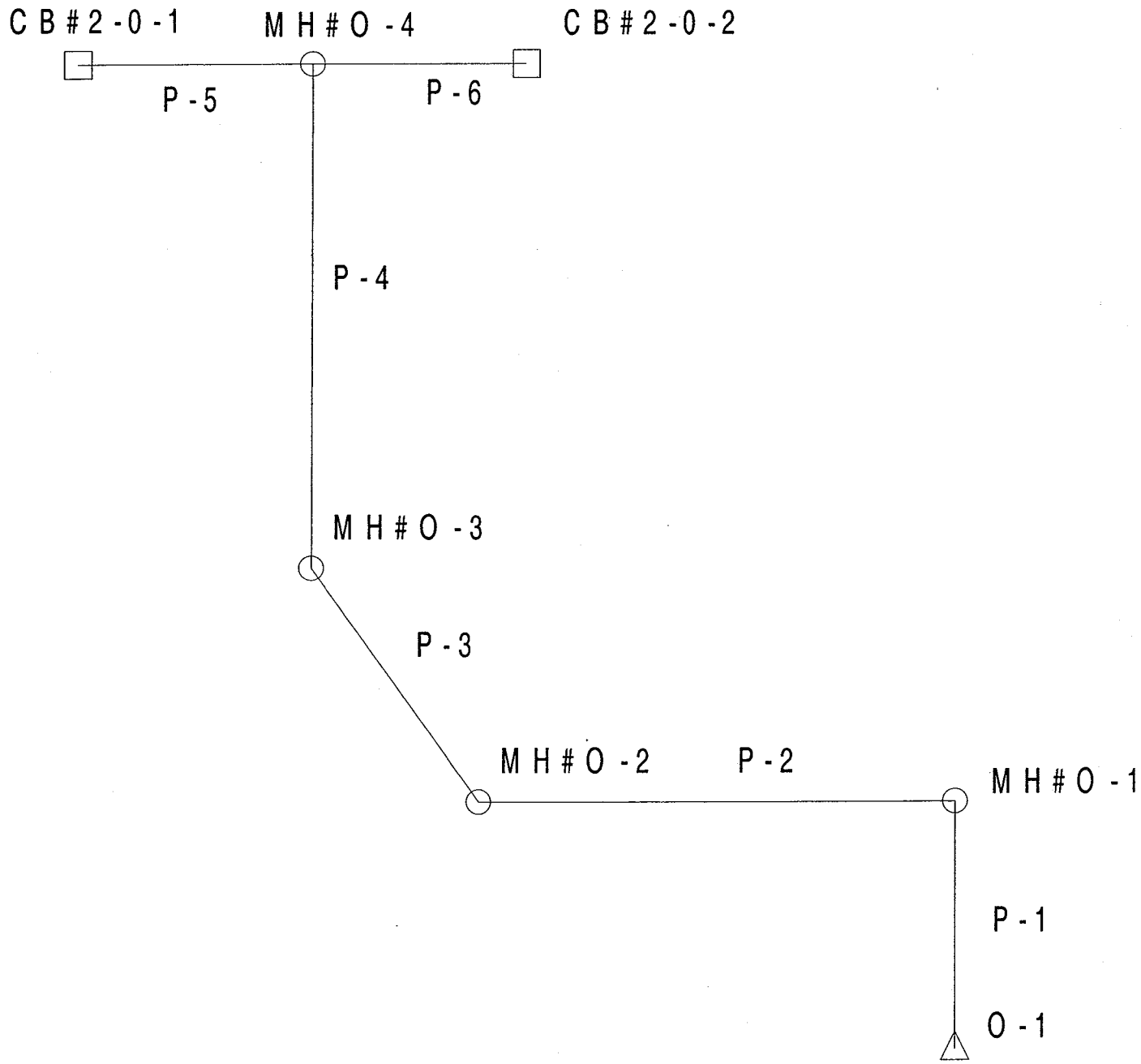
Head Loss Variables

Bend Loss, Kb (90 degrees) =	1.04
Expansion Loss, Ke =	0.35
Shape Adjustment, Cs =	0.50

ID		STORM DRAIN DESIGN DATA							HEAD LOSS CALCULATION					HYDRAULIC GRADE LINE				
Inlet	Pipe ID	Outlet Invert	Inlet Invert	Length (ft)	S (ft/ft)	D (in)	Q pipe (cfs)	Q full (cfs)	V pipe in (ft/s)	V pipe out (ft/s)	hf (ft)	km	hm (ft)	Elev. @ Outlet	Elev. @ Inlet	Depth @ Outlet	Depth @ Inlet	Ground Elev.
CB#2-0-1	P-5	32.20	32.72	17	0.0306	24	8.5	39.6	2.71	2.71	0.020	1.2	0.14	35.76	35.90	3.56	3.18	36.22
CB#2-0-2	P-6	32.20	32.64	19	0.0232	24	8.5	34.4	2.71	2.71	0.030	1.2	0.00	35.77	35.77	3.57	3.13	36.14
MH#O-4	P-4	31.60	32.10	200	0.0025	24	17.0	11.3	5.41	5.41	1.130		0.46	35.28	35.74	3.68	3.64	36.50
MH#O-3	P-3	31.30	31.50	60	0.0033	24	17.0	13.1	5.41	5.41	0.340		0.18	33.97	34.15	2.67	2.65	35.40
MH#O-2	P-2	30.50	31.20	54	0.0130	24	17.0	25.8	5.41	5.41	0.300		0.18	33.45	33.63	2.95	2.43	35.10
MH#O-1	P-1	30.10	30.40	150	0.0020	24	17.0	10.1	5.41	6.79	1.080		0.48	32.66	33.14	2.56	2.74	34.90
O-1														31.30	31.30	31.30	31.30	34.10

Note: The tailwater elevation for the strom drain was set at 31.30 (1.5ft above basin bottom for the 10yr storm)

Scenario: Base



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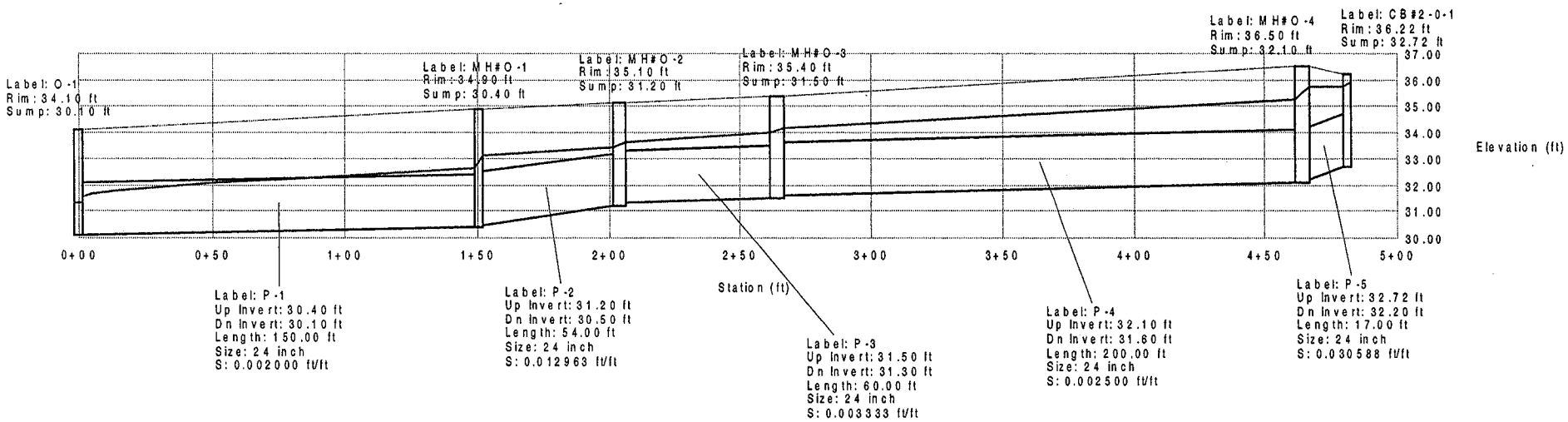
Coe & Van Loo Consultants
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Profile
Scenario: Base



Wigwam Creek - Parcel & Job # (00-0046-03) - Analysis for Proposed Storm Drain #1
Storm Drain Capacity Calculation Record

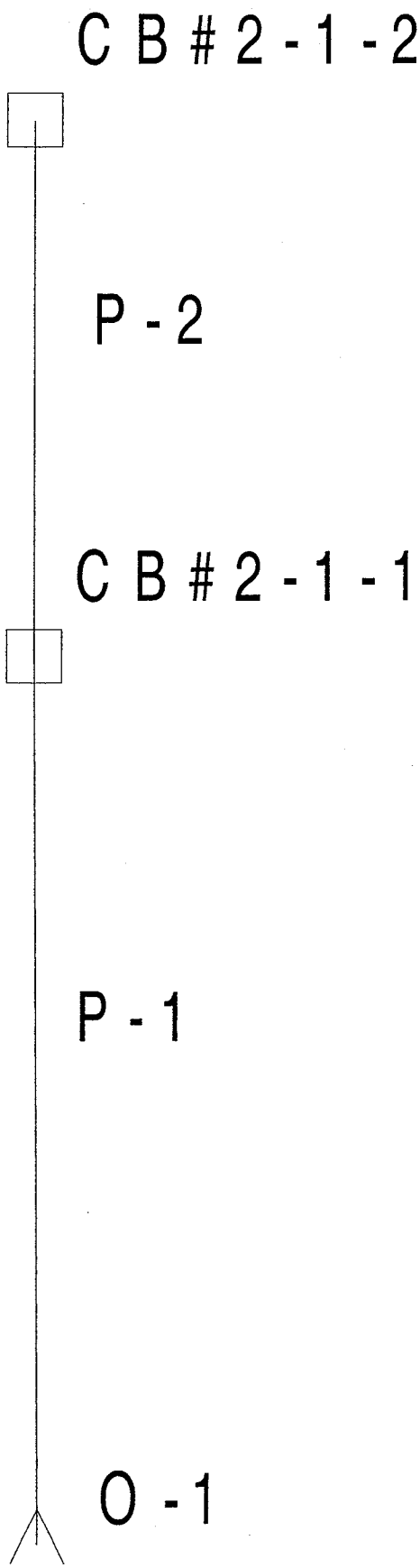
Head Loss Variables

Bend Loss, Kb (90 degrees) =	1.04
Expansion Loss, Ke =	0.35
Shape Adjustment, Cs =	0.50

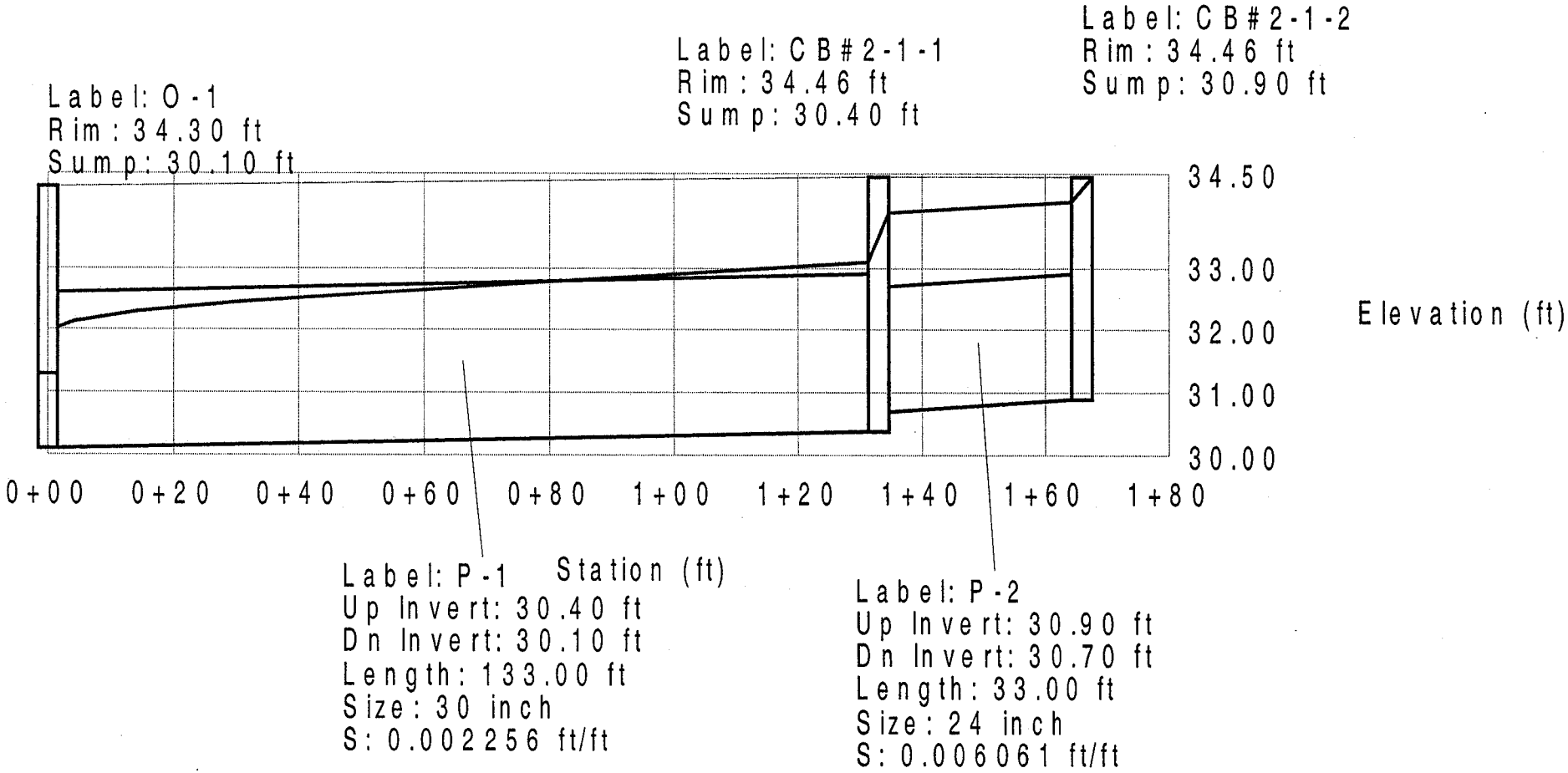
ID		STORM DRAIN DESIGN DATA							HEAD LOSS CALCULATION					HYDRAULIC GRADE LINE				
Inlet	Pipe ID	Outlet Invert	Inlet Invert	Length (ft)	S (ft/ft)	D (in)	Q pipe (cfs)	Q full (cfs)	V pipe in (ft/s)	V pipe out (ft/s)	hf (ft)	km	hm (ft)	Elev. @ Outlet	Elev. @ Inlet	Depth @ Outlet	Depth @ Inlet	Ground Elev.
CB#2-1-2	P-2	30.70	30.90	33	0.0061	24	16.0	17.6	5.09	5.09	0.170	1.2	0.48	34.06	34.46	3.36	3.56	34.46
CB#2-1-1	P-1	30.10	30.40	133	0.0023	30	32.0	19.5	6.52	7.88	1.070	1.2	0.79	33.10	33.89	3.00	3.49	34.46
O-1														31.30	31.30	31.30	31.30	34.30

Note: The tailwater elevation for the strom drain was set at 31.30 (1.5ft above basin bottom for the 10yr storm)

Scenario: Base



Profile
Scenario: Base



Wigwam Creek - Parcel & Job # (00-0046-03) - Analysis for Proposed Storm Drain #2
Storm Drain Capacity Calculation Record

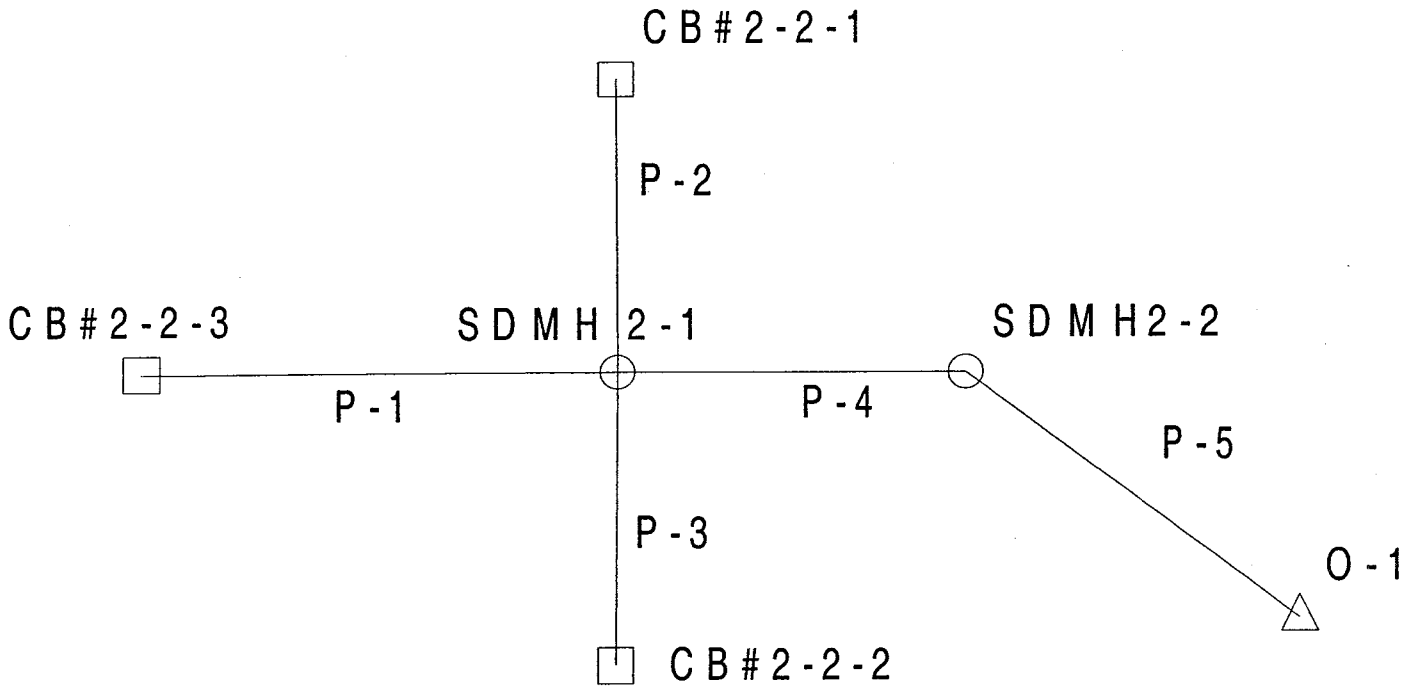
Head Loss Variables

Bend Loss, Kb (90 degrees) =	1.04
Expansion Loss, Ke =	0.35
Shape Adjustment, Cs =	0.50

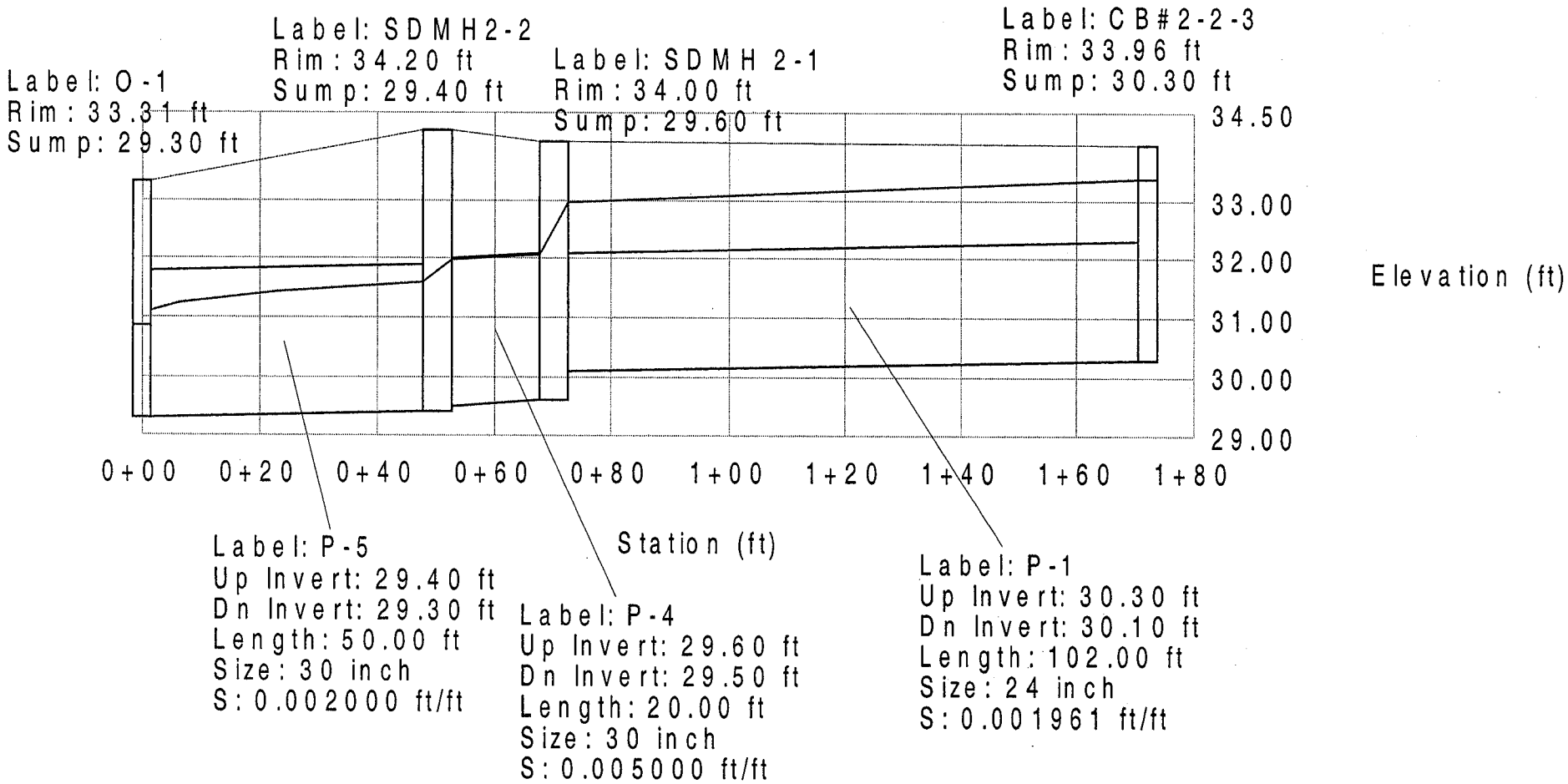
ID		STORM DRAIN DESIGN DATA							HEAD LOSS CALCULATION					HYDRAULIC GRADE LINE				
Inlet	Pipe ID	Outlet Invert	Inlet Invert	Length (ft)	S (ft/ft)	D (in)	Q pipe (cfs)	Q full (cfs)	V pipe in (ft/s)	V pipe out (ft/s)	hf (ft)	km	hm (ft)	Elev. @ Outlet	Elev. @ Inlet	Depth @ Outlet	Depth @ Inlet	Ground Elev.
CB#2-2-3	P-1	30.10	30.30	104	0.0019	24	14.0	9.9	4.46	4.46	0.400	1.2	0.00	33.37	33.37	3.27	3.07	33.96
CB#2-2-1	P-2	30.10	30.20	21	0.0048	24	7.0	15.6	2.23	2.23	0.020	1.2	0.09	33.00	33.09	2.90	2.89	33.70
CB#2-2-2	P-3	30.10	30.20	13	0.0077	24	7.0	19.8	2.23	2.23	0.010	1.2	0.09	32.99	33.08	2.89	2.88	33.70
SDMH 2-1	P-4	29.50	29.60	20	0.0050	30	28.0	29.0	5.72	5.71	0.080	1.2	0.91	32.07	32.98	2.57	3.38	34.00
SDMH2-2	P-5	29.30	29.40	50	0.0020	30	28.0	18.3	6.11	7.38	0.500	1.2	0.38	31.60	31.98	2.30	2.58	34.20
O-1														30.87	30.87	30.87	30.87	33.31

Note: The tailwater elevation for the strom drain was set at 30.87 (Sta 2700, Hec-Ras for channel 8, 10-yr storm) 1.2

Scenario: Base



Profile
Scenario: Base



10-year (60% of 100 year)

WIGWAM CREEK PHASE II

HEC-RAS Plan: ch_9 River: Channel 8 Reach: 1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	4980	96.00	1037.60	1038.55	1038.55	1038.95	0.008654	5.34	19.65	25.36	0.97
1	4800	96.00	1035.75	1036.85		1037.18	0.005635	4.77	21.72	23.36	0.80
1	4600	96.00	1034.83	1036.59	1035.81	1036.70	0.001071	2.83	37.58	26.75	0.38
1	4540	Culvert									
1	4400	96.00	1033.96	1034.95	1034.95	1035.39	0.008755	5.51	18.51	21.54	0.98
1	4200	96.00	1032.47	1034.04		1034.20	0.001663	3.28	31.96	24.61	0.46
1	4000	96.00	1031.97	1033.85		1033.95	0.000873	2.67	39.79	26.42	0.34
1	3800	96.00	1031.47	1033.74	1032.47	1033.81	0.000466	2.22	48.00	26.23	0.26
1	3710	Culvert									
1	3600	109.00	1031.10	1032.65		1032.82	0.001945	3.51	34.06	26.95	0.50
1	3200	109.00	1030.30	1031.99		1032.14	0.001502	3.26	36.53	26.36	0.44
1	3120	109.00	1030.20	1031.96		1032.03	0.000722	2.33	56.76	47.37	0.31
1	3100	109.00	1030.20	1031.94		1032.01	0.000798	2.43	53.92	44.92	0.32
1	3080	109.00	1030.16	1031.94		1032.00	0.000666	2.25	59.30	49.79	0.30
1	3050	109.00	1030.00	1031.92		1031.98	0.000525	2.11	63.13	48.64	0.27
1	3020	109.00	1029.96	1031.91		1031.96	0.000499	2.07	64.29	49.00	0.26
1	2990	109.00	1029.90	1031.84		1031.93	0.000842	2.68	45.58	30.07	0.34
1	2960	109.00	1029.85	1031.82		1031.91	0.000761	2.57	47.89	31.65	0.32
1	2930	109.00	1029.80	1031.80		1031.88	0.000722	2.53	48.69	31.75	0.32
1	2900	109.00	1029.71	1031.78		1031.86	0.000664	2.49	49.33	30.69	0.30
1	2870	109.00	1029.65	1031.76		1031.84	0.000605	2.41	51.17	31.42	0.29
1	2840	109.00	1029.60	1031.75		1031.82	0.000569	2.36	52.27	31.67	0.28
1	2800	109.00	1029.50	1031.73	1030.52	1031.80	0.000480	2.23	55.90	33.05	0.26
1	2765	Culvert									
1	2700	109.00	1029.30	1030.87		1031.04	0.001844	3.45	34.77	27.31	0.48
1	2400	109.00	1028.70	1030.48		1030.59	0.001133	2.93	41.53	29.76	0.39
1	2000	109.00	1027.90	1030.27	1028.92	1030.33	0.000390	2.09	59.74	33.41	0.24
1	1980	Culvert									
1	1900	144.00	1027.73	1029.77		1029.91	0.001149	3.24	50.58	32.63	0.40
1	1880	144.00	1027.70	1029.75		1029.89	0.001138	3.23	50.71	32.59	0.40
1	1500	144.00	1027.20	1029.34		1029.48	0.001012	3.14	51.78	31.35	0.38
1	1100	144.00	1026.60	1029.09		1029.17	0.000531	2.52	66.43	36.32	0.28
1	1070	144.00	1026.46	1029.07		1029.16	0.000495	2.51	65.63	33.22	0.27
1	1040	144.00	1026.41	1029.06		1029.14	0.000487	2.51	65.33	32.33	0.27
1	1010	144.00	1026.35	1029.05		1029.13	0.000422	2.37	70.20	34.96	0.25
1	980	144.00	1026.31	1029.04		1029.11	0.000390	2.30	72.97	36.40	0.24
1	950	144.00	1026.25	1029.04		1029.10	0.000340	2.17	76.56	36.95	0.23
1	920	144.00	1026.20	1029.02		1029.09	0.000357	2.24	74.52	35.81	0.24
1	890	144.00	1026.16	1029.02		1029.08	0.000312	2.11	78.69	37.09	0.22
1	860	144.00	1026.10	1029.00		1029.07	0.000334	2.21	75.26	34.88	0.23
1	830	144.00	1026.04	1029.00		1029.05	0.000277	2.04	81.61	37.16	0.21
1	800	166.00	1026.00	1028.96		1029.04	0.000410	2.48	77.58	35.42	0.25
1	600	166.00	1025.69	1028.90		1028.97	0.000310	2.27	84.88	35.91	0.22
1	550	166.00	1025.62	1028.89	1026.96	1028.95	0.000291	2.23	86.61	36.05	0.22
1	535	Culvert									
1	470	166.00	1025.50	1028.28		1028.37	0.000503	2.63	71.58	33.55	0.28
1	200	166.00	1024.98	1028.19		1028.26	0.000303	2.25	86.03	36.55	0.22
1	0	166.00	1024.62	1028.15		1028.21	0.000206	1.98	95.47	35.05	0.19
1	-55	166.00	1024.30	1028.14	1025.80	1028.19	0.000213	2.12	94.18	35.09	0.19
1	-101	Culvert									
1	-160	166.00	1024.00	1027.82	1025.50	1027.88	0.000214	2.13	94.13	35.28	0.19

Wigwam Creek - Parcel & Job # (00-0046-03) - Analysis for Proposed Storm Drain #3
Storm Drain Capacity Calculation Record

Head Loss Variables

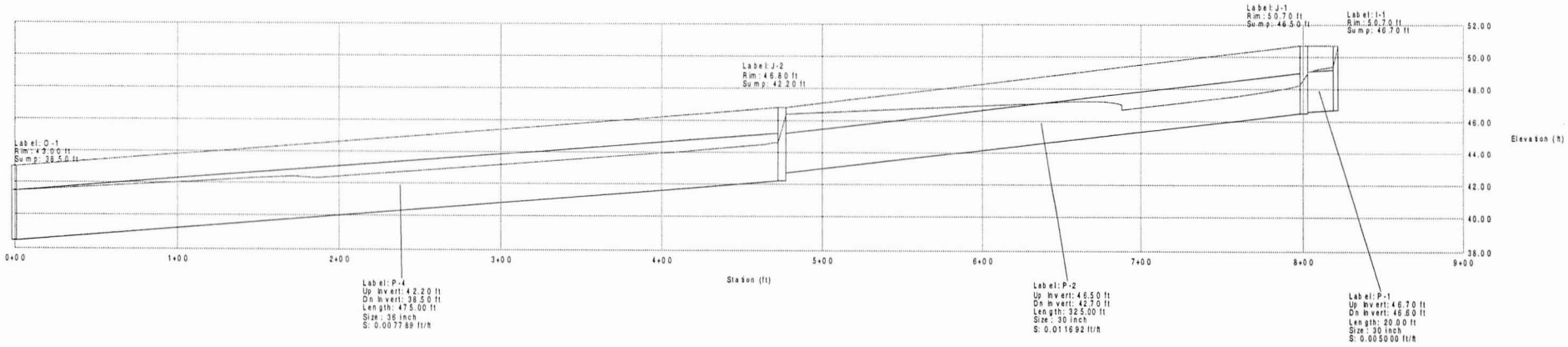
Bend Loss, Kb (90 degrees) =	1.04
Expansion Loss, Ke =	0.35
Shape Adjustment, Cs =	0.50

ID		STORM DRAIN DESIGN DATA							HEAD LOSS CALCULATION					HYDRAULIC GRADE LINE				
Inlet	Pipe ID	Outlet Invert	Inlet Invert	Length (ft)	S (ft/ft)	D (in)	Q pipe (cfs)	Q full (cfs)	V pipe in (ft/s)	V pipe out (ft/s)	hf (ft)	km	hm (ft)	Elev. @ Outlet	Elev. @ Inlet	Depth @ Outlet	Depth @ Inlet	Ground Elev.
I-1	P-1	46.60	46.70	20	0.0050	30	28.0	29.0	5.81	5.78	0.080		0.63	49.08	49.71	2.48	3.01	50.70
J-1	P-2	42.70	46.50	325	0.0117	30	28.0	44.4	7.38	5.70	1.950		0.70	48.30	49.00	5.60	2.50	50.70
I-2	P-3	42.70	42.80	20	0.0050	30	28.0	29.0	5.70	5.70	0.090		0.61	46.45	46.80	3.75	4.00	46.80
J-2	P-4	38.50	42.20	475	0.0078	36	56.0	58.9	9.14	7.92	3.130		1.73	44.63	46.36	6.13	4.16	46.80
O-1														41.50	41.50	41.50	41.50	43.00

Note: The outlet tailwater condition was assumed to be free outfall. The 10yr WSEL in the Greenbelt is lower than the outlet invert.

Scenario: Base

Profile
Scenario: Base



Wigwam Creek Phase 2 (00-0046-03)
Junction Loss Analysis for Storm Drain System # 3
10-Year Flow

Node	Size	Invert Elev.	Roughness	Area	Discharge	Velocity	Velocity Head	Conveyance	Junction Loss, Hj																						
									Q1	D1	A1	V1	Angle1	Q2	D2	A2	V2	Q3	D3	A3	V3	Angle3	Q4	D4	A4	V4	Angle4	Hj	Vh1	Vh2	JL
	inches	ft	n	A sq ft	Q cfs	V fps	Vh= V^2/2g ft	K	cfs	inches	sq ft	fps	degrees	cfs	inches	sq ft	fps	cfs	inches	sq ft	fps	degrees	cfs	inches	sq ft	fps	degrees	ft	ft	ft	ft
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(21)	(22)	(23)	(25)	(24)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)
Storm Drain System # 3																															
J #1	36	42.2	0.013	7.07	56	7.92	0.97	666.99	28.00	30.00	4.91	5.70	0.00	59.00	36.00	7.07	8.35	28.00	30.00	4.91	5.70	90.00						1.73	0.51	0.97	1.26

Notes:

1. dHGL = 2 x (Q2 x V2 - Q1 x V1 X COS(ANGLE1) - Q3 x V3 x COS(ANGLE3))/(32.2 X (A1 + A2))
   Junction Loss, JL = Hj + Vh1 - Vh2, where Hj is the headloss due to the junction.

2. Above formula and loss coefficients are taken from the Maricopa County Flood Control District's (MCFCD) Hydraulic Design Manual Volume II (Reference 2).

3. Conveyance 'K' = Discharge 'Q' / (Slope 'S')^0.5

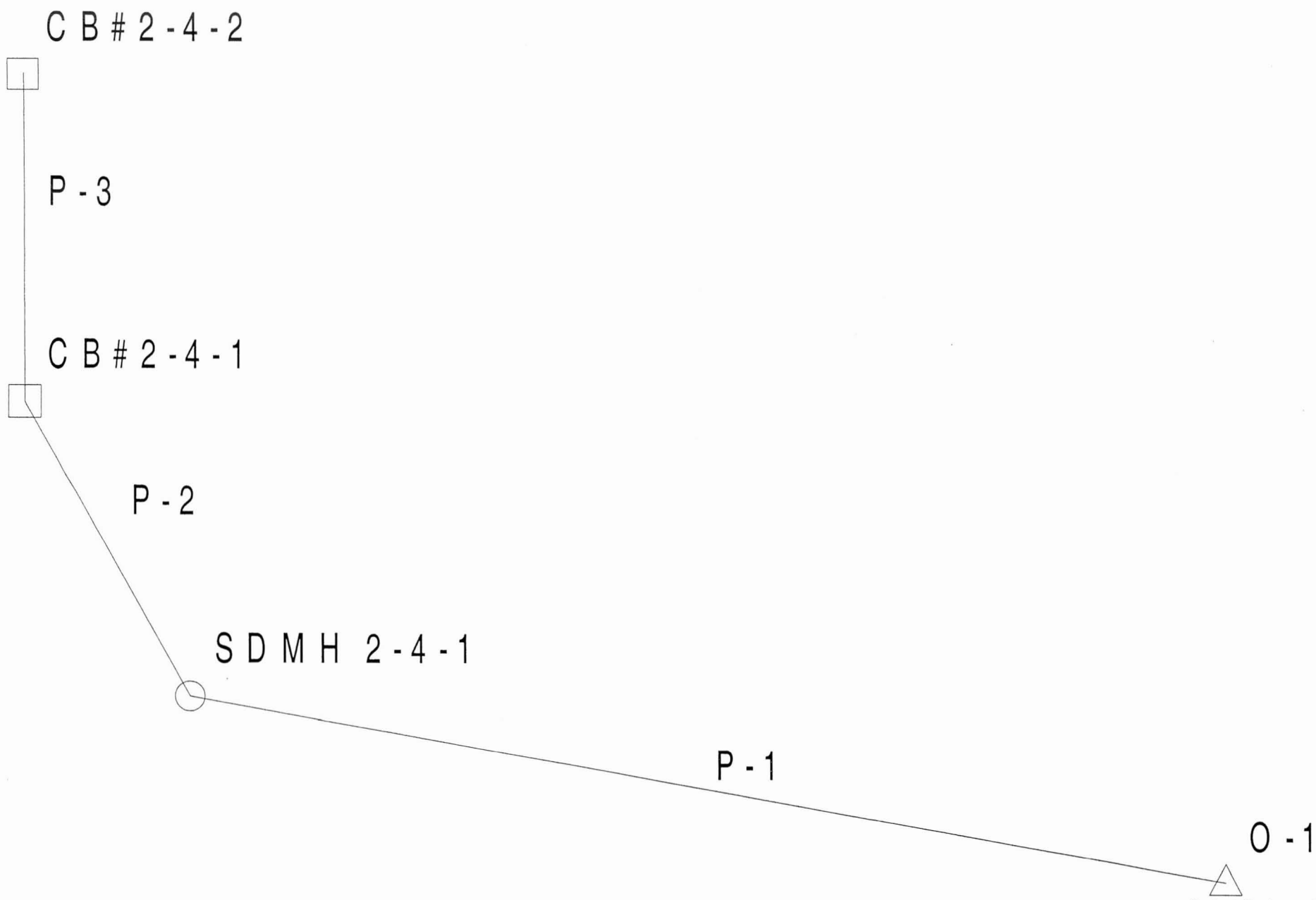
Wigwam Creek - Parcel & Job # (00-0046-03) - Analysis for Proposed Storm Drain #4
Storm Drain Capacity Calculation Record

Head Loss Variables

Bend Loss, Kb (90 degrees) =	1.04
Expansion Loss, Ke =	0.35
Shape Adjustment, Cs =	0.50

ID		STORM DRAIN DESIGN DATA							HEAD LOSS CALCULATION					HYDRAULIC GRADE LINE				
Inlet	Pipe ID	Outlet Invert	Inlet Invert	Length (ft)	S (ft/ft)	D (in)	Q pipe (cfs)	Q full (cfs)	V pipe in (ft/s)	V pipe out (ft/s)	hf (ft)	km	hm (ft)	Elev. @ Outlet	Elev. @ Inlet	Depth @ Outlet	Depth @ Inlet	Ground Elev.
CB#2-4-2	P-3	33.30	33.40	49	0.0020	36	12.5	30.1	1.77	1.77	0.020	1.2	0.06	38.61	38.66	5.31	5.26	39.54
CB#2-4-1	P-2	33.00	33.20	53	0.0038	36	25.0	41.0	3.54	3.54	0.070	1.2	0.23	38.35	38.59	5.35	5.39	39.39
SDMH 2-4-1	P-1	32.50	32.90	144	0.0028	36	25.0	35.2	3.54	3.54	0.200	1.2	0.08	38.20	38.28	5.70	5.38	38.50
O-1														38.00	38.00	38.00	38.00	37.50

Scenario: Base



Coe & Van Loo Consultants
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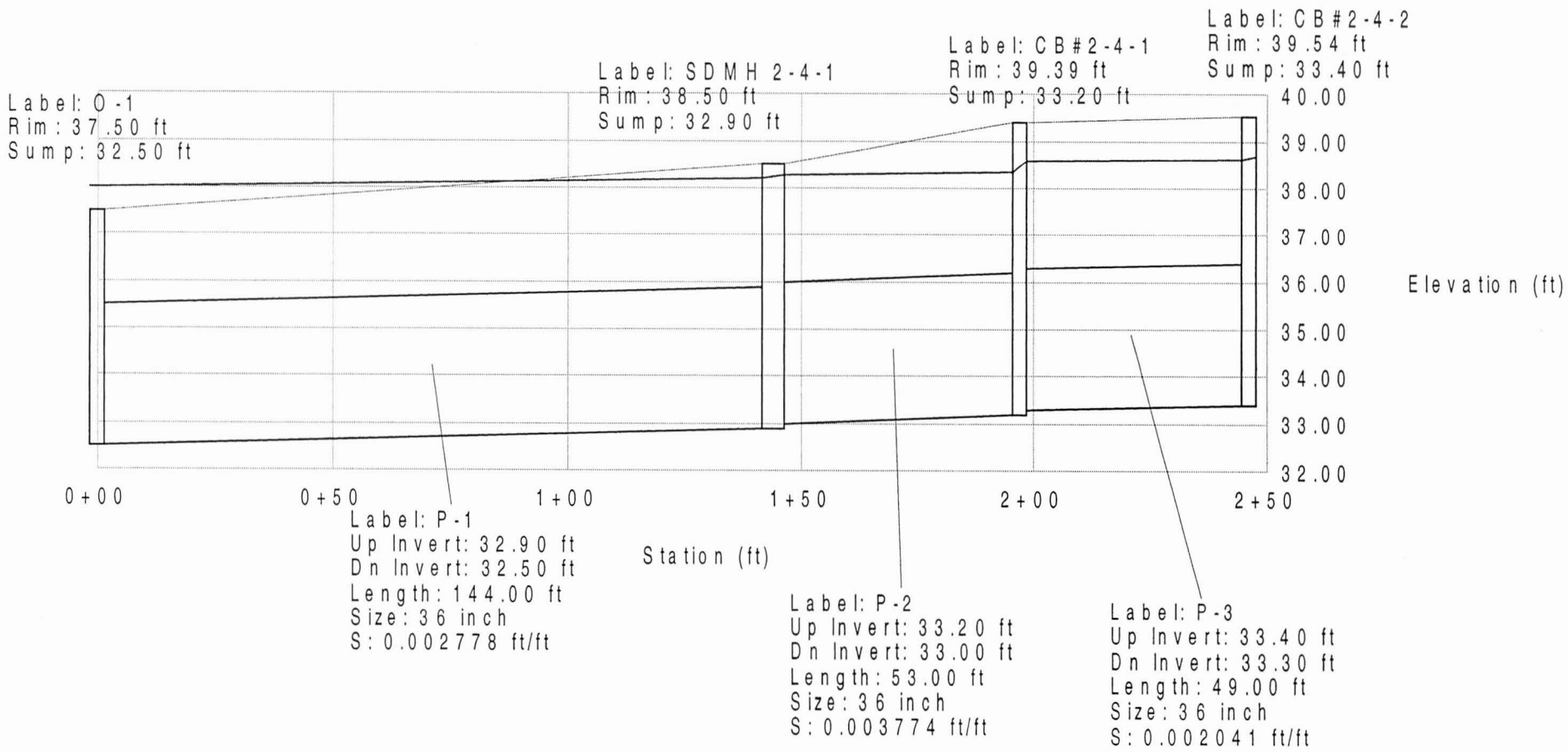
Profile
Scenario: Base



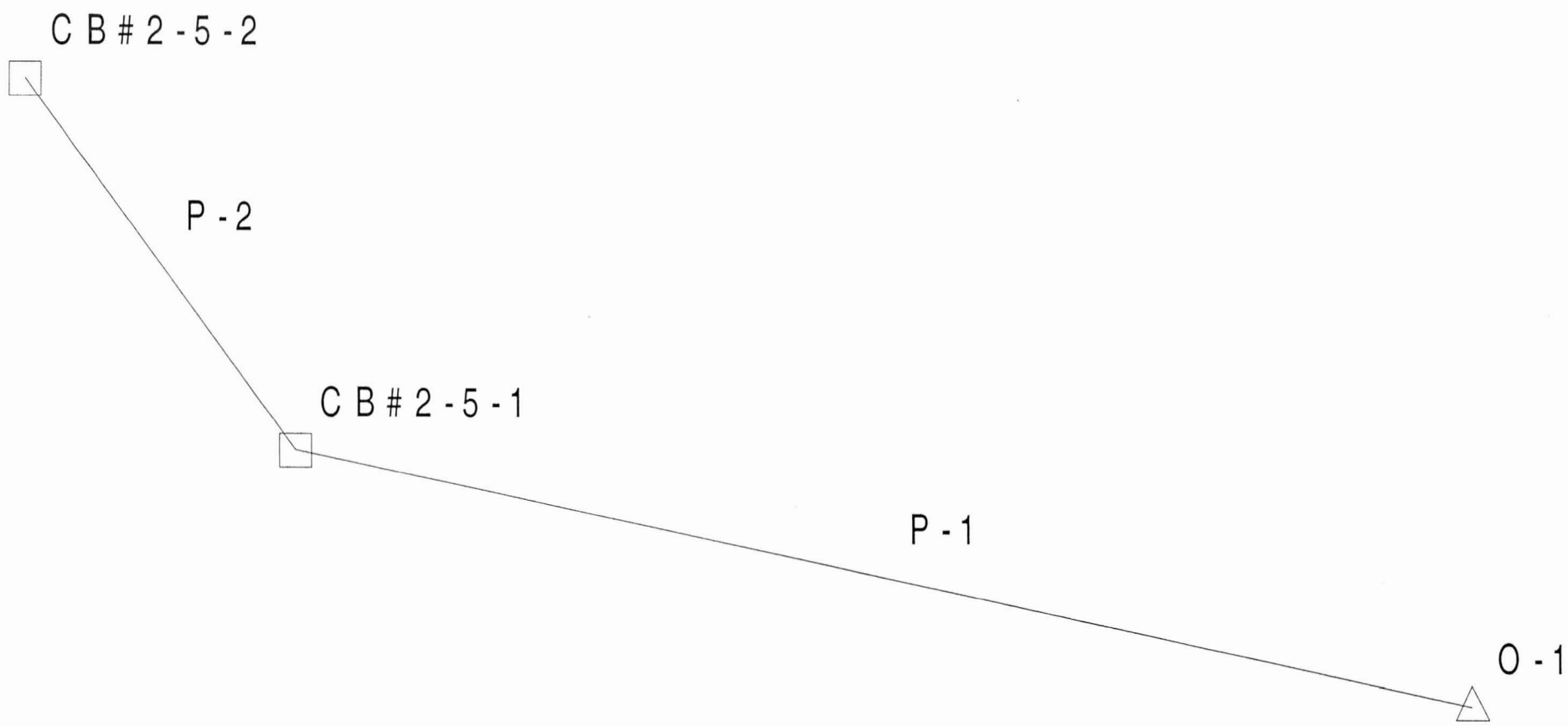
Wigwam Creek - Parcel & Job # (00-0046-03) - Analysis for Proposed Storm Drain #5
Storm Drain Capacity Calculation Record

Head Loss Variables

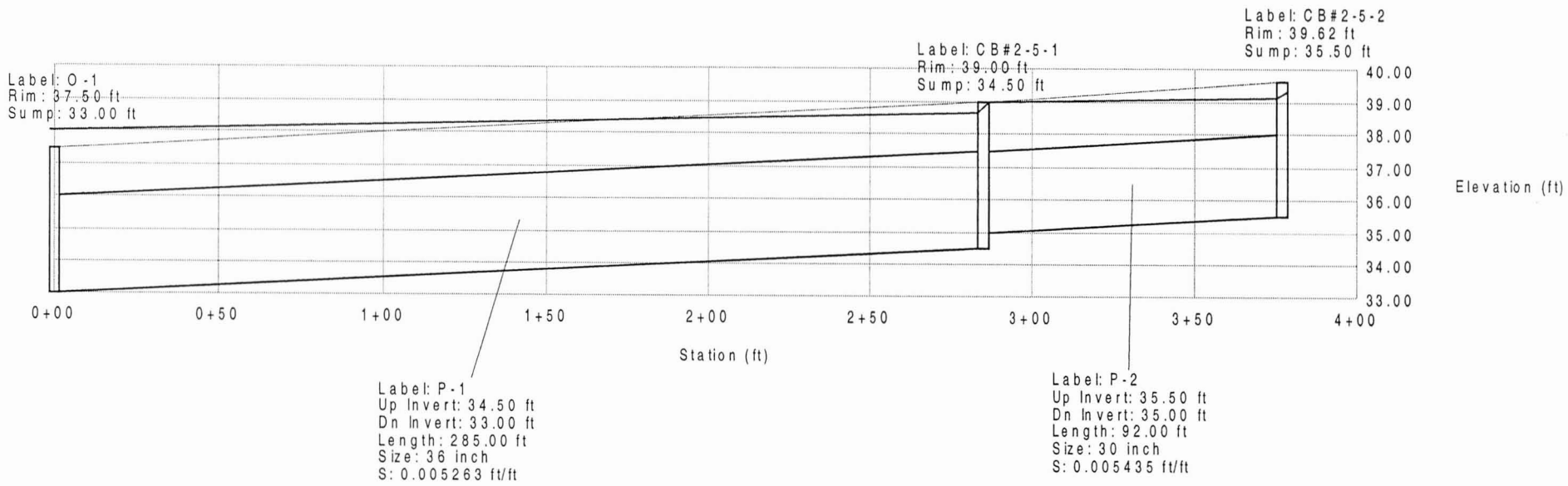
Bend Loss, Kb (90 degrees) =	1.04
Expansion Loss, Ke =	0.35
Shape Adjustment, Cs =	0.50

ID		STORM DRAIN DESIGN DATA							HEAD LOSS CALCULATION					HYDRAULIC GRADE LINE				
Inlet	Pipe ID	Outlet Invert	Inlet Invert	Length (ft)	S (ft/ft)	D (in)	Q pipe (cfs)	Q full (cfs)	V pipe in (ft/s)	V pipe out (ft/s)	hf (ft)	km	hm (ft)	Elev. @ Outlet	Elev. @ Inlet	Depth @ Outlet	Depth @ Inlet	Ground Elev.
CB#2-5-2	P-2	35.00	35.50	92	0.0054	30	16.0	30.2	3.26	3.26	0.140	1.2	0.20	39.14	39.34	4.14	3.84	39.62
CB#2-5-1	P-1	33.00	34.50	285	0.0053	36	32.0	48.4	4.53	4.53	0.660	1.2	0.38	38.66	39.00	5.66	4.50	39.00
O-1														38.00	38.00	38.00	38.00	37.50

Scenario: Base



Profile
Scenario: Base



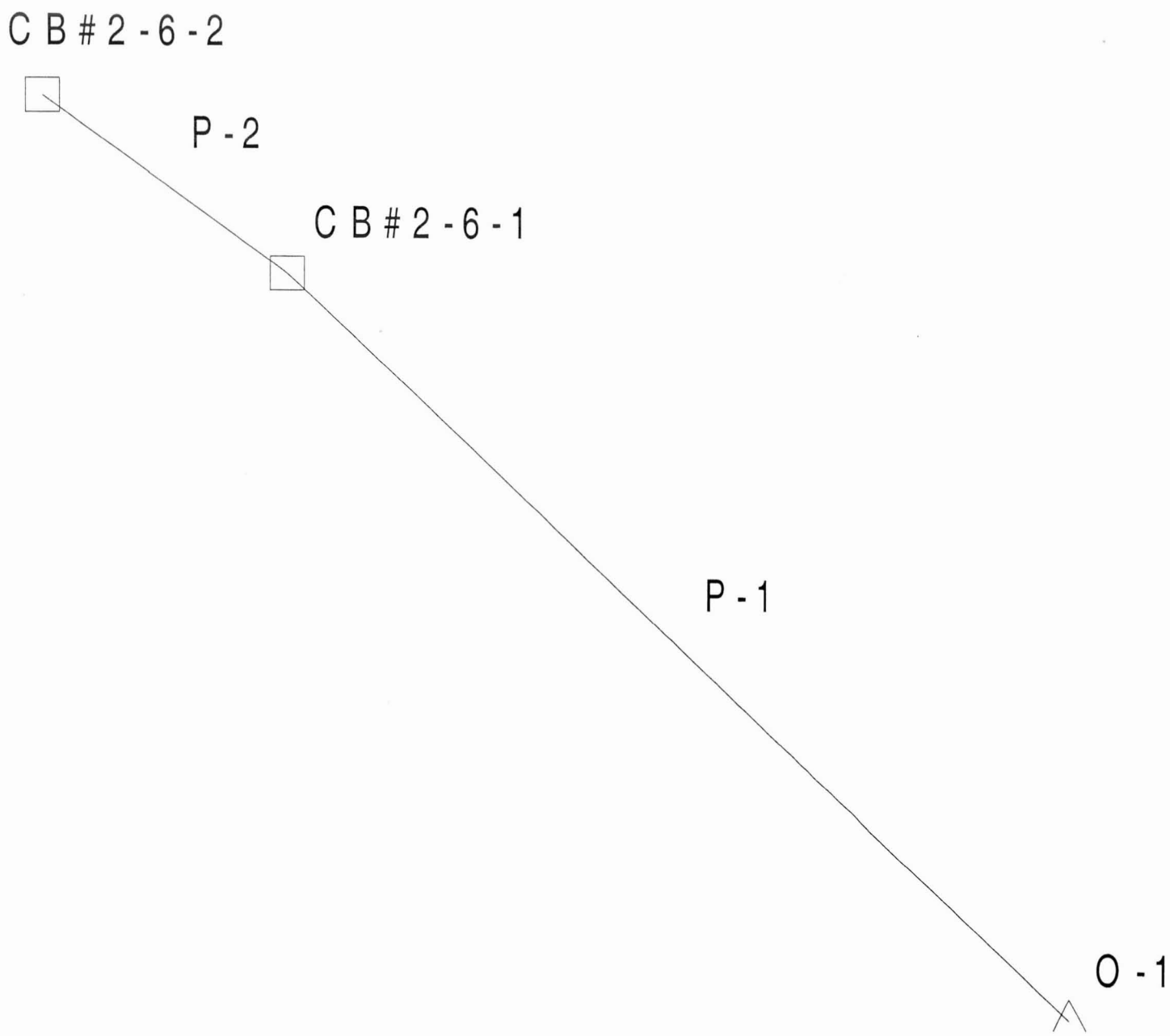
Wigwam Creek - Parcel & Job # (00-0046-03) - Analysis for Proposed Storm Drain #6
Storm Drain Capacity Calculation Record

Head Loss Variables

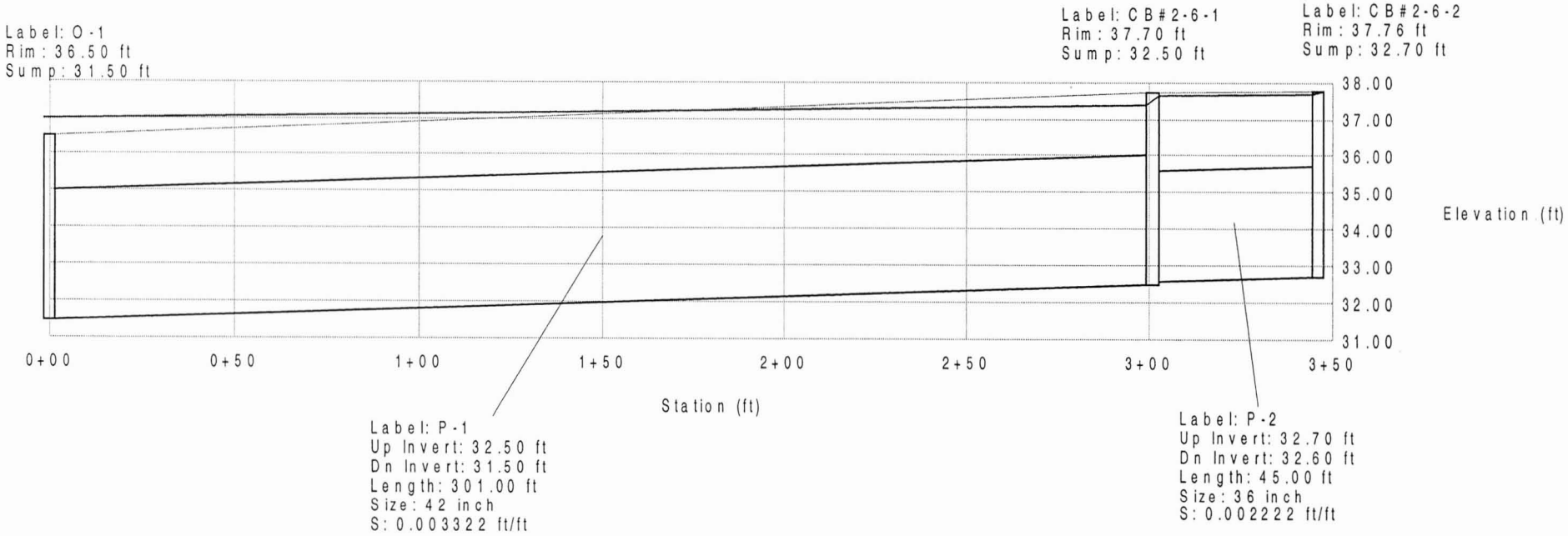
Bend Loss, Kb (90 degrees) =	1.04
Expansion Loss, Ke =	0.35
Shape Adjustment, Cs =	0.50

ID		STORM DRAIN DESIGN DATA							HEAD LOSS CALCULATION					HYDRAULIC GRADE LINE				
Inlet	Pipe ID	Outlet Invert	Inlet Invert	Length (ft)	S (ft/ft)	D (in)	Q pipe (cfs)	Q full (cfs)	V pipe in (ft/s)	V pipe out (ft/s)	hf (ft)	km	hm (ft)	Elev. @ Outlet	Elev. @ Inlet	Depth @ Outlet	Depth @ Inlet	Ground Elev.
CB#2-6-2	P-2	32.60	32.70	45	0.0022	36	18.0	31.4	2.55	2.55	0.030	1.2	0.12	37.68	37.76	5.08	5.06	37.76
CB#2-6-1	P-1	31.50	32.50	301	0.0033	42	36.0	58.0	3.74	3.74	0.390	1.2	0.26	37.39	37.65	5.89	5.15	37.70
O-1														37.00	37.00	37.00	37.00	36.50

Scenario: Base



Profile
Scenario: Base



APPENDIX D

Retention Basin Calculations

Wigwam Creek Phase 2
(00-0046--02)
Retention Basin Volume Calculations

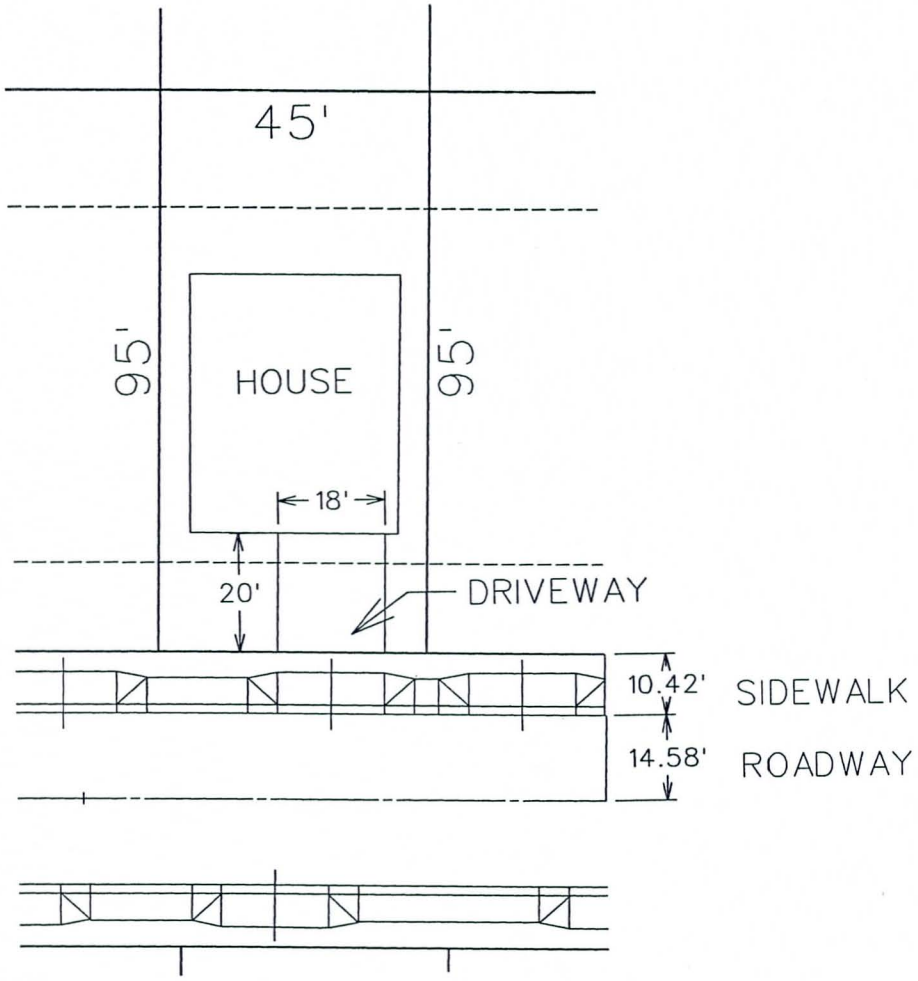
Area ID	Area (acres) A	Weighted (1) C value C	Precip. 100-yr, 2-hr (inches) P	**Volume Required (2)** (acre · ft) Volume Vreq	Cum. Vcum	**Volume Provided (3)** (acre · ft) Ret. Basin ID	Depth d (ft)	Bot. Area Ab (ac)	Top Area At (ac)	Volume Vp
Phase 1 West of WigWam Creek Blvd	13.32	0.69	2.60	1.97		R1	3.0	1.75	2.77	**6.78**
Phase 2	25.42	0.69	2.60	3.77	**5.74**	R2 (4)	3.0	0.31	0.68	**1.49**
Totals	**38.74**			**5.74**	**5.74**					**8.27**

Note:

(1) C value = 0.69 residential areas
(2) Vreq = A x C x P/12 per Reference 2.
(3) Vp = (Ab + At)/2 x d
(4) Retention Basins R1 and R2 are connected by an equilizer pipe

WEIGHTED C-VALUE CALCULATION

FOR TYPICAL LOT



AREA I.D.	AREA	C	CxA	
HOUSE	1700	0.90	1530	1700
DRIVEWAY	360	0.95	342	360
YARD	2215	0.25	554	687
SIDEWALK	469	0.95	445	469
ROADWAY	656	0.95	623	627
TOTALS	5400		3495	3834

$$\text{WEIGHTED C} = \frac{\text{CxA (TOTAL)}}{\text{AREA (TOTAL)}}$$

$$\text{WEIGHTED C} = \frac{3495}{5400}$$

$$\text{WEIGHTED C} = 0.65$$

.71

Table 3.2
C Coefficients for Use with the Rational Method

Land Use	Return Period			
	2-10 Year	25 Year	50 Year	100 Year
Streets and Roads				
Paved Roads	0.75 – 0.85	0.83 – 0.94	0.90 – 0.95	0.94 – 0.95
Gravel Roadways & Shoulders	0.60 – 0.70	0.66 – 0.77	0.72 – 0.84	0.75 – 0.88
Industrial Areas				
Heavy	0.70 – 0.80	0.77 – 0.88	0.84 – 0.95	0.88 – 0.95
Light	0.60 – 0.70	0.66 – 0.77	0.72 – 0.84	0.75 – 0.88
Business Areas				
Downtown	0.75 – 0.85	0.83 – 0.94	0.90 – 0.95	0.94 – 0.95
Neighborhood	0.55 – 0.65	0.61 – 0.72	0.66 – 0.78	0.69 – 0.81
Residential Areas				
Lawns – Flat	0.10 – 0.25	0.11 – 0.28	0.12 – 0.30	0.13 – 0.31
– Steep	0.25 – 0.40	0.28 – 0.44	0.30 – 0.48	0.31 – 0.50
Suburban	0.30 – 0.40	0.33 – 0.44	0.36 – 0.48	0.38 – 0.50
Single Family	0.45 – 0.55	0.50 – 0.61	0.54 – 0.66	0.56 – 0.69
Multi-Unit	0.50 – 0.60	0.55 – 0.66	0.60 – 0.72	0.63 – 0.75
Apartments	0.60 – 0.70	0.66 – 0.77	0.72 – 0.84	0.75 – 0.88
Parks/Cemetaries	0.10 – 0.25	0.11 – 0.28	0.12 – 0.30	0.13 – 0.31
Playgrounds	0.40 – 0.50	0.44 – 0.55	0.48 – 0.60	0.50 – 0.63
Agricultural Areas	0.10 – 0.20	0.11 – 0.22	0.12 – 0.24	0.13 – 0.25
Bare Ground	0.20 – 0.30	0.22 – 0.33	0.24 – 0.36	0.25 – 0.38
Undeveloped Desert	0.30 – 0.40	0.33 – 0.44	0.36 – 0.48	0.38 – 0.50
Mountain Terrain (Slopes > 10%)	0.60 – 0.80	0.66 – 0.88	0.72 – 0.95	0.75 – 0.95

Note: Values of C for 25, 50 and 100 Year were derived using frequency adjustment factors of 1.10, 1.20, and 1.25, respectively, with an upper limit of 0.95 for C for the 2-10 Year values.

Wigwam Creek Phase 2
Job # (00-0046-03)
Retention Basin Drain Time and Drywell Calculations

Retention Basin ID	Bottom Area (ft^2)	Volume Required (ft^3)	Percolation Rate (1) ($ft^3/hr/ft^2$)	Drain Time (2) (hr)	Need Dry Well (3)	Volume Required to Drain By Dry Well (4) (ft^3)	Flowrate Required to Drain Within 36 hrs (5) (cfs)	Dry Well Flowrate Capacity (cfs)	Number Of Dry Wells Required (6)	Number Of Dry Wells Provided (7)
R-1	13772	64904	0.25	38	Yes	2930	0.023	0.1	1	1
R-2	68843	185130	0.25	22	No	0	0.000	0.1	0	1

Notes:
(1) Percolation rates are assumed.
(2) Drain Time= (Volume Required)/[0.5 x (Percolation Rate)]/(Bottom Area of Basin)
(3) Dry well is required if the drain time by basin itself exceeds 36 hours.
(4) (Volume To Be Drained By Dry Well)= (Retention Volume Required)-(Volume To Be Drained By Basin Itself)
= (Retention Volume Required)-[0.5 x (Percolation Rate) x 36 x (Bottom Area Of Basin)]
(5) Flowrate Required to Drain Basin Within 36 hrs = (Volume To Be Drained By Dry Well)/(36 x 3600)
(6) (Number Of Dry Well(s) Required)=(Flowrate Required to Drain Basin Within 36 hrs) x 2/(Dry Well Flowrate Capacity)
(7) Total number of drywells provided includes drywell at outfall of the storm drain systems.

* Retention basins connected with equalizer pipes. A bleed off pipe is constructed for R-2 to drain into a channel adjacent to Camelback Road.
* The maximum bleed off rate is 1cfs. The calculations above are based on the full volume required to drain by percolation in the basin. However, the bleed off pipe will drain 2.97ac-ft (Volume required = 5.74 ac-ft) within 36hrs.

Culvert Calculator Report
Equilizer Pipe

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	35.10	ft	Headwater Depth/ Height	1.40	
Computed Headwater Elevation	33.80	ft	Discharge	52.60	cfs
Inlet Control HW Elev	33.12	ft	Tailwater Elevation	32.80	ft
Outlet Control HW Elev	33.80	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	30.30	ft	Downstream Invert	29.80	ft
Length	80.00	ft	Constructed Slope	0.006250	ft/ft

Hydraulic Profile					
Profile	Pressure		Depth, Downstream	3.00	ft
Slope Type	N/A		Normal Depth	1.71	ft
Flow Regime	N/A		Critical Depth	1.75	ft
Velocity Downstream	5.36	ft/s	Critical Slope	0.005880	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev	33.80	ft	Upstream Velocity Head	0.45	ft
Ke	0.50		Entrance Loss	0.22	ft

Inlet Control Properties					
Inlet Control HW Elev	33.12	ft	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	9.8	ft^2
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

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Wigwam Creek
(98-0098-02)
Equilizer Pipe Calculations (Renention Basins R-1 and R-2)

1) Retention Volume Required for Retention Basin R-2

Vreq = 3.77 acre-ft (Appendix D)

2) Retention Basin R-2 Volume Provided;

Vp = 1.49 acre-ft (Appendix D)

3) Excess Volume from Retention Basin R-2

V = Vreq - Vp = 3.77-1.49 = 2.28 acre-ft

4) Area contributed to Retention (Excess Volume)

A= V/CP = 2.28/0.69*2.6 = 15.25 acres

5) Assume i100 = 5 inches per hour

Q = CiA = 0.69*5*15.25 = 52.6 cfs

APPENDIX E

Bethany Home Road, El Mirage Road and Wigwam Creek Boulevard Drainage Calculations

CVL

WIGWAM INFRASTRUCTURE
0-1
CATCH BASIN CALCULATIONS

CP - 0-1 - CATCH BASIN NO.(s) 0-1,0-2

"Flow-by" Catch Basin Interception Capacity

Q10 @ CP- 0-1 = (30 cfs) /2 = 15.0 cfs (per half street)

Qd = Qdesign = 15.0 cfs, street slope = 1.10 %
D = Depth of flow = 0.41 ft

a) W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
T = Spread = 20.5 ft
W/T = 1.42 / 20.5 = 0.069

b) Sw' = Cross-slope of gutter section = 2 inch (depression)/ 17 inch ≅ 0.118 ft/ft
Sx = Pavement cross-slope = 0.020 ft/ft
Sw = Sw' + Sx = 0.138
Sw/Sx = 0.138 / 0.020 = 6.90

c) Eo = 0.17 (Fig. 3.23) ♦

d) Se = Sx + Sw'*Eo
= 0 0.020 + (0.118)*(0.17)
= 0 0.040

e) Qd = 15.0 cfs
Lt = 41.2 ft (Fig. 3.20) ♦
Adjust for clogging = 41.2 ft * 1.25 = 51.5 ft

For Design
Use double wing MAG Std Detail No. 533-1,
L1 = 17 ft, L2 = 17 ft
Total Opening Length = 37 ft

f) E = Efficiency of Inlet
= 1-(1-L/Lt)^1.8 (Eqn 3.5) ♦
= 1 - (1 - 37 / 51.5)^1.8
= 1 - (1 - 0.72)^1.8
= 1 - (0.28)^1.8
= 1 - (0.10)
= 0.90

g) Flow intercepted = Q*E = 15.0 cfs * 0.90 = 13.50 cfs = 13.50 cfs

h) Flow-by = Qd - Qintercepted = (15.0 cfs - 13.5 cfs) * 2 = 3.0 cfs

So: Total flow-by @ CP - 0-1 = 3.0 cfs BETHANY HOME ROAD

Total flow intercepted = (13.5 cfs) * 2 = 27.0 cfs @ CP - 0-1 (for the 10-year flow)

♦ MCFCD Volume II Hydraulics, Reference 4

WigWam Creek Phase 2 (00-0046-03)
STORM DRAIN #O3
CATCH BASIN CALCULATIONS

CP - 34A - CATCH BASIN NO.(s) O-3,O4

"Flow-by" Catch Basin Interception Capacity

Q100 @ CP- 34A = (17 cfs) /2 = 8.5 cfs (per half street)

Qd = Qdesign = 8.5 cfs, street slope = 0.30 %
D = Depth of flow = 0.50 ft

a) W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
T = Spread = 25.0 ft
W/T = 1.42 / 25.0 = 0.057

b) Sw' = Cross-slope of gutter section = 2 inch (depression)/ 17 inch ≅ 0.118 ft/ft
Sx = Pavement cross-slope = 0.020 ft/ft
Sw = Sw' + Sx = 0.138
Sw/Sx = 0.138 / 0.020 = 6.90

c) Eo = 0.14 (Fig. 3.23) ♦

d) Se = Sx + Sw'*Eo
= 0.020 + (0.118)*(0.14)
= 0.037

e) Qd = 8.5 cfs
Lt = 23.2 ft (Fig. 3.20) ♦
Adjust for clogging = 23.2 ft * 1.25 = 29.0 ft

For Design
Use single catch basin C.O.P. Std. Detail No. 1570, Type N
L1 = 17 ft, L2 = 0 ft
Total Opening Length = 20 ft

f) E = Efficiency of Inlet
= 1-(1-L/Lt)^1.8 (Eqn 3.5) ♦
= 1 - (1 - 20 / 29)^1.8
= 1 - (1 - 0.69)^1.8
= 1 - (0.31)^1.8
= 1 - (0.12)
= 0.88

g) Flow intercepted = Q*E = 8.5 cfs * 0.88 = 7.48 cfs = 7.50 cfs

h) Flow-by = Qd - Qintercepted = (8.5 cfs - 7.5 cfs) * 2 = 2.0 cfs

So: Total flow-by @ CP - 34 = 2.0 cfs

Total flow intercepted = (7.5 cfs) * 2 = 15.0 cfs @ CP - 34A (for the 100-year flow)

♦ MCFCD Volume II Hydraulics, Reference 2

WIGWAM CREEK
EL MIRAGE ROAD
SCUPPER CALCULATIONS

CP - O-3- SCUPPER NO.(s) O-3

Using inlet - sump condition calculation of total interception capacity.

Q100 @ CP- O-3 = 9 cfs

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qi = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Cw = Weir Coefficient for Curb Inlet = 2.3
Lt = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.80
d = Ponding depth at curb = 0.50 ft
Qi = Amount of street flow caught by an inlet (cfs)

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qi}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{9.0 \text{ cfs}}{0.80 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 11.3 \text{ ft}$$

For Design: For scupper(s) use MAG Std Detail No. 206.2 - total curb opening, Lt = 12 ft

Design scupper interception capacity >= required capacity of the Q100 in the street at CP - O-3

♦ MCFCD Volume II Hydraulics, Reference 4

WIGWAG CREEK

SCUPPER CALCULATIONS

CP - O-4 - SCUPPER NO.(s) O-4

"Flow-by" Scupper Interception Capacity
10 CFS FOR(CP-O-4) + 3 CFS FLOW-BYF OR (CP-0-2)= 13CFS
Q100 @ CP- O-4 = 13 cfs

Qd = Qdesign = 13.0 cfs, street slope = 0.26 %
D = Depth of flow = 0.39 ft

a) W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
T = Spread = 19.6 ft
W/T = 1.42 / 19.6 = 0.072

b) Sw' = Cross-slope of gutter section = 2 inch (depression)/ 17 inch ≅ 0.118 ft/ft
Sx = Pavement cross-slope = 0.020 ft/ft
Sw = Sw' + Sx = 0.138
Sw/Sx = 0.138 / 0.020 = 6.90

c) Eo = 0.4 0.18 (Fig. 3.23) ♦

d) Se = Sx + Sw'*Eo
= 0.020 + (0.118)*(0.18)
= 0.041

e) Qd = 13.0 cfs
Lt = 24.8 ft (Fig. 3.20) ♦
Adjust for clogging = 24.8 ft * 1.25 = 31.0 ft

For Design
Use MAG Std Detail No. 206.2,
Total Opening Length = 16 ft

f) E = Efficiency of Inlet
= 1-(1-L/Lt)^1.8 (Eqn 3.5) ♦
= 1 - (1 - 16 / 31)^1.8
= 1 - (1 - 0.52)^1.8
= 1 - (0.48)^1.8
= 1 - (0.27)
= 0.73

g) Flow intercepted = Q*E = 13.0 cfs * 0.73 = 9.49 cfs = 9.5 cfs

h) Flow-by = Qd - Qintercepted = (13.0 cfs - 9.5 cfs) * 1 3.5 cfs

So: Total flow-by @ CP - O- = 3.5 cfs

Total flow intercepted = (9.5 cfs) * 1 = 9.5 cfs @ CP - O-4 (for the 100-year flow)

♦ MCFCD Volume II Hydraulics, Reference 4

WIGWAM CREEK
EL MIRAGE ROAD
SCUPPER CALCULATIONS

CP - O-4A - SCUPPER NO.(s) O-4A

Using inlet - sump condition calculation of total interception capacity.

Q100 @ CP- O-4A = 5 cfs

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qi = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Cw = Weir Coefficient for Curb Inlet = 2.3
Lt = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.80
d = Ponding depth at curb = 0.50 ft
Qi = Amount of street flow caught by an inlet (cfs)

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qi}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{5.0 \text{ cfs}}{0.80 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 5.1 \text{ ft}$$

For Design: For scupper(s) use MAG Std Detail No. 206.2 - total curb opening, Lt = 6 ft

Design scupper interception capacity >= required capacity of the Q100 in the street at CP - O-4A

♦ MCFCD Volume II Hydraulics, Reference 4

WIGWAM CREEK
EL MIRAGE ROAD
SCUPPER CALCULATIONS

CP - O-5- SCUPPER NO.(s) O-5

Using inlet - sump condition calculation of total interception capacity.

Q100 @ CP- O-5 = 8 cfs

Compute "sump" condition interception capacity for curb inlet; weir flow:

So: Qi = Cw (L + 1.8w)d^1.5 * Cc (Weir Flow Eqn, Eqn. 3.8) ♦

Where:
Cw = Weir Coefficient for Curb Inlet = 2.3
Lt = Length of Curb Opening (ft)
W = Width of Depressed Gutter [inch] , [ft] = 17 = 1.42
Cc = Clogging Factor (per Table 3.2) ♦ = 0.80
d = Ponding depth at curb = 0.50 ft
Qi = Amount of street flow caught by an inlet (cfs)

Estimate Required Length of Curb Opening

$$L = \left[\frac{Qi}{Cc * Cw * d^{1.5}}\right] - 1.8 * W = \left[\frac{8.0 \text{ cfs}}{0.80 * 2.3 * 0.50^{1.5}}\right] - (1.8)*(1.42) = 9.7 \text{ ft}$$

For Design: For scupper(s) use MAG Std Detail No. 206.2 - total curb opening, Lt = 10 ft

Design scupper interception capacity >= required capacity of the Q100 in the street at CP - O-5

♦ MCFCD Volume II Hydraulics, Reference 4

6" (EL MIRAGE/BETHANY HOME)
Rating Table for Irregular Channel

Project Description	
Project File	n:\980098\hydro\haestad\local st.fm2
Worksheet	EL MIRAGE/BETHANY HOME ROAD
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Water Surface Elevation	0.50 ft

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.002000	0.010000	0.000100 ft/ft

Rating Table

Channel Slope (ft/ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
0.002000	0.015	21.69	1.74
0.002100	0.015	22.23	1.78
0.002200	0.015	22.75	1.82
0.002300	0.015	23.26	1.86
0.002400	0.015	23.76	1.90
0.002500	0.015	24.25	1.94
0.002600	0.015	24.73	1.98
0.002700	0.015	25.20	2.02
0.002800	0.015	25.67	2.05
0.002900	0.015	26.12	2.09
0.003000	0.015	26.57	2.13
0.003100	0.015	27.01	2.16
0.003200	0.015	27.44	2.19
0.003300	0.015	27.87	2.23
0.003400	0.015	28.28	2.26
0.003500	0.015	28.70	2.30
0.003600	0.015	29.10	2.33
0.003700	0.015	29.51	2.36
0.003800	0.015	29.90	2.39
0.003900	0.015	30.29	2.42
0.004000	0.015	30.68	2.45
0.004100	0.015	31.06	2.48
0.004200	0.015	31.44	2.51
0.004300	0.015	31.81	2.54
0.004400	0.015	32.18	2.57
0.004500	0.015	32.54	2.60

6" (EL MIRAGE/BETHANY HOME)
Rating Table for Irregular Channel

Rating Table

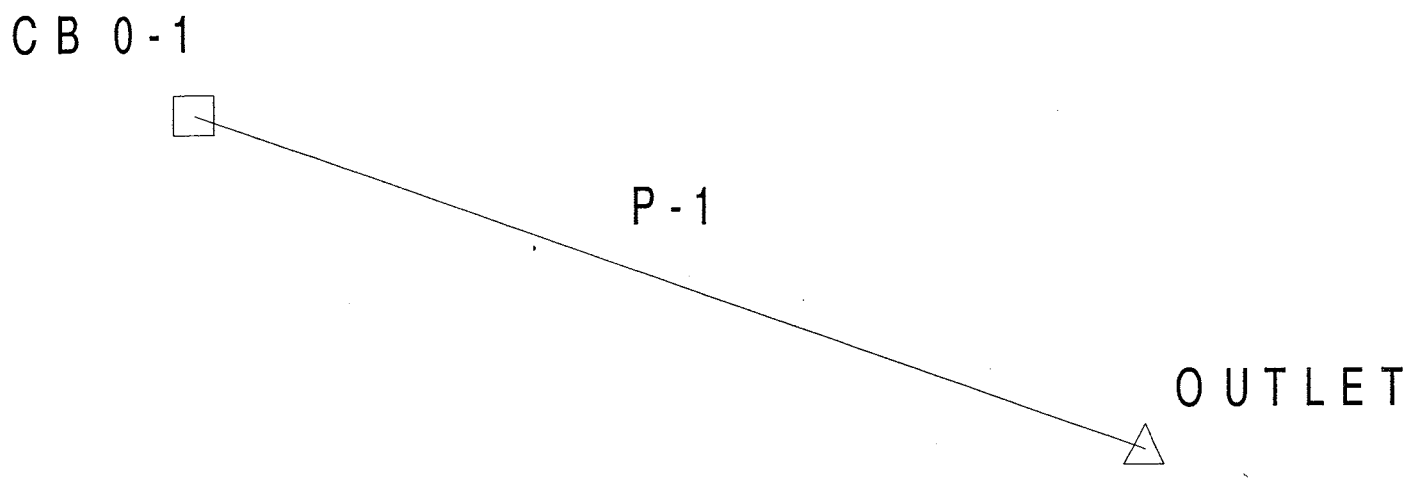
Channel Slope (ft/ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
0.004600	0.015	32.90	2.63
0.004700	0.015	33.25	2.66
0.004800	0.015	33.61	2.69
0.004900	0.015	33.95	2.72
0.005000	0.015	34.30	2.74
0.005100	0.015	34.64	2.77
0.005200	0.015	34.98	2.80
0.005300	0.015	35.31	2.82
0.005400	0.015	35.65	2.85
0.005500	0.015	35.97	2.88
0.005600	0.015	36.30	2.90
0.005700	0.015	36.62	2.93
0.005800	0.015	36.94	2.96
0.005900	0.015	37.26	2.98
0.006000	0.015	37.57	3.01
0.006100	0.015	37.89	3.03
0.006200	0.015	38.19	3.06
0.006300	0.015	38.50	3.08
0.006400	0.015	38.81	3.10
0.006500	0.015	39.11	3.13
0.006600	0.015	39.41	3.15
0.006700	0.015	39.70	3.18
0.006800	0.015	40.00	3.20
0.006900	0.015	40.29	3.22
0.007000	0.015	40.58	3.25
0.007100	0.015	40.87	3.27
0.007200	0.015	41.16	3.29
0.007300	0.015	41.44	3.32
0.007400	0.015	41.73	3.34
0.007500	0.015	42.01	3.36
0.007600	0.015	42.29	3.38
0.007700	0.015	42.56	3.40
0.007800	0.015	42.84	3.43
0.007900	0.015	43.11	3.45
0.008000	0.015	43.39	3.47
0.008100	0.015	43.66	3.49
0.008200	0.015	43.92	3.51
0.008300	0.015	44.19	3.53
0.008400	0.015	44.46	3.56
0.008500	0.015	44.72	3.58
0.008600	0.015	44.98	3.60
0.008700	0.015	45.24	3.62
0.008800	0.015	45.50	3.64
0.008900	0.015	45.76	3.66
0.009000	0.015	46.02	3.68

6" (EL MIRAGE/BETHANY HOME)
Rating Table for Irregular Channel

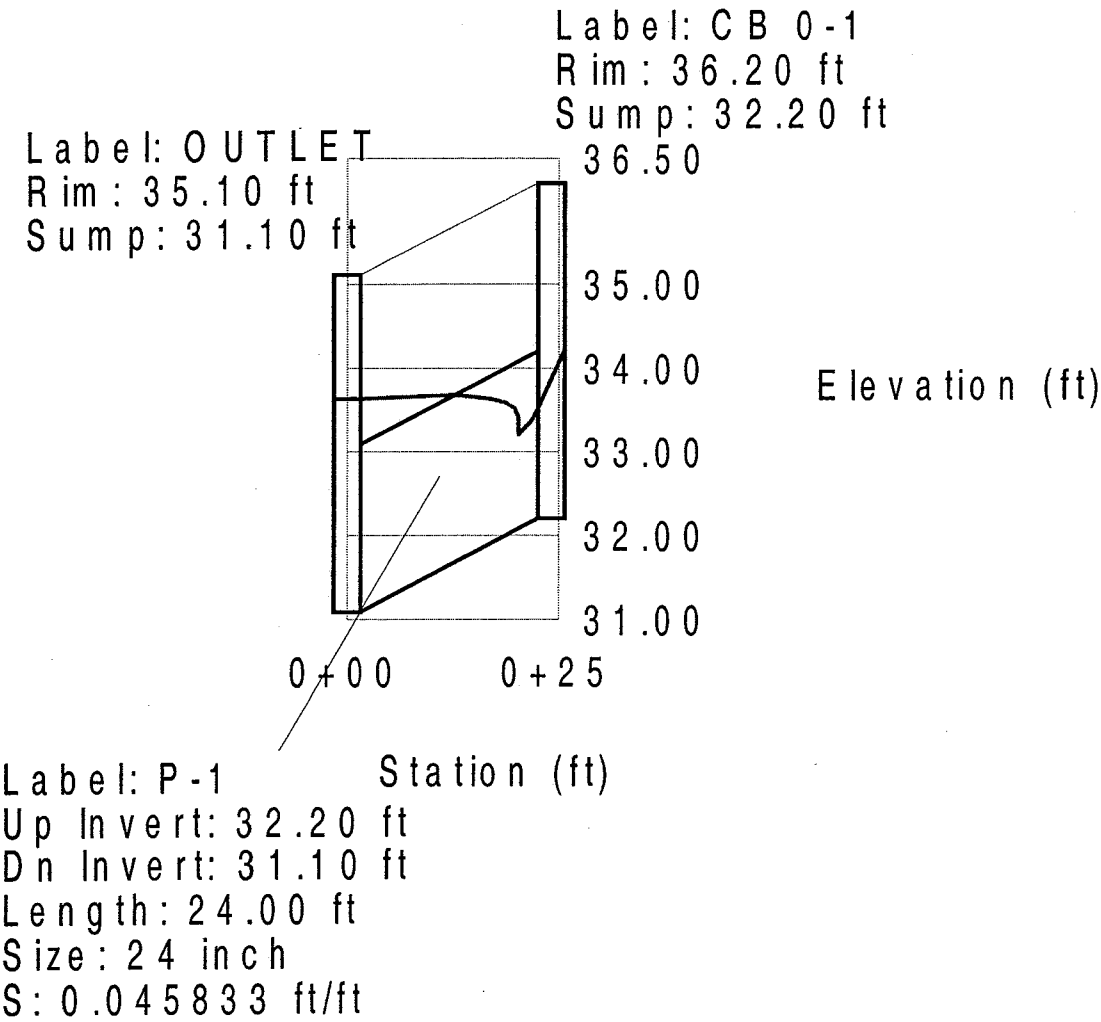
Rating Table

Channel Slope (ft/ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)
0.009100	0.015	46.27	3.70
0.009200	0.015	46.53	3.72
0.009300	0.015	46.78	3.74
0.009400	0.015	47.03	3.76
0.009500	0.015	47.28	3.78
0.009600	0.015	47.53	3.80
0.009700	0.015	47.77	3.82
0.009800	0.015	48.02	3.84
0.009900	0.015	48.26	3.86
0.010000	0.015	48.51	3.88

Scenario: Base



Profile
Scenario: Base



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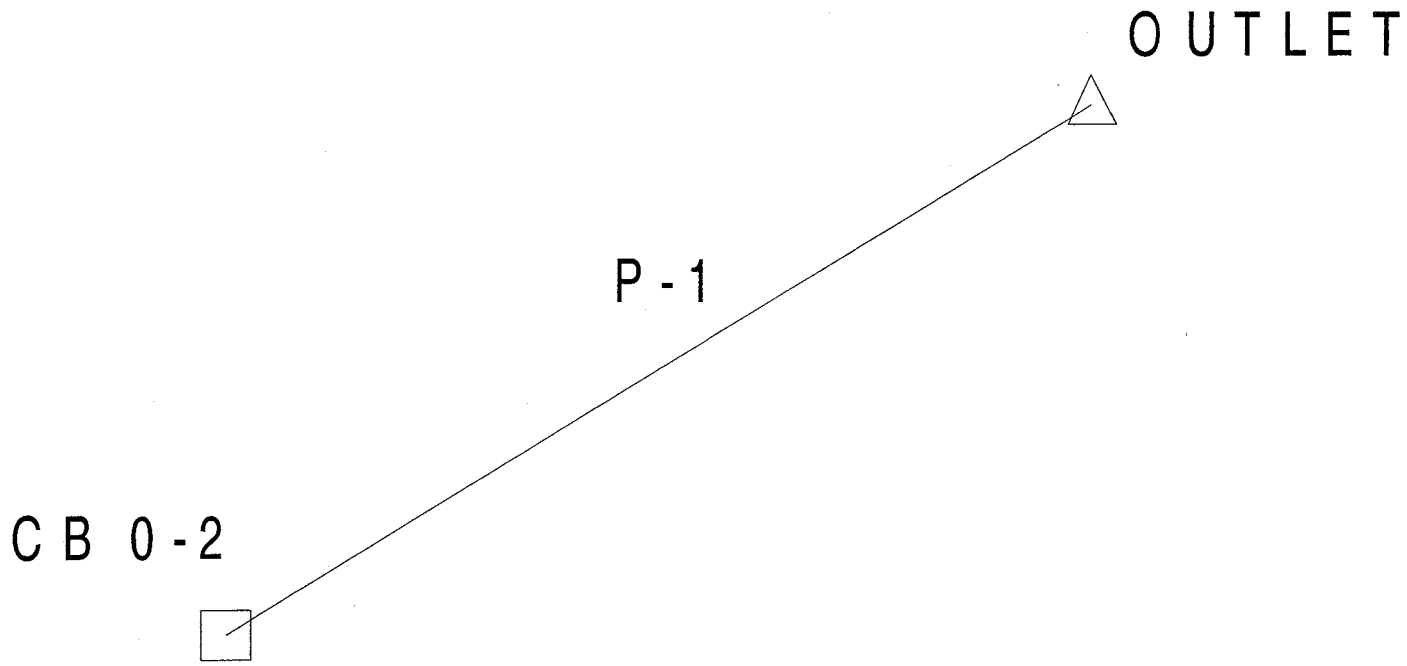

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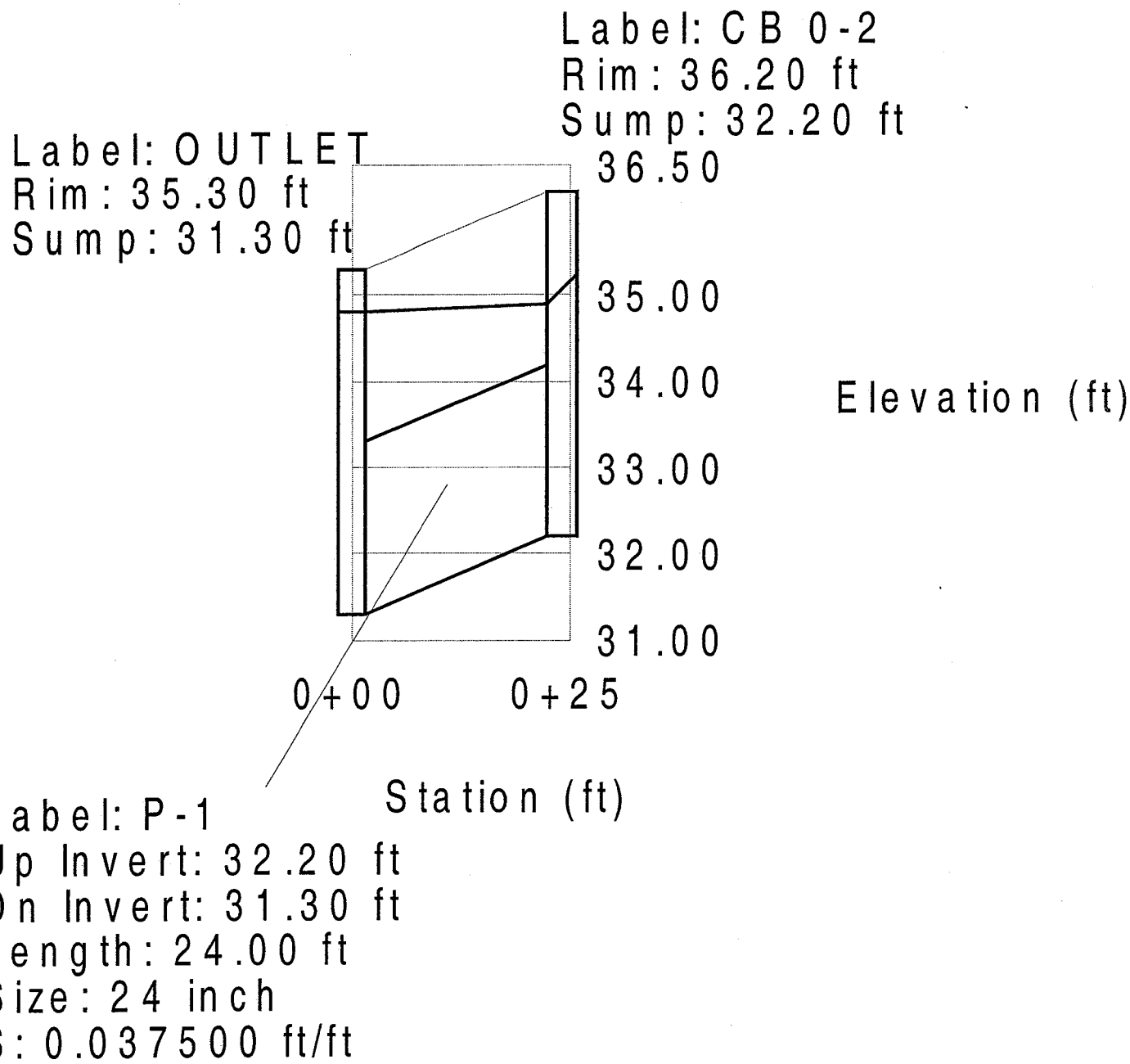

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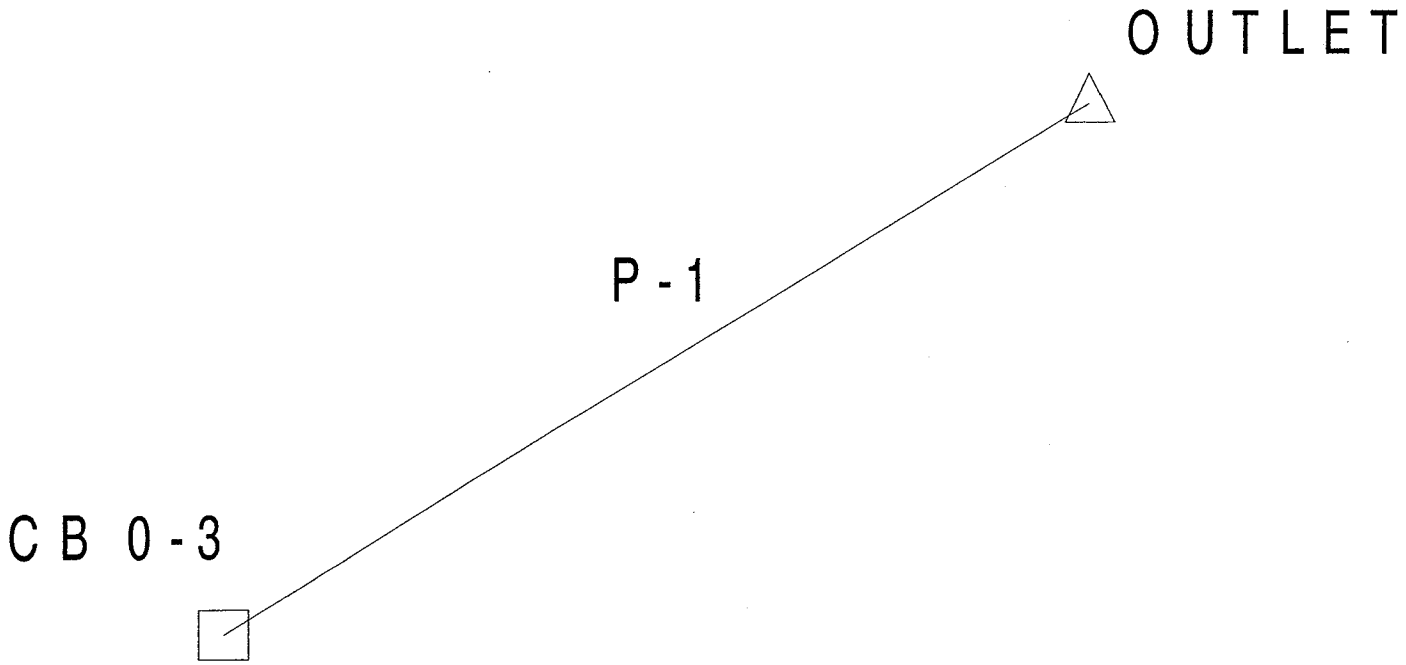

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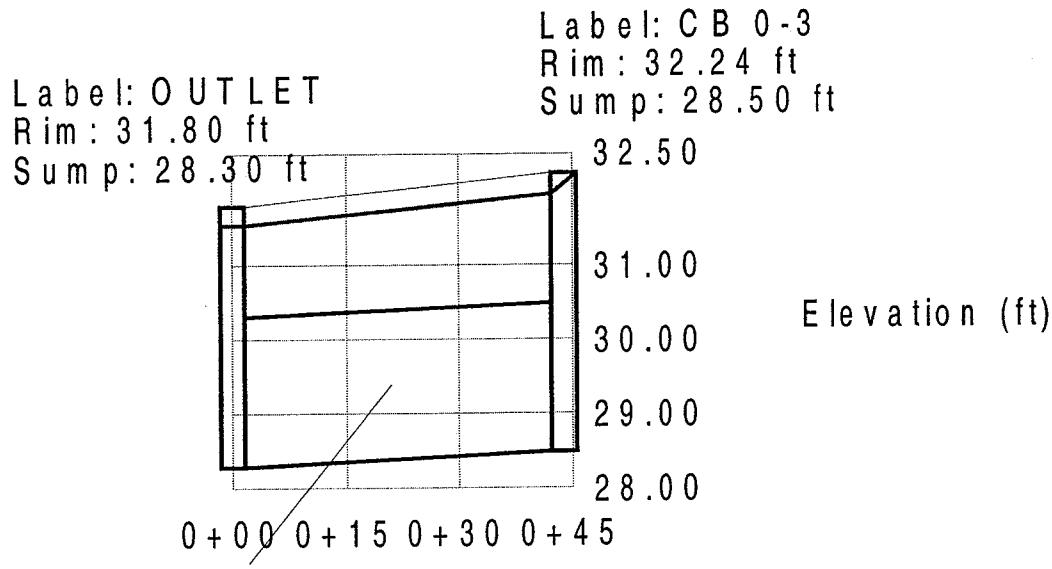
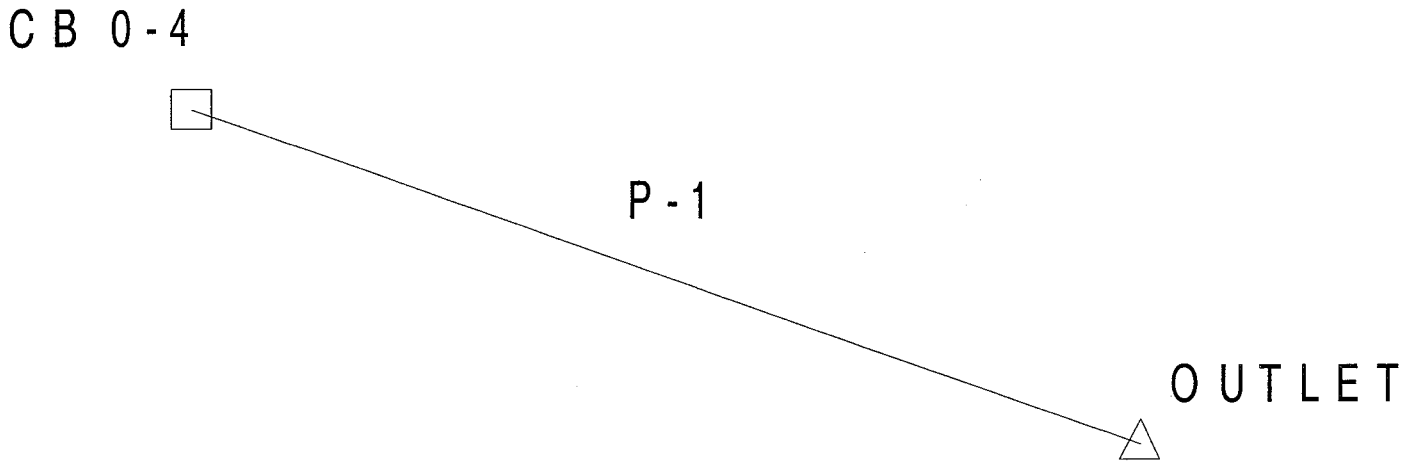
Scenario: Base



Label: P-1
Up Invert: 28.50 ft
Dn Invert: 28.30 ft
Length: 44.00 ft
Size: 24 inch
S: 0.004545 ft/ft

Scenario: Base



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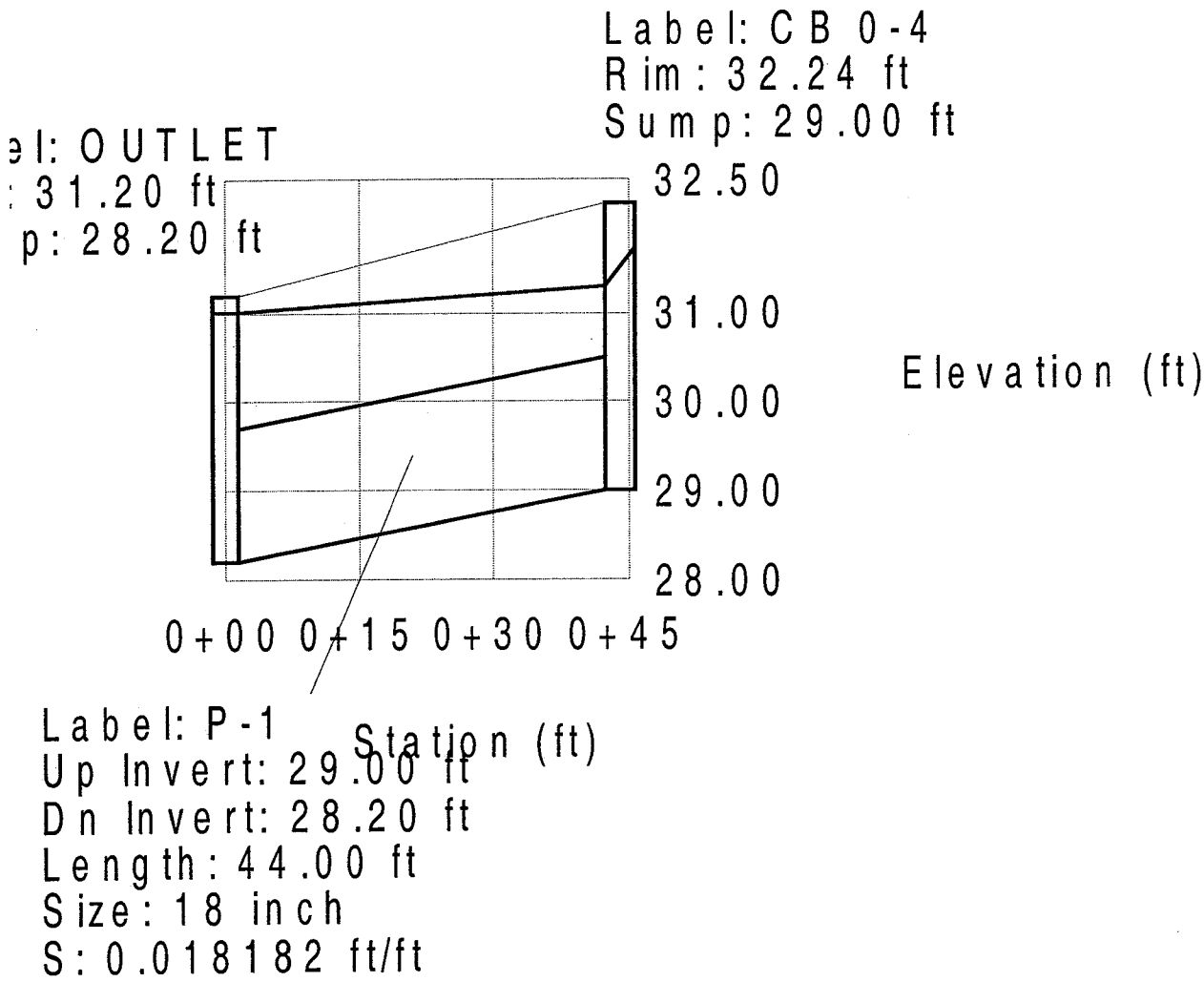
Scenario: Base



Wigwam Creek - Parcel & Job # (00-0046-03) - Analysis for Proposed Storm Drain #O1
Storm Drain Capacity Calculation Record

Head Loss Variables

Bend Loss, Kb (90 degrees) =	1.04
Expansion Loss, Ke =	0.35
Shape Adjustment, Cs =	0.50

ID		STORM DRAIN DESIGN DATA							HEAD LOSS CALCULATION					HYDRAULIC GRADE LINE				
Inlet	Pipe ID	Outlet Invert	Inlet Invert	Length (ft)	S (ft/ft)	D (in)	Q pipe (cfs)	Q full (cfs)	V pipe in (ft/s)	V pipe out (ft/s)	hf (ft)	km	hm (ft)	Elev. @ Outlet	Elev. @ Inlet	Depth @ Outlet	Depth @ Inlet	Ground Elev.
CB 0-1	P-1	31.30	32.20	24	0.0375	24	13.5	43.8	4.30	4.30	0.090	1.2	0.34	34.90	35.24	3.60	3.04	36.20
OUTLET														34.81	34.81	34.81	34.81	35.30

Note: The tailwater elevation for the strom drain was set at 34.81 (Sta 3800, Hec-Ras for channel 8, 100-yr storm)

Wigwam Creek - Parcel & Job # (00-0046-03) - Analysis for Proposed Storm Drain #O2
Storm Drain Capacity Calculation Record

Head Loss Variables

Bend Loss, Kb (90 degrees) =	1.04
Expansion Loss, Ke =	0.35
Shape Adjustment, Cs =	0.50

ID		STORM DRAIN DESIGN DATA							HEAD LOSS CALCULATION					HYDRAULIC GRADE LINE				
Inlet	Pipe ID	Outlet Invert	Inlet Invert	Length (ft)	S (ft/ft)	D (in)	Q pipe (cfs)	Q full (cfs)	V pipe in (ft/s)	V pipe out (ft/s)	hf (ft)	km	hm (ft)	Elev. @ Outlet	Elev. @ Inlet	Depth @ Outlet	Depth @ Inlet	Ground Elev.
CB 0-2	P-1	31.10	32.20	24	0.0458	24	13.5	48.4	6.12	4.30	-0.110	1.2	0.70	33.52	34.22	2.42	2.02	36.20
OUTLET														33.63	33.63	33.63	33.63	35.10

Note: The tailwater elevation for the strom drain was set at 34.81 (Sta 3600, Hec-Ras for channel 8, 100-yr storm)

Wigwam Creek - Parcel & Job # (00-0046-03) - Analysis for Proposed Storm Drain #O3
Storm Drain Capacity Calculation Record

Head Loss Variables

Bend Loss, Kb (90 degrees) =	1.04
Expansion Loss, Ke =	0.35
Shape Adjustment, Cs =	0.50

ID		STORM DRAIN DESIGN DATA							HEAD LOSS CALCULATION					HYDRAULIC GRADE LINE				
Inlet	Pipe ID	Outlet Invert	Inlet Invert	Length (ft)	S (ft/ft)	D (in)	Q pipe (cfs)	Q full (cfs)	V pipe in (ft/s)	V pipe out (ft/s)	hf (ft)	km	hm (ft)	Elev. @ Outlet	Elev. @ Inlet	Depth @ Outlet	Depth @ Inlet	Ground Elev.
CB 0-3	P-1	28.30	29.00	44	0.0159	18	8.5	13.3	4.81	4.81	0.290	1.2	0.43	31.83	32.24	3.53	3.24	32.24
OUTLET														31.54	31.54	31.54	31.54	31.80

Note: The tailwater elevation for the strom drain was set at 34.81 (Sta 2000, Hec-Ras for channel 8, 100-yr storm)

Wigwam Creek - Parcel & Job # (00-0046-03) - Analysis for Proposed Storm Drain #O4
Storm Drain Capacity Calculation Record

Head Loss Variables

Bend Loss, Kb (90 degrees) =	1.04
Expansion Loss, Ke =	0.35
Shape Adjustment, Cs =	0.50

ID		STORM DRAIN DESIGN DATA							HEAD LOSS CALCULATION					HYDRAULIC GRADE LINE				
Inlet	Pipe ID	Outlet Invert	Inlet Invert	Length (ft)	S (ft/ft)	D (in)	Q pipe (cfs)	Q full (cfs)	V pipe in (ft/s)	V pipe out (ft/s)	hf (ft)	km	hm (ft)	Elev. @ Outlet	Elev. @ Inlet	Depth @ Outlet	Depth @ Inlet	Ground Elev.
CB 0-4	P-1	28.20	29.00	44	0.0182	18	8.5	14.2	4.81	4.81	0.290	1.2	0.43	31.31	31.74	3.11	2.74	32.24
OUTLET														31.02	31.02	31.02	31.02	31.20

Note: The tailwater elevation for the strom drain was set at 34.81 (Sta 1880, Hec-Ras for channel 8, 100-yr storm)

PAVING & STORM DRAIN PLANS
FOR
WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE

PART OF THE EAST HALF OF SECTION 14 AND PART OF THE SOUTHEAST QUARTER OF SECTION 11, TOWNSHIP 2 NORTH, RANGE 1 WEST, GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, ARIZONA.

ENGINEER'S NOTES/PAVING

THE CONTRACTOR SHALL MAKE NO CLAIM AGAINST THE OWNER OR THE ENGINEER REGARDING ALLEGED INACCURACY OF CONSTRUCTION STAKES SET BY THE ENGINEER UNLESS ALL SURVEY STAKES SET BY THE ENGINEER ARE MAINTAINED INTACT AND CAN BE VERIFIED AS TO THEIR ORIGIN. IF, IN THE OPINION OF THE ENGINEER, THE STAKES ARE NOT MAINTAINED INTACT AND CANNOT BE VERIFIED AS TO THEIR ORIGIN, ANY REMEDIAL WORK REQUIRED TO CORRECT ANY ITEM OR IMPROPER CONSTRUCTION WORK IN THIS DEVELOPMENT SHALL BE PERFORMED AT THE SOLE EXPENSE OF THE RESPONSIBLE CONTRACTOR OR SUBCONTRACTOR.

NOTHING CONTAINED IN THE CONTRACT DOCUMENTS SHALL CREATE, NOR SHALL BE CONSTRUED TO CREATE, ANY CONTRACTUAL RELATIONSHIP BETWEEN THE ENGINEER AND THE CONTRACTOR OR ANY SUBCONTRACTOR.

THE ENGINEER WILL NOT BE RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES OR FOR SAFETY PRECAUTIONS OR PROGRAMS UTILIZED IN CONNECTION WITH THE WORK, AND HE WILL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S FAILURE TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

A THOROUGH ATTEMPT HAS BEEN MADE TO SHOW THE LOCATIONS OF ALL UNDERGROUND OBSTRUCTIONS AND UTILITY LINES IN THE WORK AREA. HOWEVER, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTIONS AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION AND SHALL DETERMINE THE EXACT LOCATION OF UTILITIES IN THE AREA.

THE ENGINEER WILL MAKE FIELD RECORD DRAWING MEASUREMENTS OF THE WORK UPON NOTIFICATION BY THE PAVING CONTRACTOR THAT THE WORK IS COMPLETE AND READY FOR RECORD DRAWING SURVEY.

ALL CURB RETURN RADII SHALL BE 19.42' TO BACK OF CURB (UNLESS OTHERWISE NOTED).

ALL EARTHWORK CONSTRUCTION SHALL CONFORM TO THE LATEST MARICOPA ASSOCIATION OF GOVERNMENTS STANDARD DETAILS AND/OR SPECIFICATIONS INCLUDING ANY SUPPLEMENTS THERETO AND THE SOILS REPORT PREPARED BY:

CONSTRUCTION INSPECTION & TESTING PROJECT NO. 99-8045 DATED: 7-11-99

ALL PARKWAY GRADING TO BE PER M.A.G. SPEC. 424 (4:1 MAX SLOPE).

DATA FOR EARTHWORK CALCULATIONS IS PROVIDED IN THE SOILS REPORT AND (IF APPLICABLE) ANY SUPPLEMENTS THERETO.

ALL CONDUITS (BOX CULVERT, REINFORCED CONCRETE PIPE, CAST-IN-PLACE PIPE, AND/OR CORRUGATED METAL PIPE) SHOWN ON THESE PLANS ARE DESIGNED FOR STANDARD HIGHWAY LOADINGS. THE STANDARD SATISFACTORY MINIMUM COVER REQUIREMENTS AS ESTABLISHED BY THE CONDUIT MANUFACTURER MAY NOT ALWAYS BE ADEQUATE DURING CONSTRUCTION. WHEN CONSTRUCTION EQUIPMENT, FREQUENTLY HEAVIER THAN TRAFFIC LOADS FOR WHICH THE CONDUIT HAS BEEN DESIGNED, IS TO BE DRIVEN OVER OR CLOSE TO THE BURIED CONDUIT, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE CONDUIT. THE ADEQUACY OF THE COVER REQUIREMENTS FOR CONDUITS SHALL BE ANALYZED AND CHECKED BY THE CONTRACTOR TO ADDRESS LOADING CONDITIONS IMPOSED BY CONSTRUCTION ACTIVITY. ANY CONDUIT DAMAGED BY CONSTRUCTION ACTIVITY SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.

MARICOPA COUNTY GENERAL NOTES

1. ALL CONSTRUCTION SHALL CONFORM TO THE LATEST MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION (MCDOT) ROADWAY DESIGN MANUAL AND M.A.G. SPECIFICATIONS AND MARICOPA COUNTY SPECIAL PROVISIONS FOR CONSTRUCTION OF STREET IMPROVEMENTS. ADOPTED 11/03/93.

2. CONTRACTOR TO OBTAIN NECESSARY MCDOT PERMITS PRIOR TO CONSTRUCTION WITHIN COUNTY RIGHT-OF-WAY.

3. CONTRACTOR SHALL NOTIFY THE MCDOT INSPECTION DEPARTMENT AT LEAST 24 HOURS IN ADVANCE OF ANY CONSTRUCTION AT (602) 506-8606.

4. AN APPROVED SET OF PLANS SHALL BE ON THE SITE DURING CONSTRUCTION AND INSPECTIONS.

5. CONTRACTOR PERFORMING EXCAVATING OPERATIONS IS RESPONSIBLE FOR LOCATING, RELOCATING AND/OR PROTECTING ALL UNDERGROUND UTILITIES, AT NO EXPENSE TO MARICOPA COUNTY.

6. ALL COMPACTION AND BACKFILL WITHIN COUNTY RIGHT-OF-WAY SHALL CONFORM TO THE SPECIAL PROVISIONS FOR CONSTRUCTION OF STREET IMPROVEMENTS AND INSTALLATION OF UNDERGROUND UTILITIES. ADOPTED 11/03/93.

7. ALL STRUCTURES, SUCH AS MANHOLES, VALVE BOX & COVERS, AND MONITORING WELLS MUST BE MARKED WITH AT LEAST TWO REFLECTORIZED YELLOW FLEX POST WHEN STRUCTURES ARE LOCATED OUTSIDE THE TRAVELED WAY AND WITHIN THE RIGHT-OF-WAY. ("APPLIES ONLY WHEN THERE IS NO CURB.")

8. ALL EXISTING PAVEMENT MARKING, TRAFFIC SIGNS AND SIGNAL EQUIPMENT THAT NEEDS TO BE REMOVED, REPLACED, RELOCATED OR REPAIRED BECAUSE OF CONTRACTOR'S WORK, WILL BE DONE BY THE CONTRACTOR AT HIS EXPENSE. ALL TRAFFIC SIGNS THAT ARE REMOVED SHALL BE STOCKPILED ON THE PROJECT SITE AND THE CONTRACTOR IS TO NOTIFY THE INSPECTOR WHEN ALL SIGNS HAVE BEEN REMOVED. ALL COUNTY SIGNS WILL BE INSTALLED BY MCDOT CREWS. ALL NEW STREET NAME SIGNS SHALL BE PROVIDED AND INSTALLED BY PERMITTEE AT NO EXPENSE TO MARICOPA COUNTY.

9. PAVEMENT MARKING, SIGNING AND SIGNAL WORK WILL BE INSPECTED AND WILL HAVE TO MEET COUNTY STANDARDS BEFORE RELEASE OF BOND.

10. ASPHALT MIX DESIGN SHALL BE SUBMITTED TO MCDOT A MINIMUM OF 48 HOURS PRIOR TO PLACING ANY ASPHALT COURSES. (TRENCH WORK EXCLUDED.)

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MARICOPA COUNTY GENERAL NOTES CON'T

11. PRIOR TO CONDUCTING EXCAVATION OPERATIONS, THE CONTRACTOR SHALL OBTAIN FROM THE ARIZONA STATE ENVIRONMENTAL PLANNING GROUP (602) 712-7760, RECOMMENDATIONS REGARDING THE NEED FOR CULTURAL RESOURCES (ARCHAEOLOGICAL) CLEARANCE. ALL DISCOVERIES OF HUMAN REMAINS, CULTURAL ARTIFACTS, OR PALEONTOLOGICAL REMAINS SHALL BE REPORTED TO THE ARIZONA STATE MUSEUM AND MCDOT. UPON DISCOVERY, CONTRACTOR SHALL CEASE OPERATIONS IN THE VICINITY OF THE FIND AND PROTECT THE DISCOVERY AREA FROM FURTHER DISTURBANCE UNTIL THE FIND CAN BE PROFESSIONALLY INVESTIGATED BY THE ARIZONA STATE MUSEUM AND MCDOT.

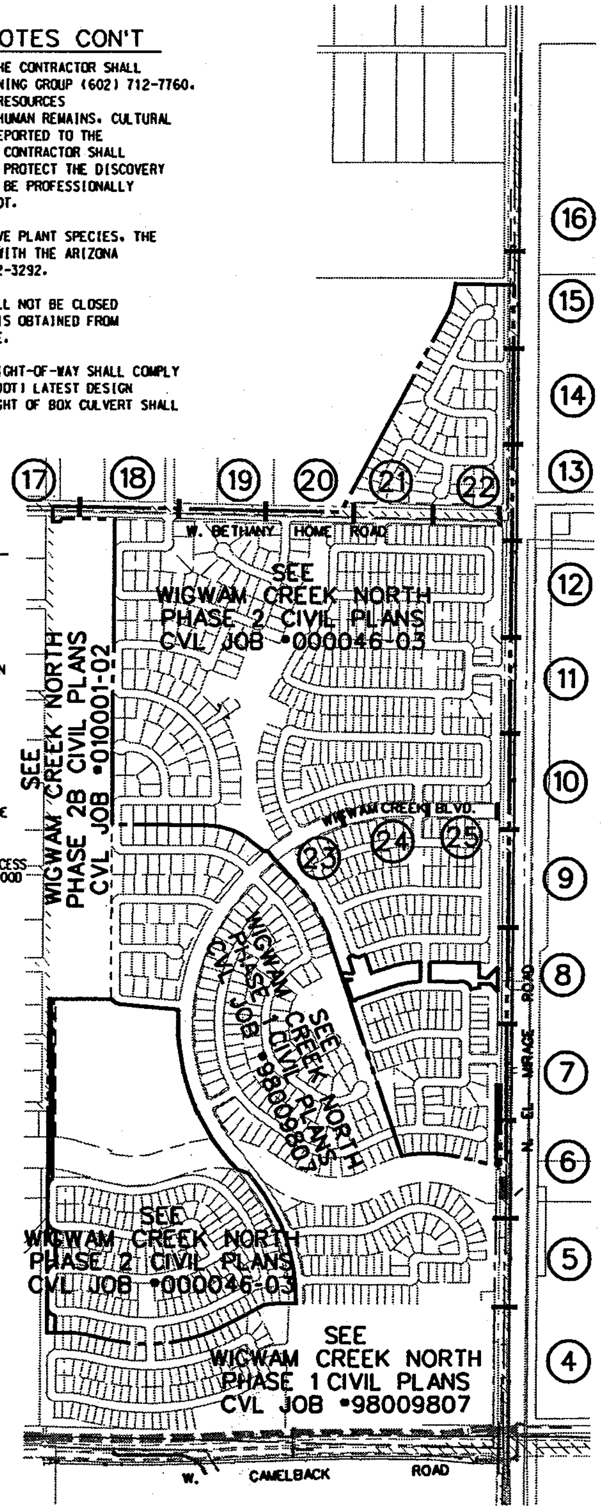
12. PRIOR TO MOVING OR DESTROYING PROTECTED NATIVE PLANT SPECIES, THE CONTRACTOR SHALL FILE A FORMAL NOTICE OF INTENT WITH THE ARIZONA DEPARTMENT OF AGRICULTURE NATIVE PLANTS (602) 542-3292.

13. EXCEPT UNDER EMERGENCY CONDITIONS, ROADS SHALL NOT BE CLOSED FOR CONSTRUCTION ACTIVITY UNLESS PRIOR APPROVAL IS OBTAINED FROM THE TRANSPORTATION DIRECTOR OF HIS REPRESENTATIVE.

14. ALL BOX CULVERTS CONSTRUCTED IN THE PUBLIC RIGHT-OF-WAY SHALL COMPLY WITH THE ARIZONA DEPARTMENT OF TRANSPORTATION (ADOT) LATEST DESIGN SPECIFICATIONS AND STANDARDS. MINIMUM CLEAR HEIGHT OF BOX CULVERT SHALL BE 4 FEET.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY GENERAL NOTES

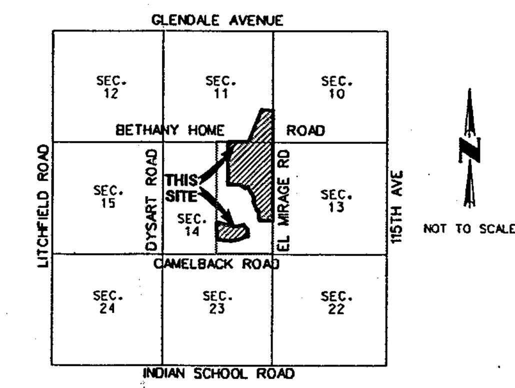
1. ALL CONSTRUCTION WITHIN DISTRICT RIGHTS-OF-WAY AND/OR JURISDICTION SHALL CONFORM TO THE LATEST MAG SPECIFICATIONS.
2. CONTRACTOR TO OBTAIN NECESSARY FLOOD CONTROL DISTRICT PERMIT PRIOR TO CONSTRUCTION WITHIN DISTRICT RIGHT-OF-WAY AND MAINTAIN A COPY OF THE PERMIT ON THE PROJECT SITE AT ALL TIMES.
3. NOTIFY THE DISTRICT'S CONSTRUCTION & MAINTENANCE DIVISION AT 506-1501 AT LEAST 48 HOURS PRIOR TO ANY WORK TO BE PERFORMED IN THE DISTRICT'S RIGHT-OF-WAY.
4. CONTRACTOR PEFORMING EXCAVATION OPERATIONS IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UNDERGROUND UTILITES.
5. ALL COMPACTION AND BACKFILL WITHIN DISTRICT RIGHT-OF-WAY SHALL CONFORM TO THE LATEST MAG SPECIFICATIONS UNLESS STIPULATED OTHERWISE IN THE DISTRICT'S PERMIT.
6. ANY DAMAGE TO FCD STRUCTURES, EQUIPMENT, MATERIALS, VEGETATION, AND/OR PROPERTY SHALL BE REPLACED AND/OR REPAIRED IN-KIND TO THE SATISFACTION OF THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY.
7. IF FLOOD CONTROL DISTRICT FENCING IS TEMPORARILY DISTRUBED DURING CONSTRUCTION ACTIVITIES, TEMPORARY FENCING TO RESTRICT PUBLIC ACCESS SHALL BE INSTALLED AND MAINTAINED BY THE CONTRACTOR UNTIL THE FLOOD CONTROL DISTRICT FENCING IS REPLACEDTO ITS PREEXISTING CONDITION.



ZONING:
PAD RESIDENTIAL

UTILITIES:

SEWER:	LPSCO
WATER:	LPSCO
FIRE:	RURAL METRO
GAS:	SOUTH WEST
ELECTRIC:	A.P.S.
TELEPHONE:	QWEST
CABLE TV:	COX CABLE



VICINITY MAP

DEVELOPER
CHI CONSTRUCTION COMPANY
7001 N. SCOTTSDALE RD., SUITE •2050
SCOTTSDALE, ARIZONA 85253
PHONE: (480) 483-0006
FAX: (480) 992-2577
CONTACT: BRETT HOPPER

ENGINEER
COE & VAN LOO
4550 N. 12TH STREET
PHOENIX, AZ. 85014
(602) 264-6831
(602) 264-0928 (FAX)

BENCHMARK
MARICOPA COUNTY DEPT. OF TRANSPORTATION - 1/2" IRON PIPE IN POTHOLE @ BETHANY HOME RD & EL MIRAGE RD ELEVATION 1036.44 MARICOPA COUNTY DATUM

SHEET INDEX

1........................COVER SHEET
2-3......................DETAILS & QUANTITES
4-25....................PAVING & STORM DRAIN PLANS
26-29..................A.D.O.T. STANDARD DRAWING DETAILS
30........................GABIONS DETAIL

AS-BUILT CERTIFICATION
I HEREBY CERTIFY THAT THE "RECORD DRAWING" MEASUREMENTS AND SURVEY MONUMENTS AS SHOWN HEREON WERE MADE UNDER MY SUPERVISION OR AS NOTED AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

REGISTERED LAND SURVEYOR ____________ DATE ______

REGISTRATION NUMBER ______ CVL PHONE: (602) 264-6831

MCDOT APPROVAL
BY LETTER
COUNTY ENGINEER ____________ DATE ______

Call two working days before you dig. CALL FOR THE BLUE STAKES 602-263-1100 1-800-STAKE-IT OUTSIDE MARICOPA COUNTY

WIGWAM CREEK NORTH PHASE 2 • INFRASTRUCTURE
INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831
COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

REVISIONS	DATE	BY

DESIGNED	G.W.V.\ D.J.H
DRAWN	D.J.H
CHECKED	G.W.V.\D.J.H
DATE	MAR-2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) Certificate No. 37325 RYAN WEED Date Signed ARIZONA, U.S.A.

CVL

SHEET 1 OF 30

CVL PROJECT NO.: 000046-04

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE E)
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18. DEPRESS LIP OF GUTTER ½" BELOW FLOWLINE.
19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-A WITH M3 OBJECT MARKERS
20. INSTALL 16' DRIVEWAY PER MCDOT STD. DET. 2034
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. SAWCUT, REMOVE, AND REPLACE A 2' WIDE STRIP OF EXIST. A.C. PAVEMENT. REPLACE PER MAG SEC. 336 AND MAG STD. DET. 200 OR IN KIND WHICH EVER IS GREATER.
23. INSTALL PVC SLEEVE SCH. 40 - SEE PLANS FOR SIZE & LENGTH
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS=12"wD +6" (UNLESS OTHERWISE NOTED)
25. CONSTRUCT 3-8'X4' C.B.C WITH INLET/OUTLET HEADWALLS & WINGWALLS TYPE 'A' PER A.D.O.T. STD. DET. 8-02.30 & 08.10 SEE DET. SHTS. 27,28&29
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27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2 (UNLESS OTHERWISE NOTED)
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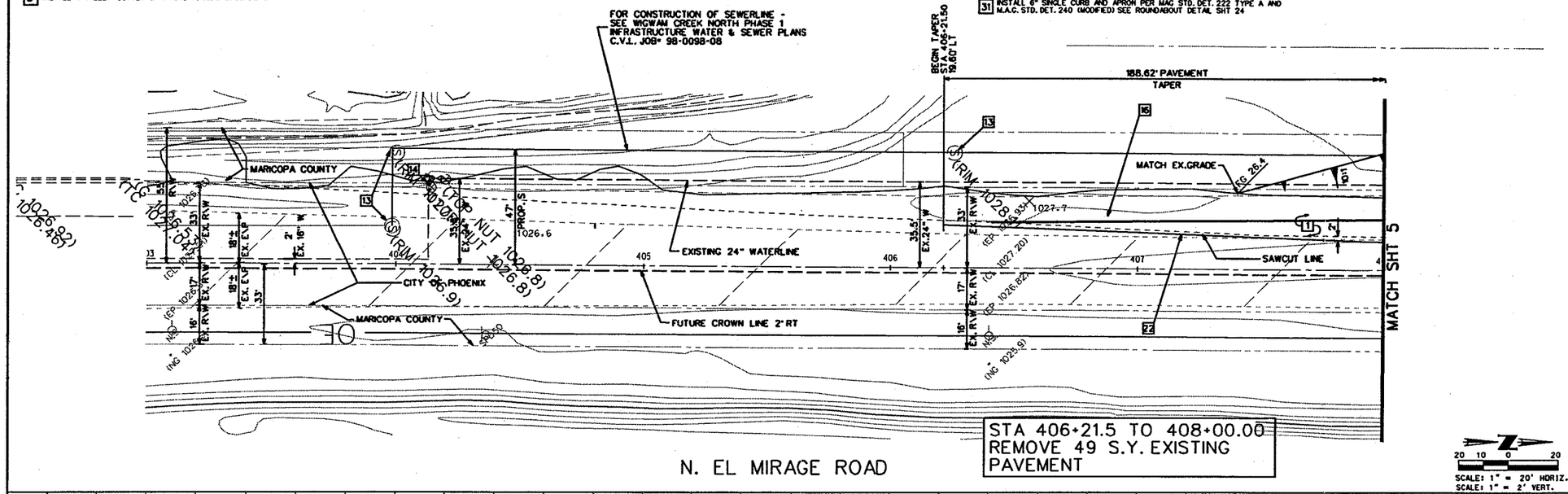
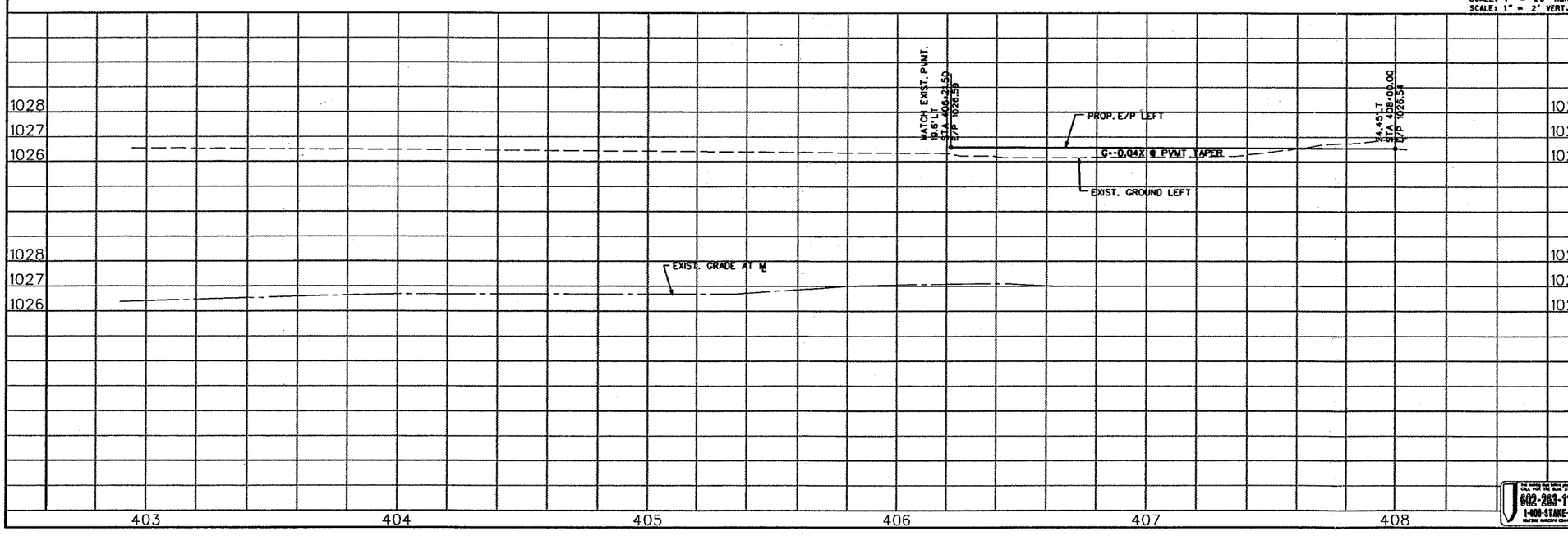
33. INSTALL BARRIER TRANSITION-TANGENT DEPARTURE TYPE 1 PER A.D.O.T. DWG. NO. C-10.75 SEE SHT. 3
34. RELOCATE POWER POLE (BY UTILITY COMPANY)





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COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

	BY	DATE	REVISIONS

DESIGNED G.W.V. D.J.H.
DRAWN D.J.H.
CHECKED G.W.V./D.J.H.
DATE MAR-2001

PAVING AND STORM DRAIN PLANS

CVL

SHEET 4 OF 30

CVL PROJECT NO.: 000046-04

CALL FOR THE BLUE STAKES 602-263-1100 1-800-STAKE-IT

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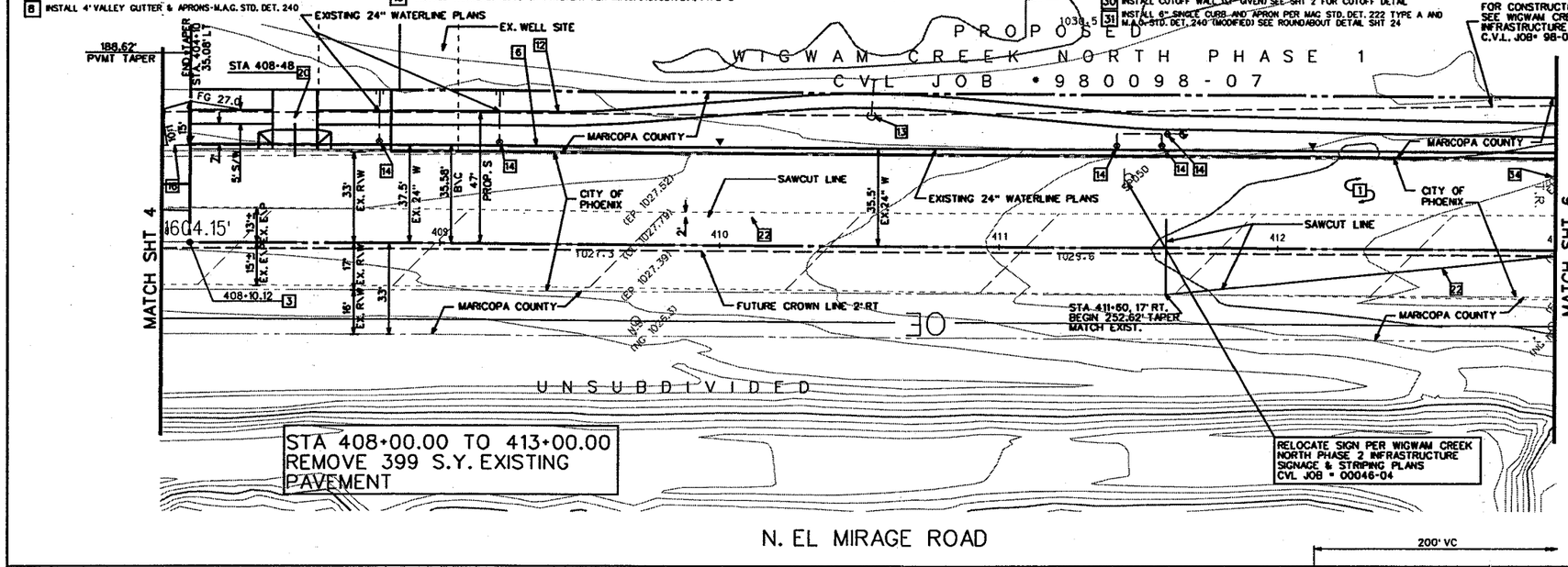

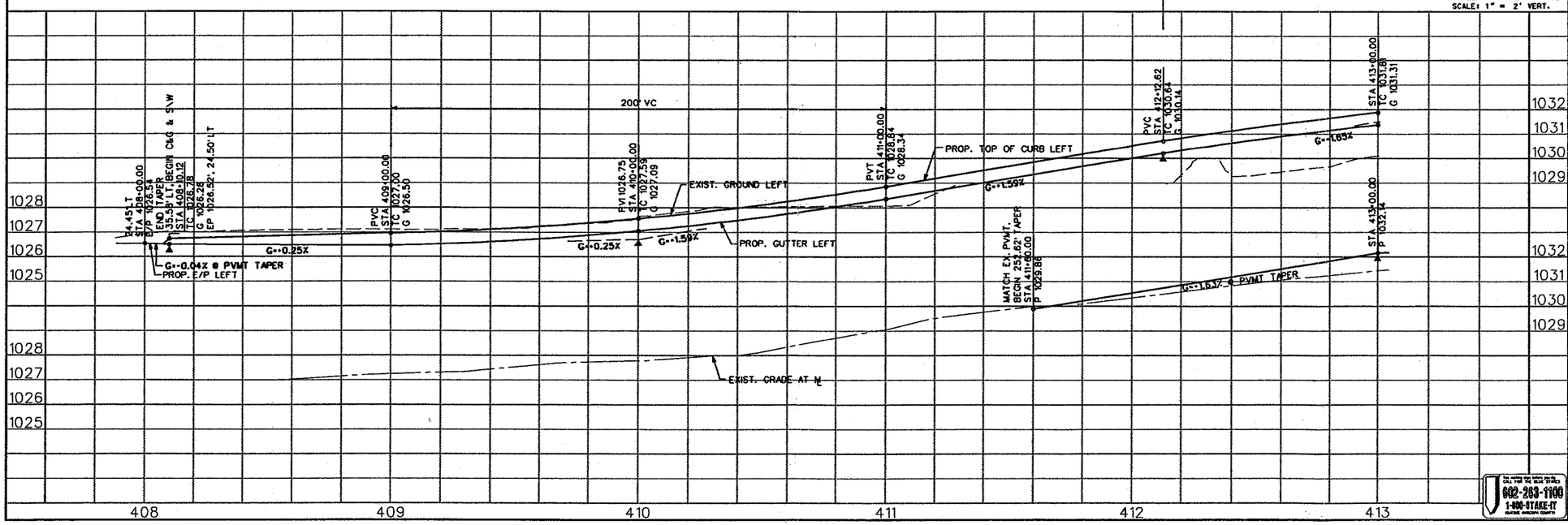

WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
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4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

PAVING AND STORM DRAIN PLANS

REVISIONS	DATE	BY

DESIGNED G.W.V. DJH
DRAWN D.J.H.
CHECKED G.W.V. DJH
DATE MAR-2001

CVL

SHEET 5 OF 30

CVL PROJECT NO.: 000046-04

602-263-1100
1-800-STAKE-IT

DATE- Oct. 02, 2001
TIME- 14:08:54
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.../land/phase2/infra/pa20s05.dgn Aug. 15, 2003 11:54:22

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27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2 (UNLESS OTHERWISE NOTED)
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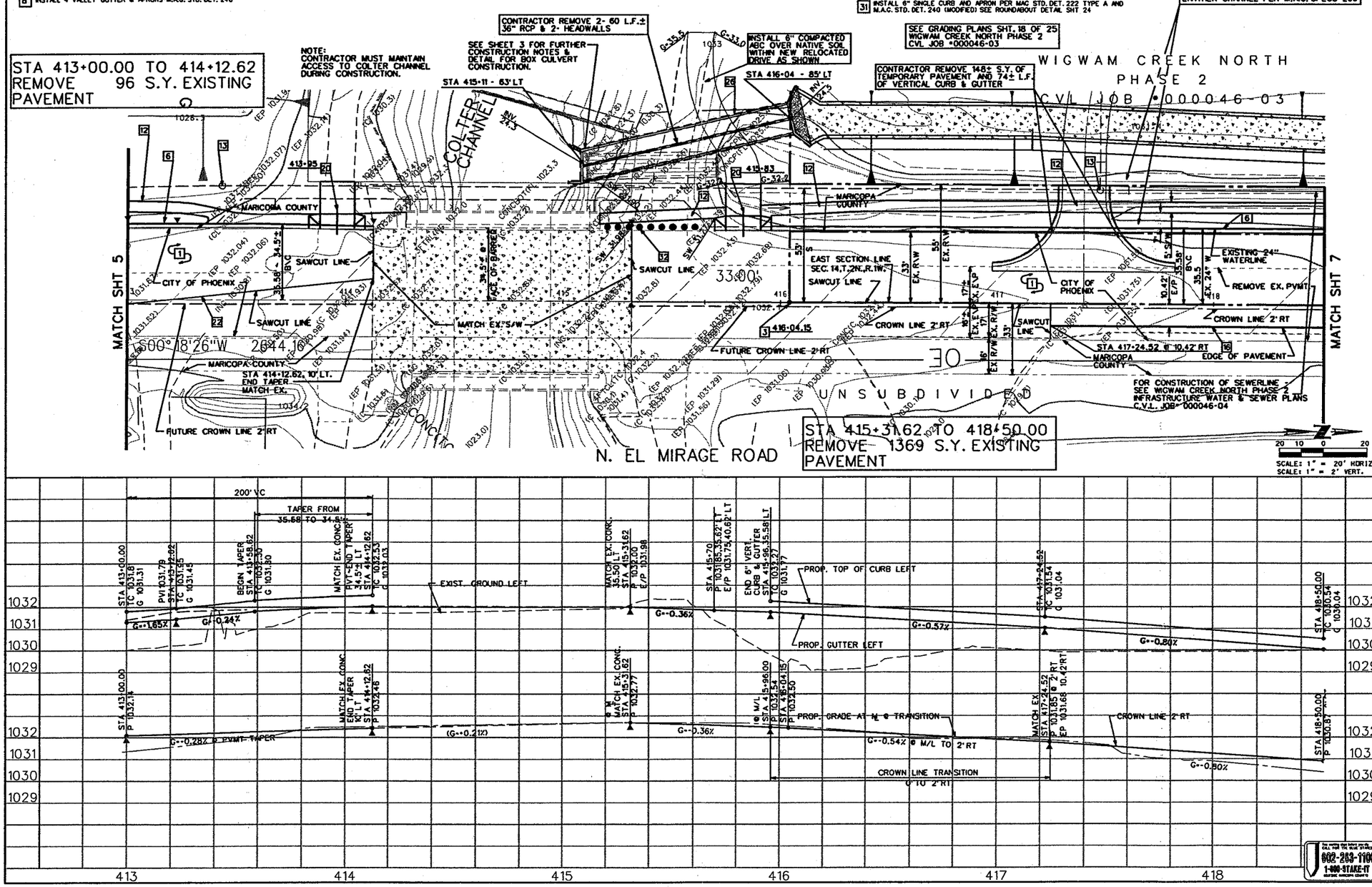
34. RELOCATE POWER POLE (BY UTILITY COMPANY)



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WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED C.W.V. D.J.H
DRAWN D.J.H
CHECKED C.W.V. D.J.H
DATE MAR-2001

PAVING AND STORM DRAIN PLANS

CVL

SHEET 6 OF 30

CVL PROJECT NO.: 000046-04

602-263-1100
1-800-STAKE-IT

.../land/phase2/infra/pa20s06.dgn Aug. 15, 2003 11:54:27

PAVING NOTES:

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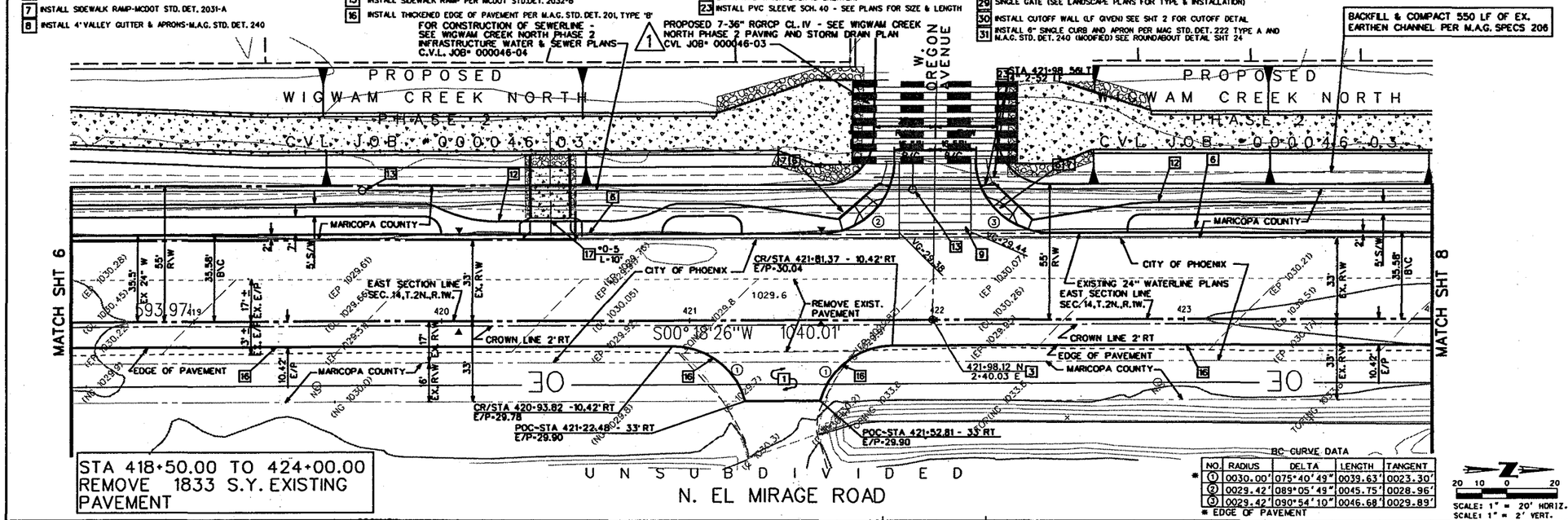
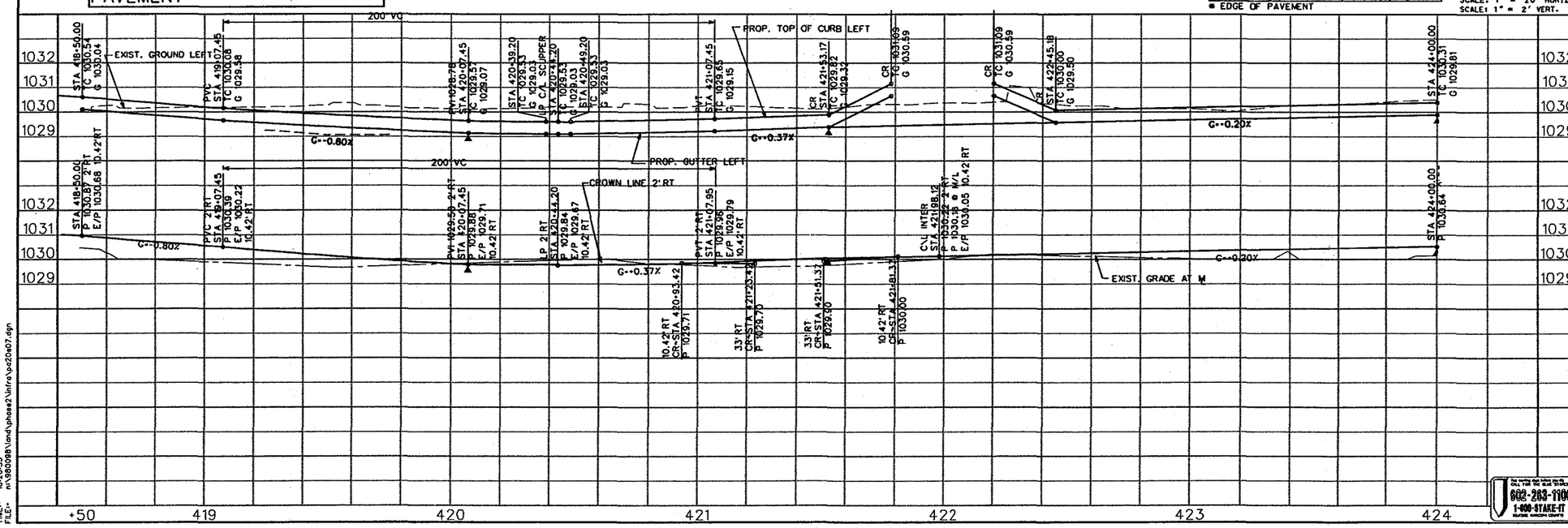


BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0030.00'	075°40'49"	0039.63'	0023.30'
2	0029.42'	089°05'49"	0045.75'	0028.96'
3	0029.42'	090°54'10"	0046.68'	0029.89'

* EDGE OF PAVEMENT

SCALE: 1" = 20' HORIZ.
SCALE: 1" = 2' VERT.



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WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
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PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY
1 MOD. PIPES & HEADWALLS	5-9-03	JK

DESIGNED C.W.V. \ D.J.M.
DRAWN D.J.H.
CHECKED C.W.V. \ D.J.H.
DATE MAR. 2001

PAVING AND STORM DRAIN PLANS

37325 RYAN WEED ARIZONA U.S.A.

CVL

SHEET 7 OF 30

CVL PROJECT NO.: 000046-04

CALL FOR ONE NUMBER TO REACH ALL THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
ELSEWHERE WITHIN MARICOPA COUNTY

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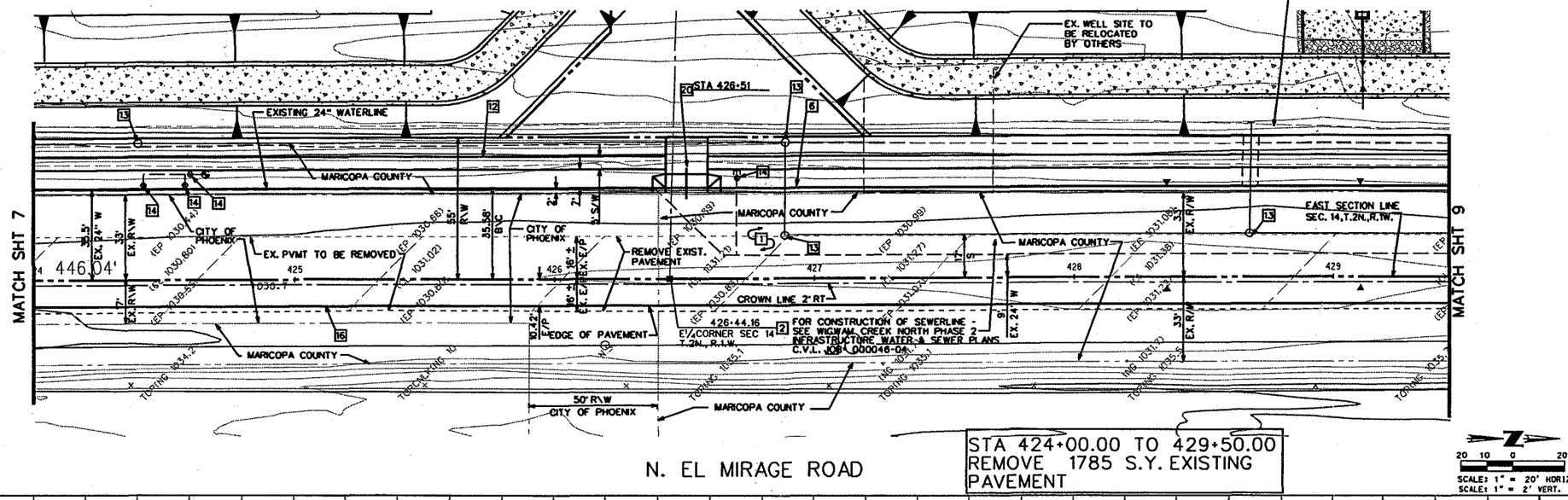
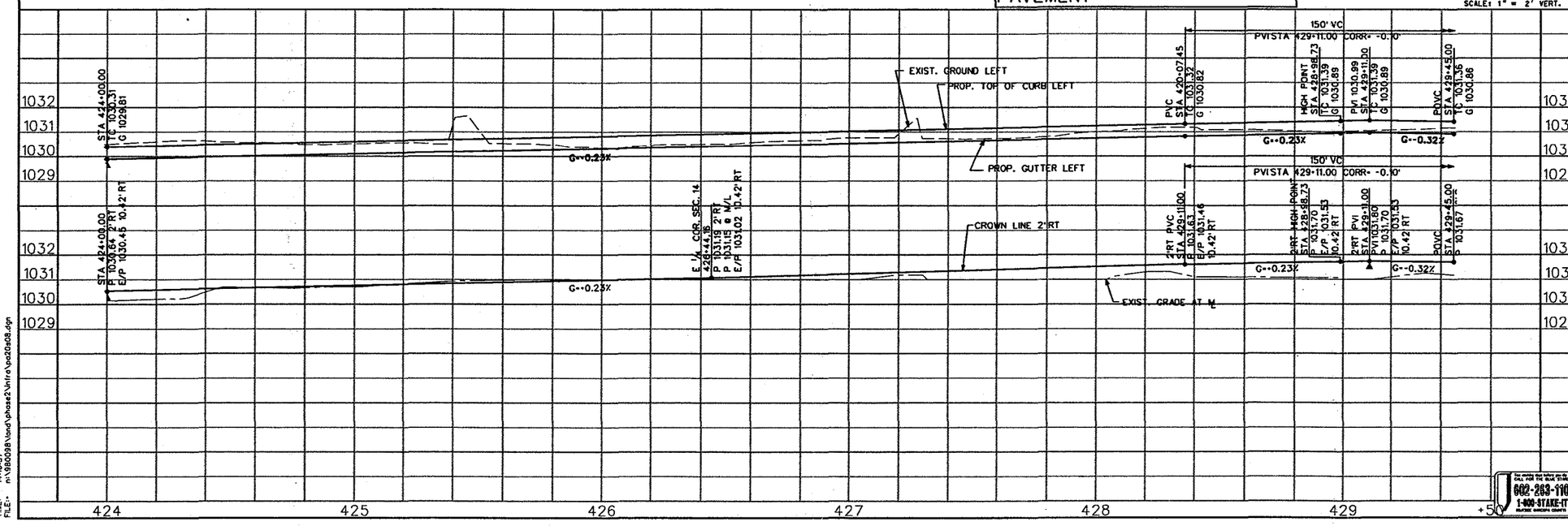
BACKFILL & COMPACT 545 LF OF EX. EARTHEN CHANNEL PER M.A.G. SPECS 206





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602-263-1100
1-800-STAKE-IT

REVISIONS	DATE	BY

DESIGNED G.W.V. 0JH
DRAWN DJH
CHECKED G.W.V. 0JH
DATE MAR-2001

SHEET 8 OF 30

CVL PROJECT NO.: 000046-04

WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE

INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

PAVING AND STORM DRAIN PLANS

.../land/phase2/infra/pa20s08.dgn Aug. 15, 2003 11:54:35

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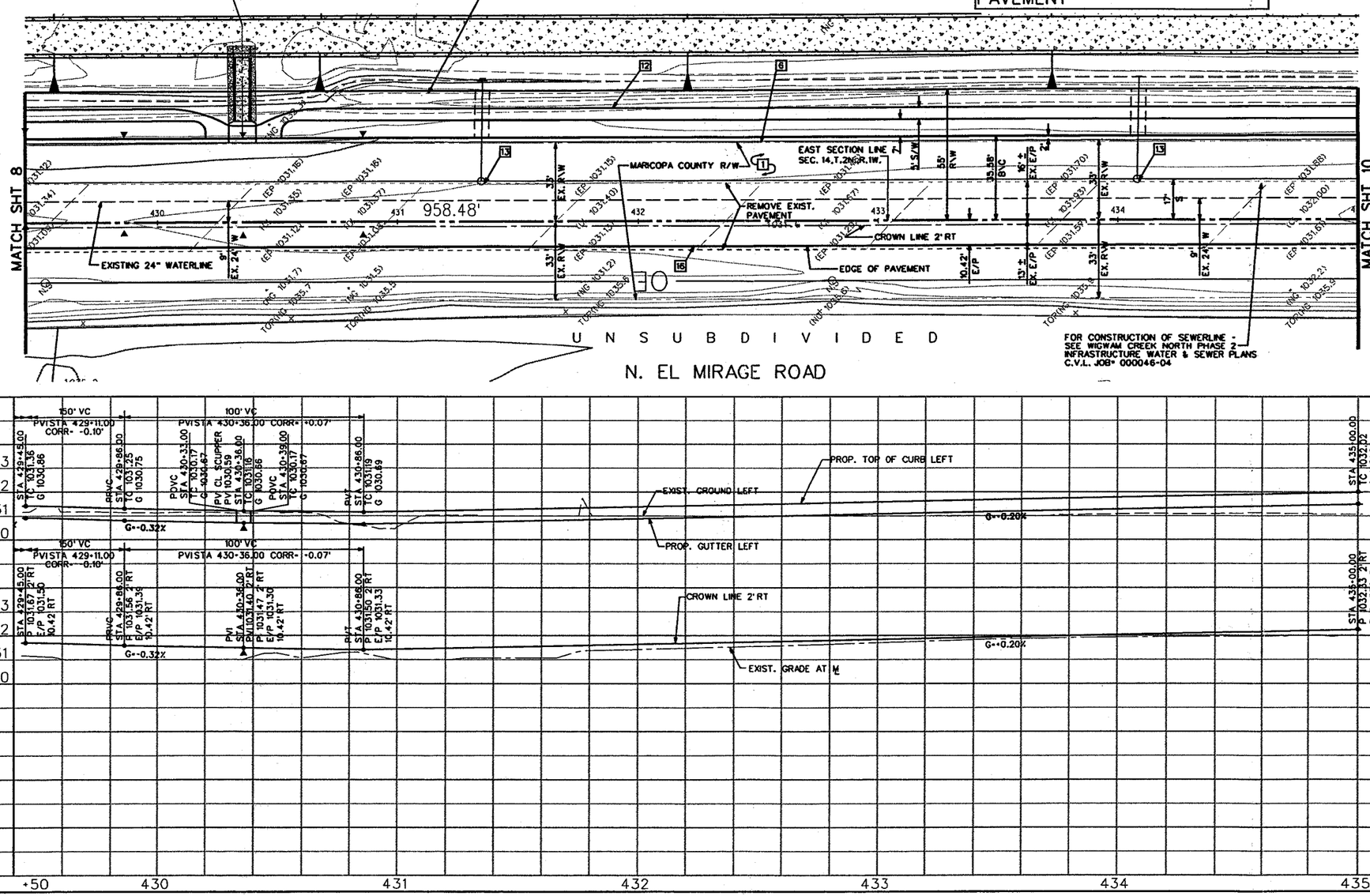
PROPOSED
WIGWAM CREEK NORTH
PHASE 2
CVL JOB #000046-03

BACKFILL & COMPACT 555 LF OF EX. EARTHEN CHANNEL PER M.A.G. SPECS 206

STA 429+50.00 TO 435+00.00
REMOVE 1735 S.Y. EXISTING PAVEMENT



WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
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COE & VAN LOO
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4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED G.W.K.\ D.J.H
DRAWN D.J.H.
CHECKED G.W.K.\ D.J.H
DATE MAR-2001

PAVING AND STORM DRAIN PLANS

CVL

SHEET 9 OF 30

CVL PROJECT NO.: 000046-04

602-263-1100
1-800-STAKE-IT

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TIME:- 14:11:05
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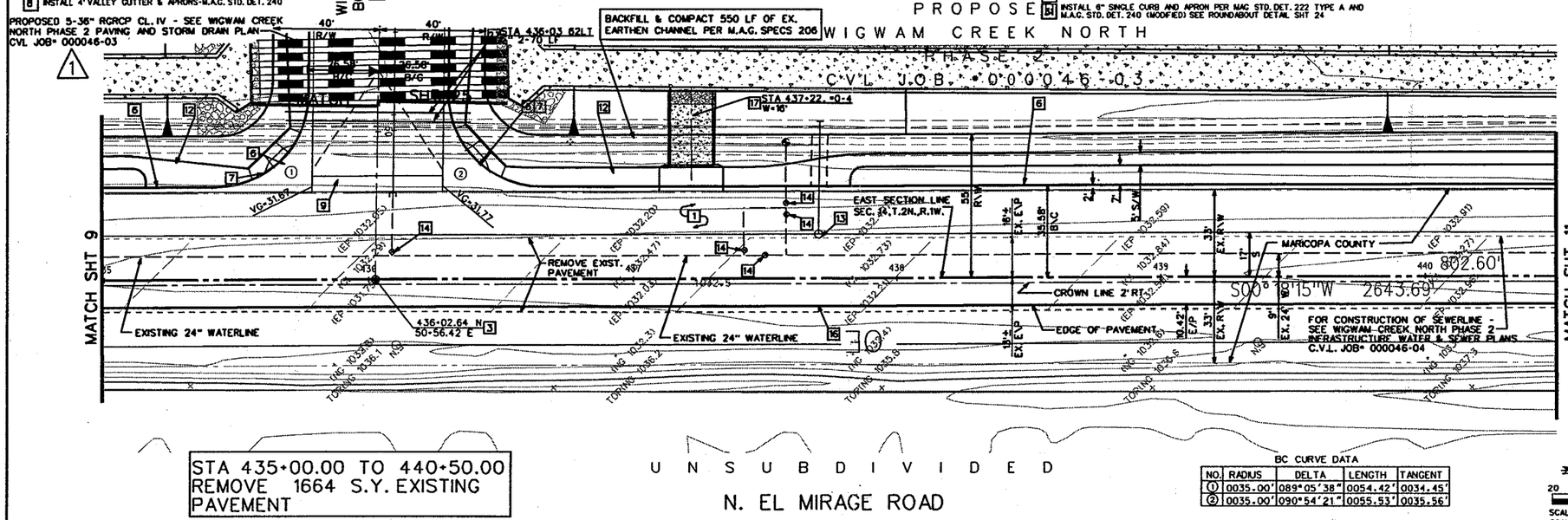

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602-263-1100
1-800-STAKE-IT

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REVISIONS		BY
1	MOD PIPE & HEADWALLS 5-9-03	JK

DESIGNED G.M.V. DJH
DRAWN DJH
CHECKED G.M.V. DJH
DATE MAR-2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 37325 RYAN WEED Date Signed 8/15/03 ARIZONA, U.S.A.

CVL

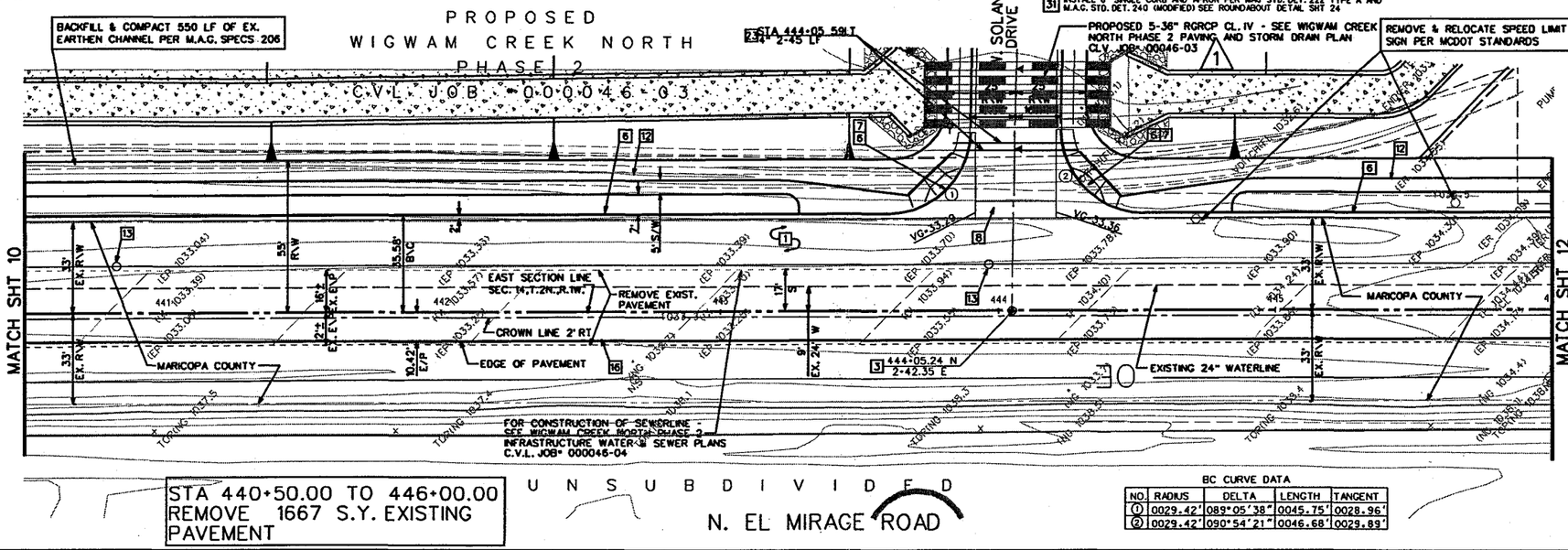
SHEET 10 OF 30

CVL PROJECT NO.: 000046-04

.../land/phase2/infra/pa20s10.dgn Aug. 15, 2003 11:54:42

PAVING NOTES:

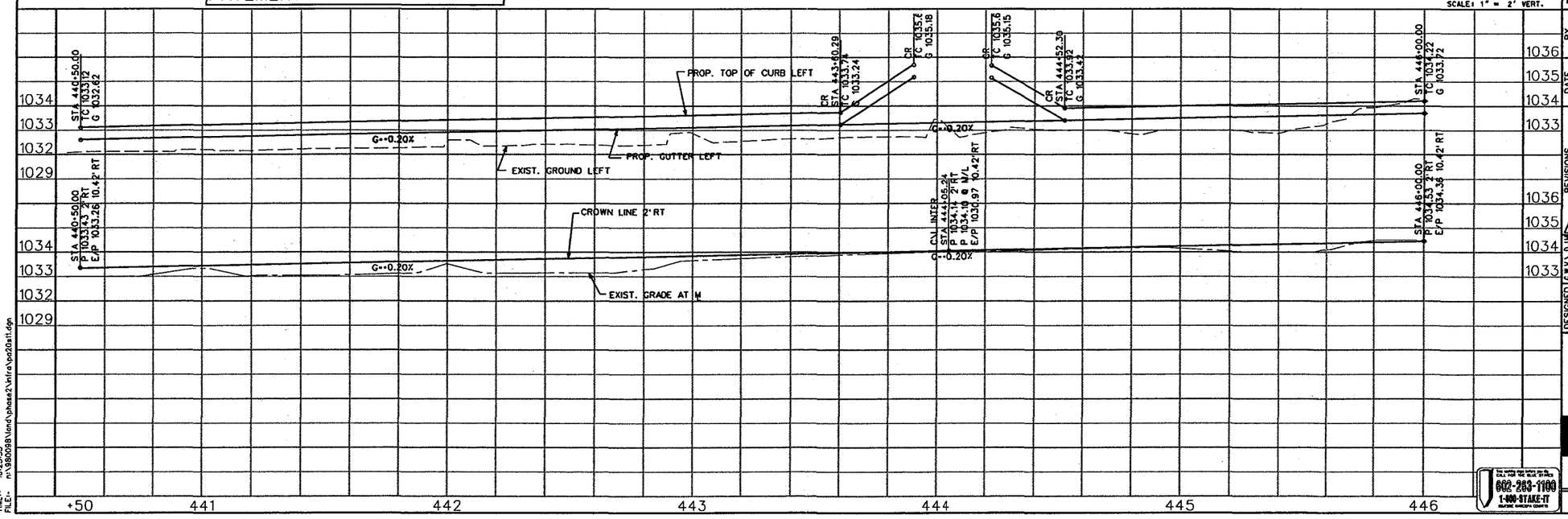
1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE E)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE D)
4. INSTALL ROLL CURB & GUTTER-M.C.D.O.T. STD. DET. 2030
5. INSTALL SIDEWALK RAMP-MCDOT STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL SIDEWALK RAMP-MCDOT STD. DET. 2031-A
8. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
9. INSTALL 6' VALLEY GUTTER & APRON-M.A.G. STD. DET. 240 (MODIFIED)
10. INSTALL 5' CURB TRANSITION FROM VERTICAL TO ROLL CURB-M.A.G. STD. DET. 221
11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
12. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
13. MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422
14. WATER VALVE/CLEANOUT ADJUSTMENT- M.A.G. STD. DET. 270
15. INSTALL SIDEWALK RAMP PER MCDOT STD.DET. 2032-B
16. INSTALL THICKENED EDGE OF PAVEMENT PER M.A.G. STD. DET. 201, TYPE "B"
17. INSTALL CONC. SCUPPER PER M.A.G. STD. DET. 206.2 WITH OPENING WIDTH AS INDICATED ON PLAN.
18. DEPRESS LIP OF GUTTER ½" BELOW FLOWLINE.
19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-A WITH M3 OBJECT MARKERS
20. INSTALL 16' DRIVEWAY PER MCDOT STD. DET. 2034
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. SAWCUT, REMOVE, AND REPLACE A 2' WIDE STRIP OF EXIST. A.C. PAVEMENT. REPLACE PER MAG SEC. 336 AND MAG STD. DET. 200 OR IN KIND WHICH EVER IS GREATER.
23. INSTALL PVC SLEEVE SCH. 40 - SEE PLANS FOR SIZE & LENGTH
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS-12"wD +6" (UNLESS OTHERWISE NOTED)
25. CONSTRUCT 3-6'X4' C.B.C WITH INLET/OUTLET HEADWALLS & WINGWALLS TYPE 'A' PER A.D.O.T. STD. DET. B-02.30 & 08.10 SEE DET. SHTS. 27,28&29
26. CONSTRUCT 2-6'X4' C.B.C WITH INLET/OUTLET HEADWALLS & WINGWALLS TYPE 'B' PER A.D.O.T. STD. DET. B-02.30 & 08.10 SEE DET. SHTS. 26,28&29 W/PARAPET WALL (ON NORTH HEADWALL ONLY) PER A.D.O.T. STD. DTL. B22.70, DETAIL 'A' TOP OF PARAPET WALL=31.0 TOP OF WING WALL TO MATCH PARAPET WALL
27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2 (UNLESS OTHERWISE NOTED)
28. WROUGHT IRON FENCE (SEE LANDSCAPE PLANS FOR TYPE & INSTALLATION)
29. SINGLE GATE (SEE LANDSCAPE PLANS FOR TYPE & INSTALLATION)
30. INSTALL CUTOFF WALL (LF GIVEN) SEE SHT 2 FOR CUTOFF DETAIL
31. INSTALL 6" SINGLE CURB AND APRON PER MAG STD. DET. 222 TYPE A AND M.A.G. STD. DET. 240 (MODIFIED) SEE ROUNDABOUT DETAIL SHT 24
32. INSTALL 9-36" CYLINDER SYSTEMS BY REACT 350 (36") (ENERGY ABSORPTION SYSTEM INC. SEE DETAIL SHT. 3)
33. INSTALL BARRIER TRANSISTION-TANGENT DEPARTURE TYPE 1 PER A.D.O.T. DWG. NO. C-10.75 SEE SHT. 3
34. RELOCATE POWER POLE (BY UTILITY COMPANY)



BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0029.42'	089°05'38"	0045.75'	0028.96'
2	0029.42'	090°54'21"	0046.68'	0029.89'

SCALE: 1" = 20' HORIZ.
SCALE: 1" = 2' VERT.



DATE:- Jan. 07, 2002
TIME:- 10:23:15
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602-263-1100
1-800-STAKE-IT

WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE

INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY
1 MOD. PIPESWHEADWALLS	5-9-03	JK

DESIGNED G.W.V. D.J.H.
DRAWN D.J.H.
CHECKED G.W.V. D.J.H.
DATE MAR. 2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 37325 RYAN WEED Date Signed 5/9/03 ARIZONA, U.S.A.

CVL

SHEET 11 OF 30

CVL PROJECT NO.: 000046-04

.../land/phase2/infra/pa20s11.dgn Aug. 15, 2003 11:54:47

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE E)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE D)
4. INSTALL ROLL CURB & GUTTER-M.C.D.O.T. STD. DET. 2030
5. INSTALL SIDEWALK RAMP-MCDOT STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL SIDEWALK RAMP-MCDOT STD. DET. 2031-A
8. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
9. INSTALL 6' VALLEY GUTTER & APRON-M.A.G. STD. DET. 240 (MODIFIED)
10. INSTALL 5' CURB TRANSITION FROM VERTICAL TO ROLL CURB-M.A.G. STD. DET. 221
11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
12. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
13. MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422
14. WATER VALVE/CLEANOUT ADJUSTMENT- M.A.G. STD. DET. 270
15. INSTALL SIDEWALK RAMP PER MCDOT STD.DET. 2032-B
16. INSTALL THICKENED EDGE OF PAVEMENT PER M.A.G. STD. DET. 201, TYPE "B"
17. INSTALL CONC. SCUPPER PER M.A.G. STD. DET. 206.2 WITH OPENING WIDTH AS INDICATED ON PLAN.
18. DEPRESS LIP OF GUTTER ½" BELOW FLOWLINE.
19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-A WITH M3 OBJECT MARKERS
20. INSTALL 18' DRIVEWAY PER MCDOT STD. DET. 2034
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. SAWCUT, REMOVE, AND REPLACE A 2' WIDE STRIP OF EXIST. A.C. PAVEMENT. REPLACE PER MAG SEC. 336 AND MAG STD. DET. 200 OR IN KIND WHICH EVER IS GREATER.
23. INSTALL PVC SLEEVE SCH. 40 - SEE PLANS FOR SIZE & LENGTH
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS=12"ø +6" (UNLESS OTHERWISE NOTED)
25. CONSTRUCT 3-8'X4' C.B.C WITH INLET/OUTLET HEADWALLS & WINGWALLS TYPE "A" PER A.D.O.T. STD. DET. 8-02.30 & 08.10 SEE DET. SHTS. 27,28&29
26. CONSTRUCT 2-6'X4' C.B.C WITH INLET/OUTLET HEADWALLS & WINGWALLS TYPE "B" PER A.D.O.T. STD. DET. 8-02.20 & 08.10 SEE DET. SHTS. 26,28&29 W/PARAPET WALL (ON NORTH HEADWALL ONLY) PER A.D.O.T. STD. DTL. B22.70, DETAIL "A" TOP OF PARAPET WALL=31.0 TOP OF WING WALL TO MATCH PARAPET WALL
27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2 (UNLESS OTHERWISE NOTED)
28. WROUGHT IRON FENCE (SEE LANDSCAPE PLANS FOR TYPE & INSTALLATION)
29. SINGLE GATE (SEE LANDSCAPE PLANS FOR TYPE & INSTALLATION)
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31. INSTALL 6' SINGLE CURB AND APRON PER MAG STD. DET. 222 TYPE A AND M.A.C. STD. DET. 240 (MODIFIED) SEE ROUNDABOUT DETAIL SHT 24
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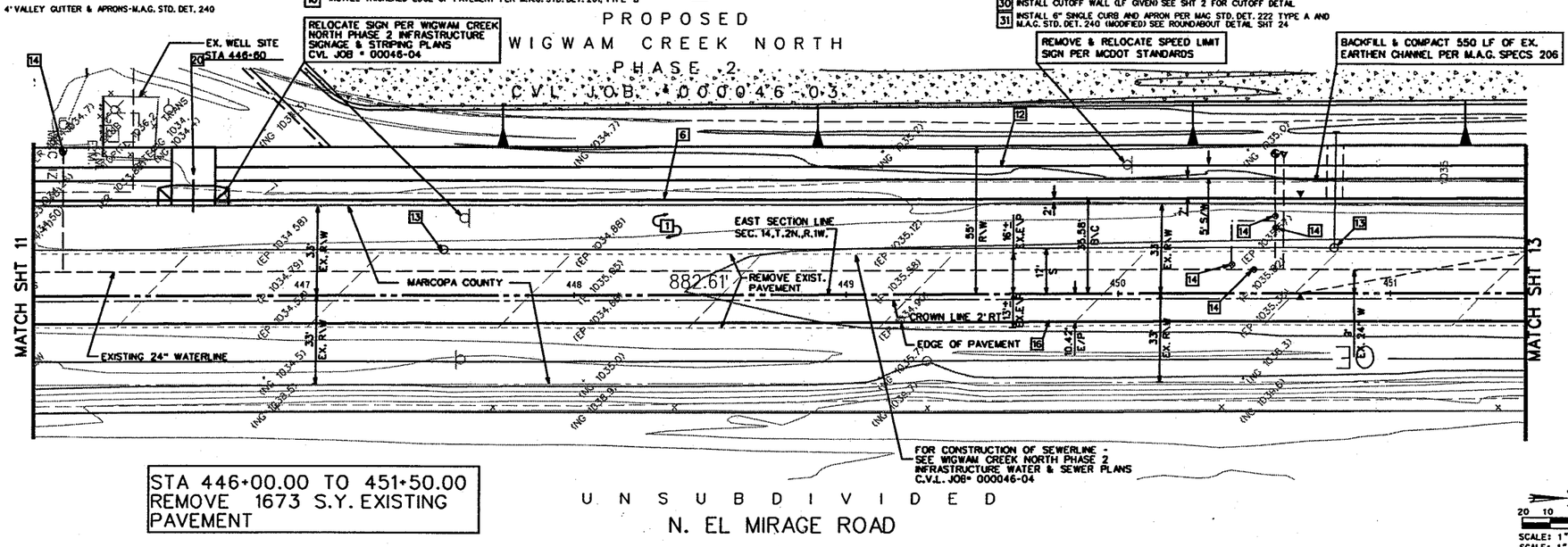
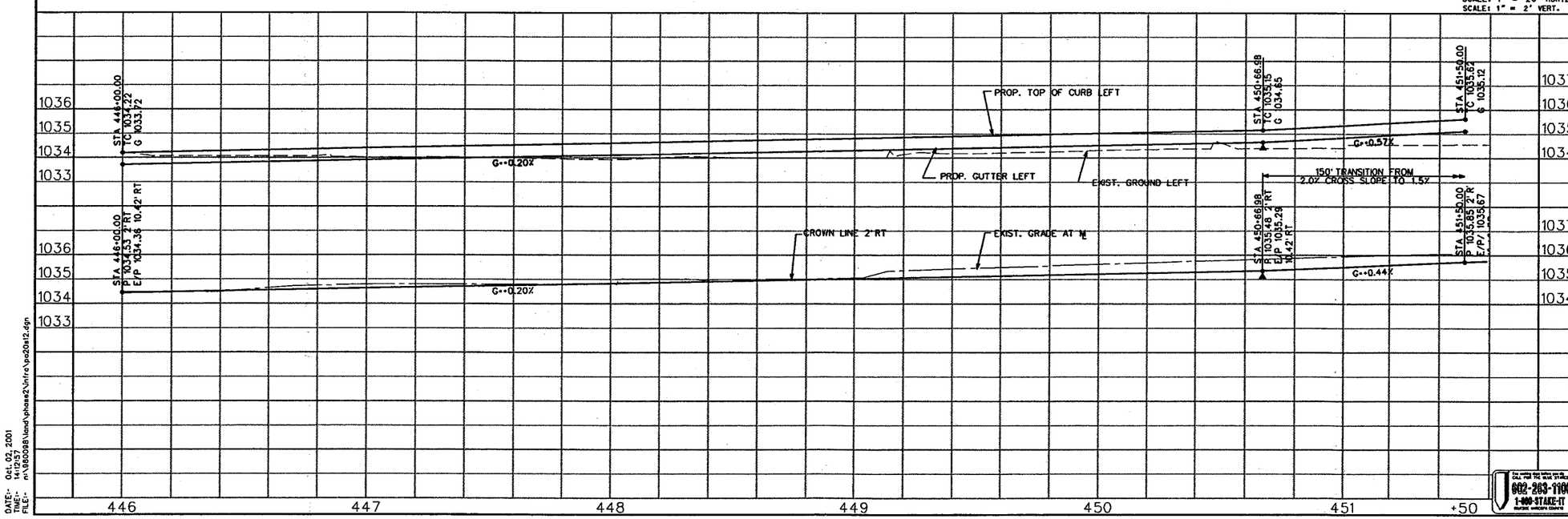
33. INSTALL BARRIER TRANSISTION-TANGENT DEPARTURE TYPE 1 PER A.D.O.T. DWG. NO. C-10.75 SEE SHT. 3
34. RELOCATE POWER POLE (BY UTILITY COMPANY)



STA 446+00.00 TO 451+50.00
REMOVE 1673 S.Y. EXISTING PAVEMENT



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FILE:- n:\980098\land\phase2\infra\pa20s12.dgn

CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

BY	DATE	REVISIONS

DESIGNED	G.W.K.	DJK
DRAWN	D.J.K.	
CHECKED	G.W.K.	V.D.J.K
DATE	MAR-2001	

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 37325 RYAN WEED Date Signed 8/15/03 ARIZONA U.S.A.

CVL

SHEET 12 OF 30

CVL PROJECT NO.: 000046-04

.../land/phase2/infra/pa20s12.dgn Aug. 15, 2003 11:54:51

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE E)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE D)
4. INSTALL ROLL CURB & GUTTER-M.C.D.O.T. STD. DET. 2030
5. INSTALL SIDEWALK RAMP-MCDOT STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL SIDEWALK RAMP-MCDOT STD. DET. 2031-A
8. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
9. INSTALL 6' VALLEY GUTTER & APRON-M.A.G. STD. DET. 240 (MODIFIED)
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11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
12. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
13. MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422
14. WATER VALVE/CLEANOUT ADJUSTMENT- M.A.G. STD. DET. 270
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16. INSTALL THICKENED EDGE OF PAVEMENT PER M.A.G. STD. DET. 201, TYPE "B"
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19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-A WITH M3 OBJECT MARKERS
20. INSTALL 16' DRIVEWAY PER MCDOT STD. DET. 2034
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. SAWCUT, REMOVE, AND REPLACE A 2' WIDE STRIP OF EXIST. A.C. PAVEMENT. REPLACE PER MAG SEC. 336 AND MAG STD. DET. 200 OR IN KIND WHICH EVER IS GREATER.
23. INSTALL PVC SLEEVE SCH. 40 - SEE PLANS FOR SIZE & LENGTH
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS=12"@D +6" (UNLESS OTHERWISE NOTED)
25. CONSTRUCT 3-8'X4' C.B.C WITH INLET/OUTLET HEADWALLS & WINGWALLS TYPE "A" PER A.D.O.T. STD. DET. 8-02.30 & 08.10 SEE DET. SHTS. 27,28&29
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30. INSTALL CUTOFF WALL (LF GIVEN) SEE SHT 2 FOR CUTOFF DETAIL
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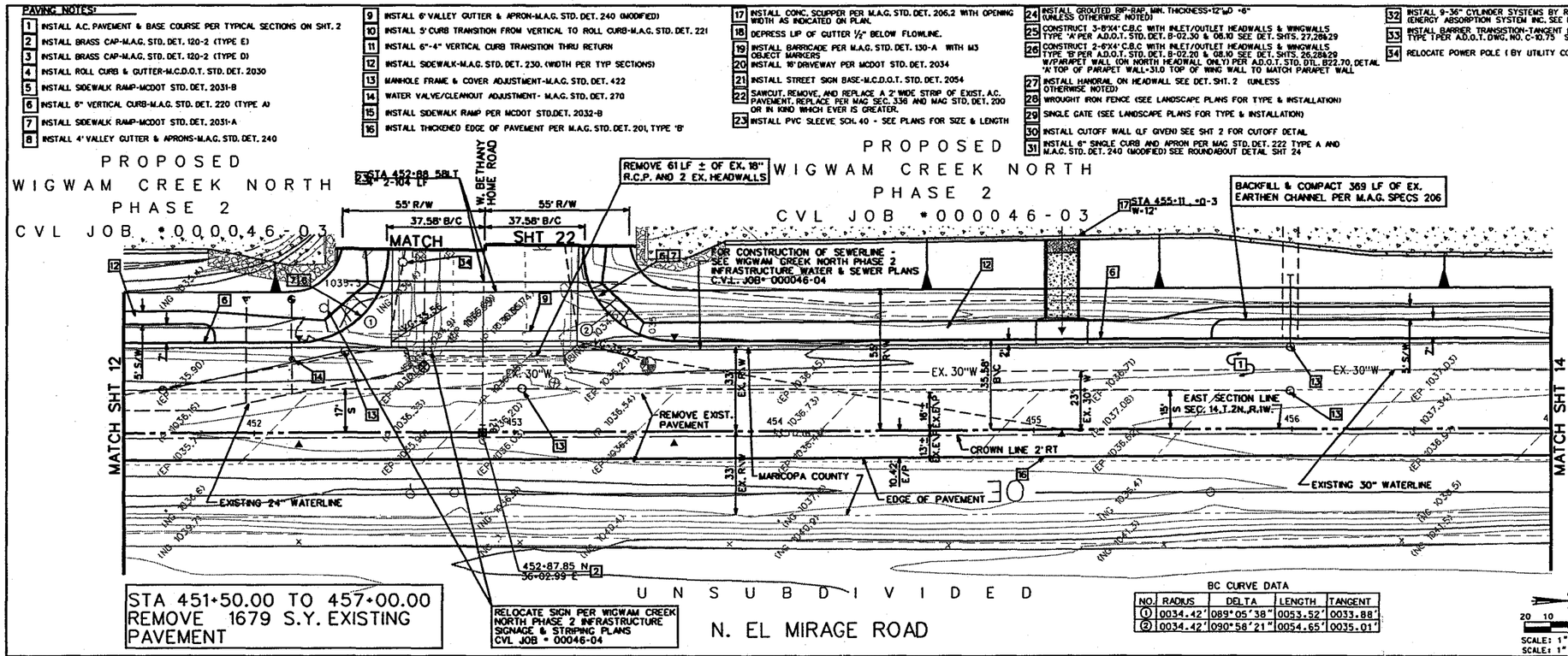
32. INSTALL 9-36" CYLINDER SYSTEMS BY REACT 350 (36") (ENERGY ABSORPTION SYSTEM INC. SEE DETAIL SHT. 3)
33. INSTALL BARRIER TRANSISTION-TANGENT DEPARTURE TYPE 1 PER A.D.O.T. DWG. NO. C-10.75 SEE SHT. 3
34. RELOCATE POWER POLE (BY UTILITY COMPANY)

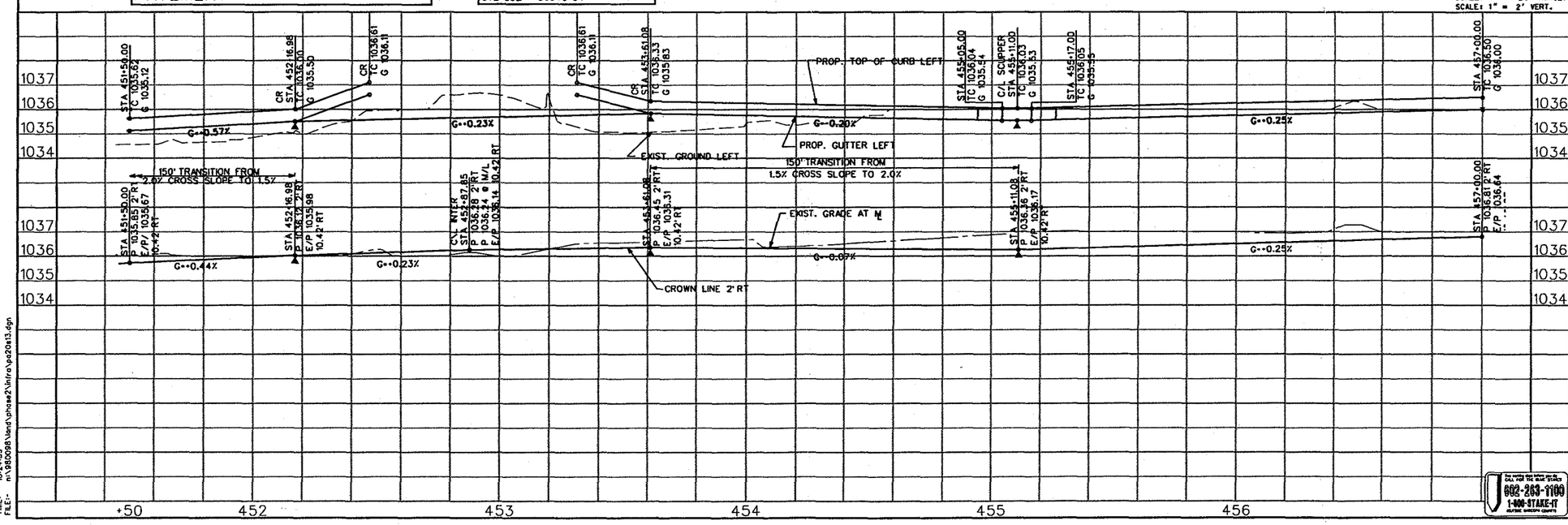


STA 451+50.00 TO 457+00.00
REMOVE 1679 S.Y. EXISTING PAVEMENT

BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0034.42'	089°05'38"	0053.52'	0033.88'
2	0034.42'	090°58'21"	0054.65'	0035.01'

SCALE: 1" = 20' HORIZ.
SCALE: 1" = 2' VERT.



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TIME:- 10:24:35
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WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

DATE	BY	REVISIONS

DESIGNED G.W.V.L. D.J.H.
DRAWN D.J.H.
CHECKED G.W.V.L. D.J.H.
DATE MAR-2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 37325 RYAN WEED ARIZONA U.S.A.

CVL

SHEET 13 OF 30

CVL PROJECT NO.: 000046-04

BLUE STAKE, INC. CALL FOR THE BLUE STAKES 602-263-1100 1-800-STAKE-IT (OUTSIDE MARICOPA COUNTY)

.../land/phase2/infra/pa20s13.dgn Aug. 15, 2003 11:54:54

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE E)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE D)
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6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL SIDEWALK RAMP-MCDOT STD. DET. 2031-A
8. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
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11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
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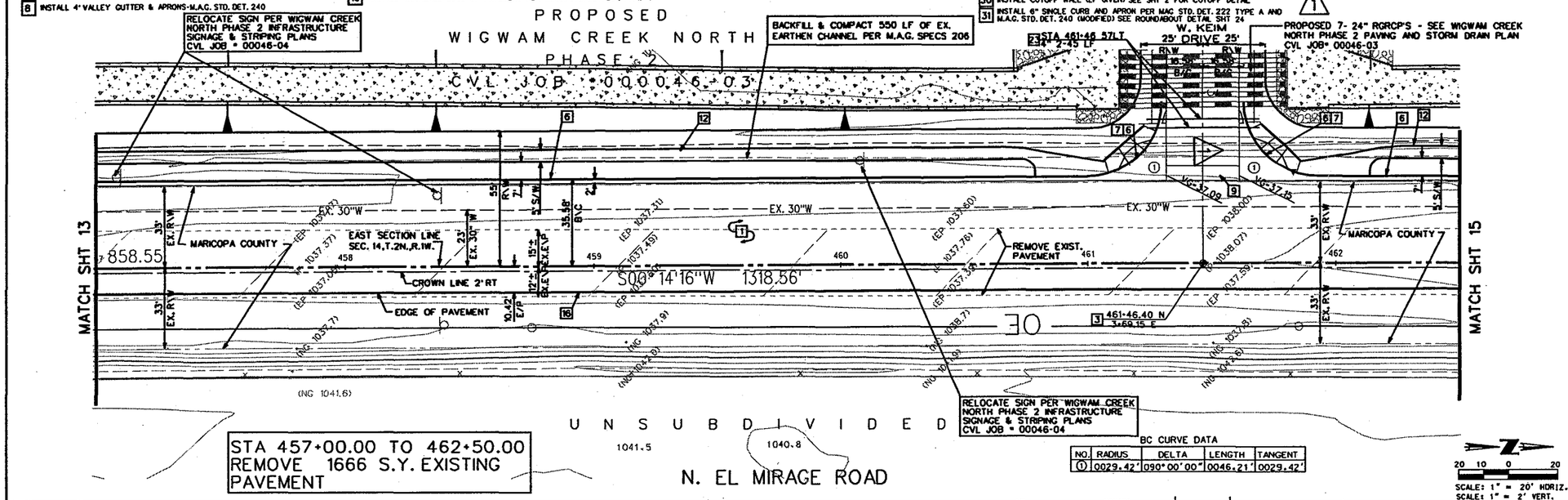
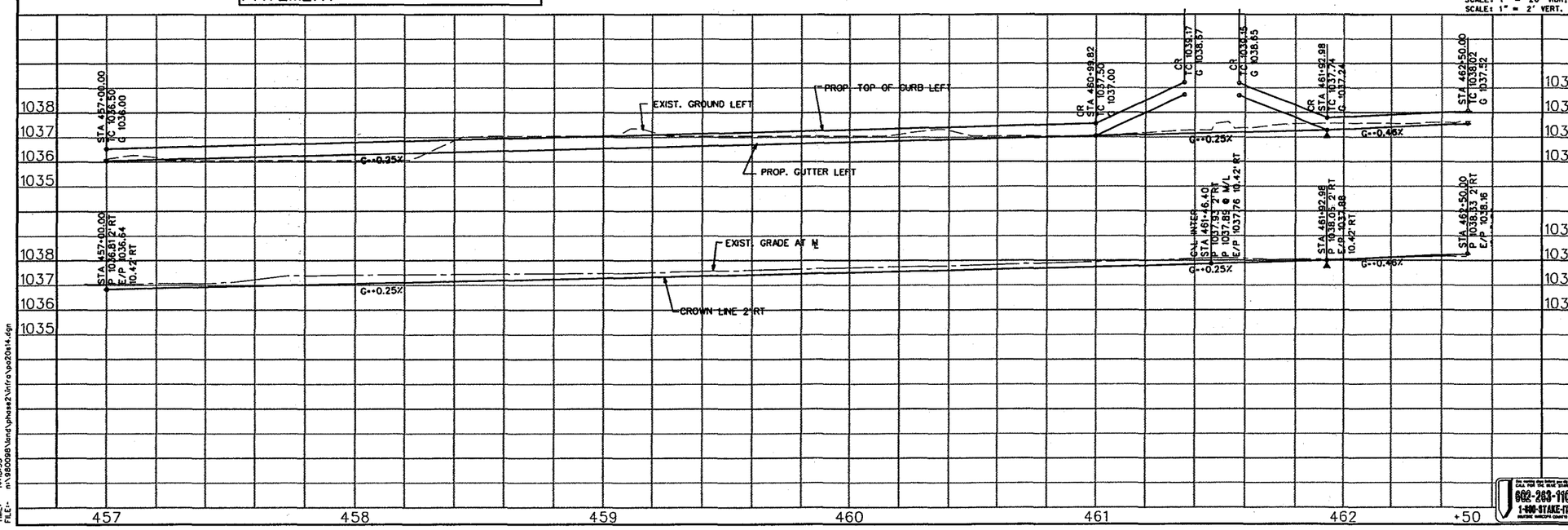


BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0029.42'	090°00'00"	0046.21'	0029.42'



DATE:- Oct. 02, 2001
TIME:- 11:13:53
FILE:- m:\980098\land\phase2\infra\pa20s14.dgn

WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	BY
DATE	JK
5-9-03	
MOD. PIPE&HEADWALLS	
1	

DESIGNED	G.W.V.	D.J.H
DRAWN	D.J.H	
CHECKED	G.W.V.	J.J.H
DATE	MAR-2001	

PAVING AND STORM DRAIN PLANS

CVL

SHEET 14 OF 30

CVL PROJECT NO.: 000046-04

602-263-1100
1-800-STAKE-IT

.../land/phase2/infra/pa20s14.dgn Aug. 15, 2003 11:54:57

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE E)
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21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
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23. INSTALL PVC SLEEVE SCH. 40 - SEE PLANS FOR SIZE & LENGTH
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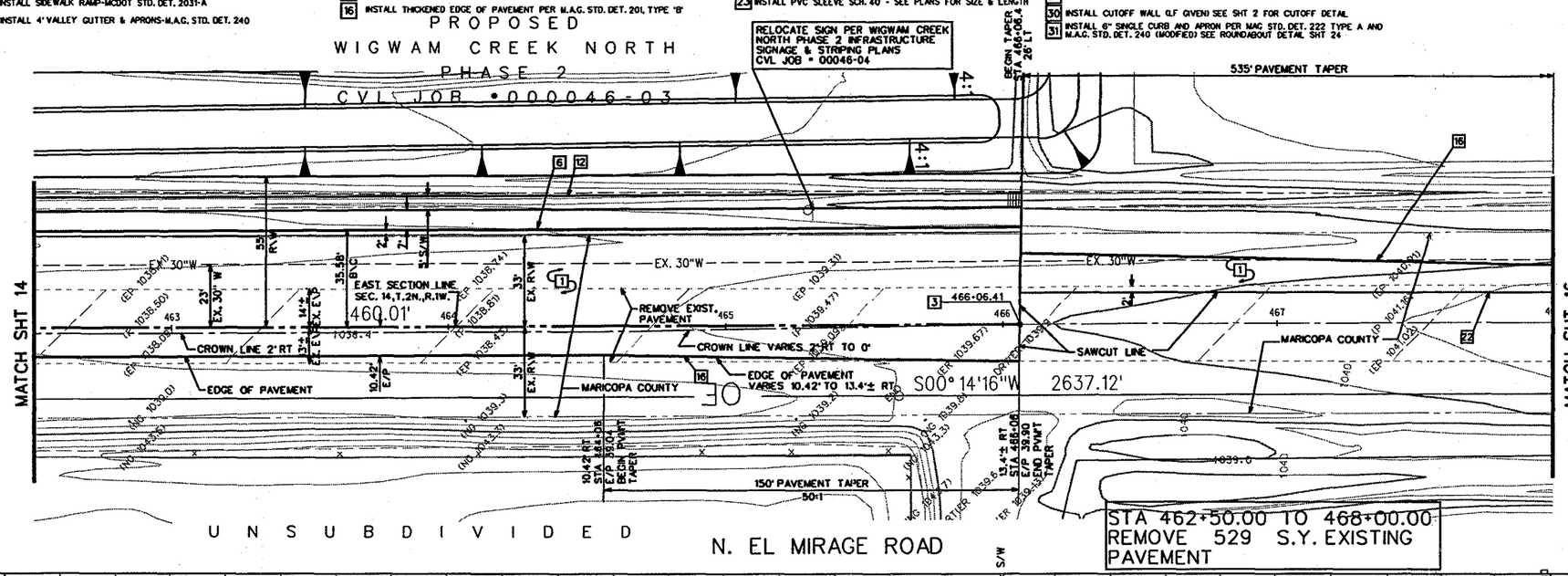
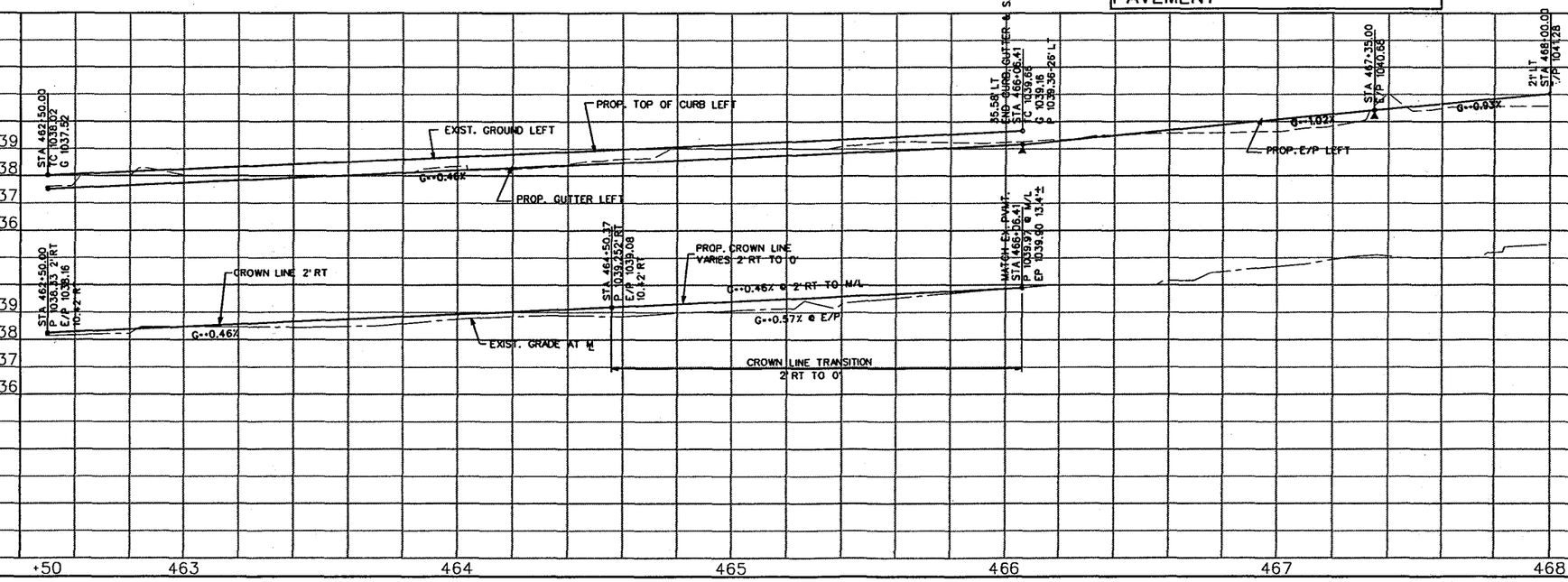
34. RELOCATE POWER POLE (BY UTILITY COMPANY)





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WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED	G.R.V.	D.J.H.
DRAWN	D.J.H.	
CHECKED	G.R.V.	D.J.H.
DATE	MAY-2001	

PAVING AND STORM DRAIN PLANS

CVL

SHEET 15 OF 30

CVL PROJECT NO.: 000046-04

602-263-1100
1-800-STAKE-IT

.../land/phase2/infra/pa20s15.dgn Aug. 15, 2003 11:55:01

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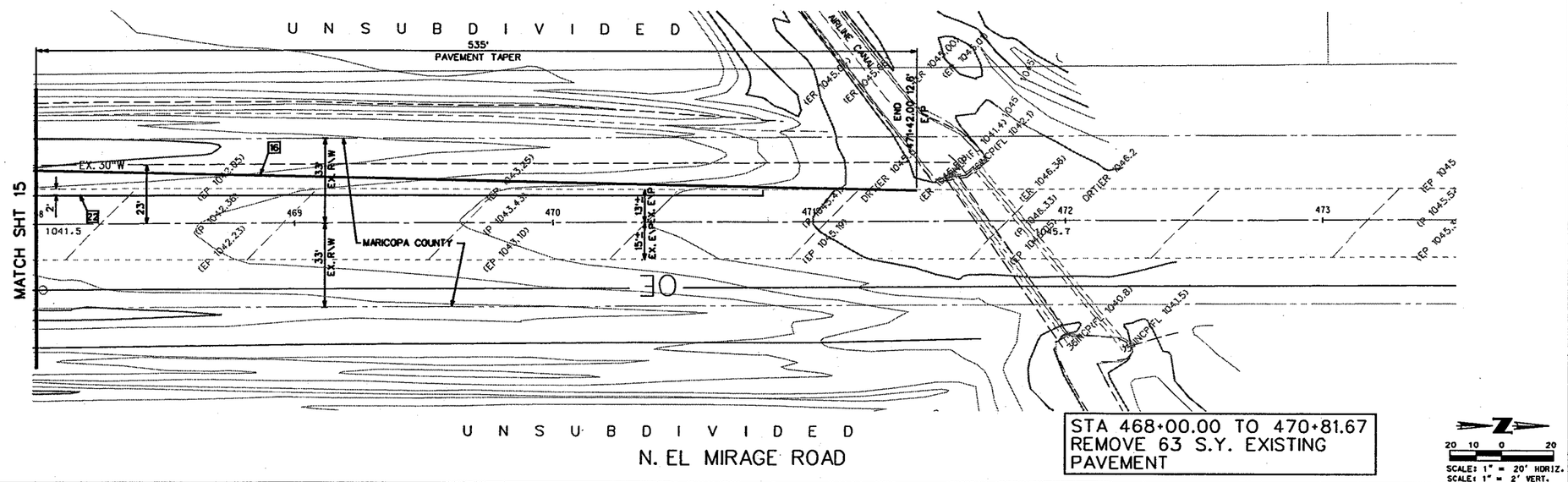

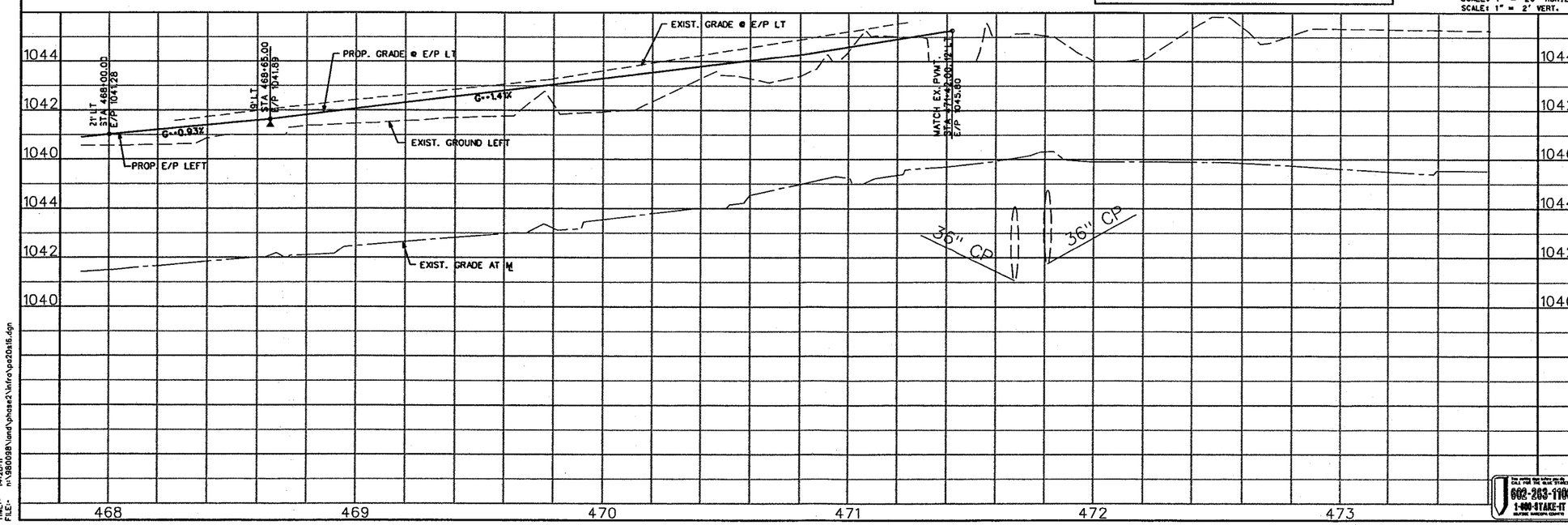

WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
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PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED G.W.V. | DRAWN D.J.H. | CHECKED G.W.V./D.J.H. | DATE MAR-2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 37325 RYAN WEED ARIZONA U.S.A.

CVL

SHEET 16 OF 30

CVL PROJECT NO.: 000046-04

602-263-1100
1-800-STAKE-IT (OUTSIDE MARICOPA COUNTY)

DATE:- Oct. 02, 2001
TIME:- 14:20:11
FILE:- n:\980098\land\phase2\infra\pa20s16.dgn

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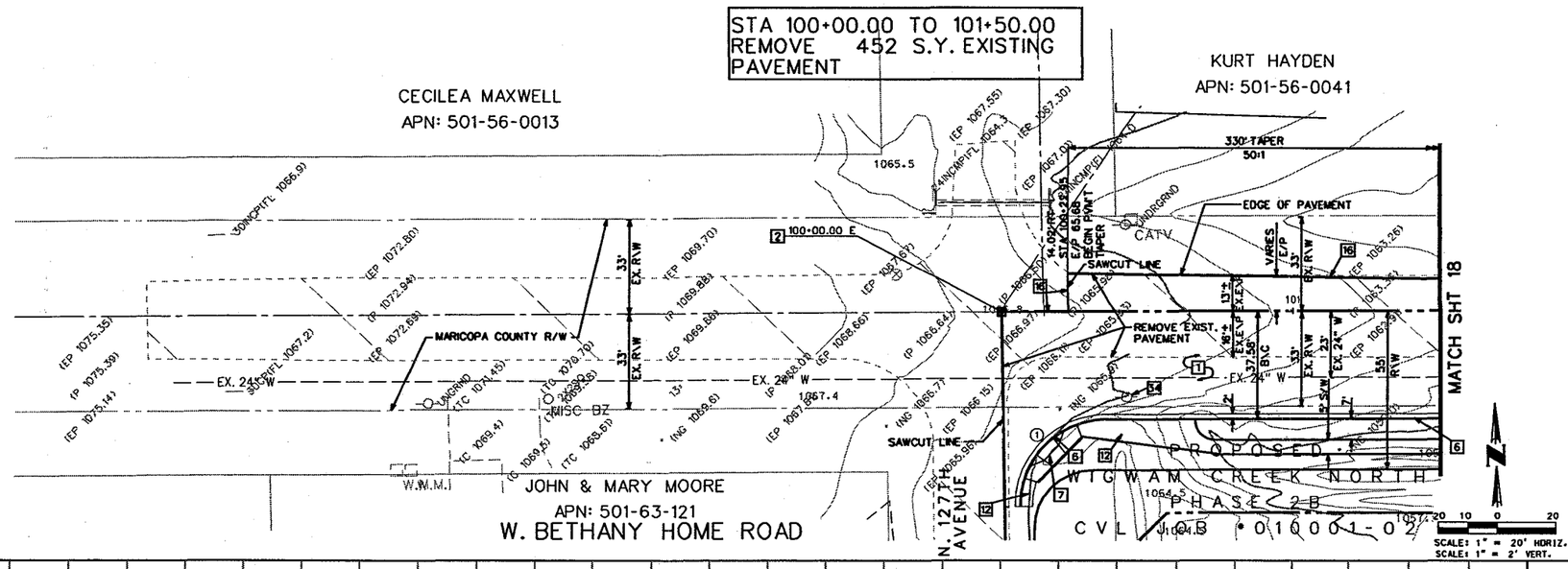
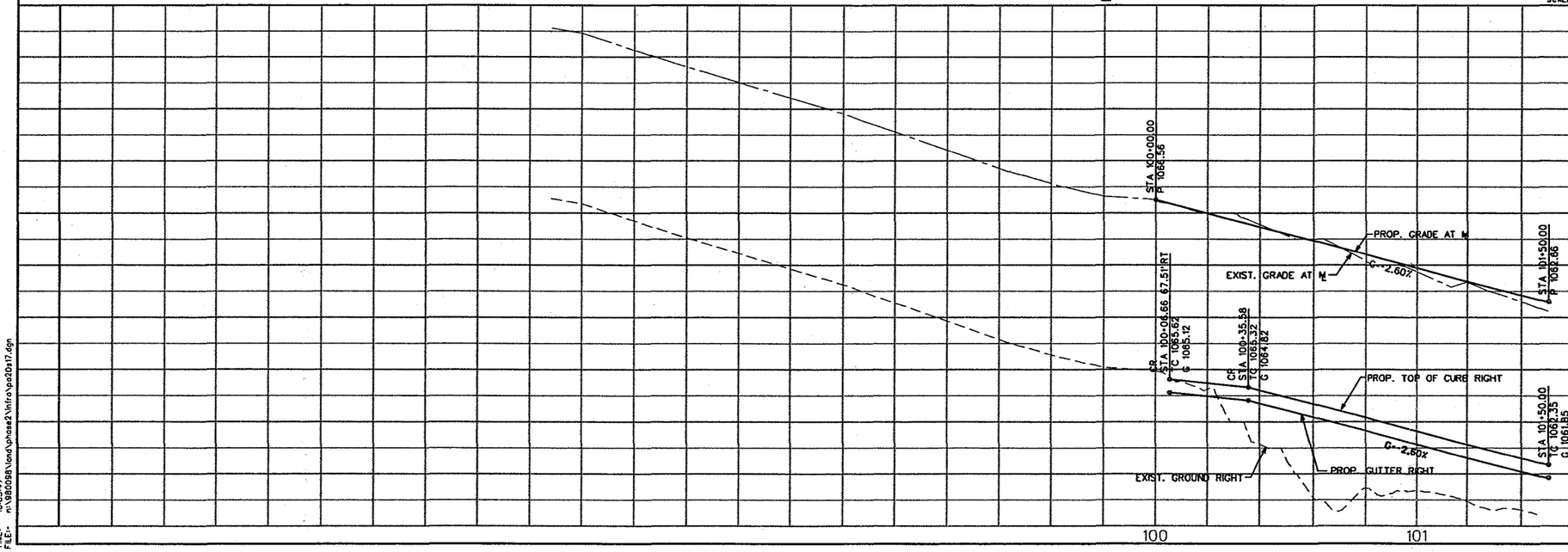
BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0029.42'	090°59'05"	0046.72'	0029.93'





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TIME:- 16:01:47
FILE:- n:\980098\land\phase2\infra\pa20s17.dgn

CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

REVISIONS	DATE	BY

DESIGNED	G.W.A.	D.J.H.
DRAWN	D.J.H.	
CHECKED	G.W.A.	D.J.H.
DATE	MAR-2001	

WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 37325 RYAN WEED ARIZONA, U.S.A.

CVL

SHEET 17 OF 30

CVL PROJECT NO.: 000046-04

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STORM DRAIN CONSTRUCTION NOTES

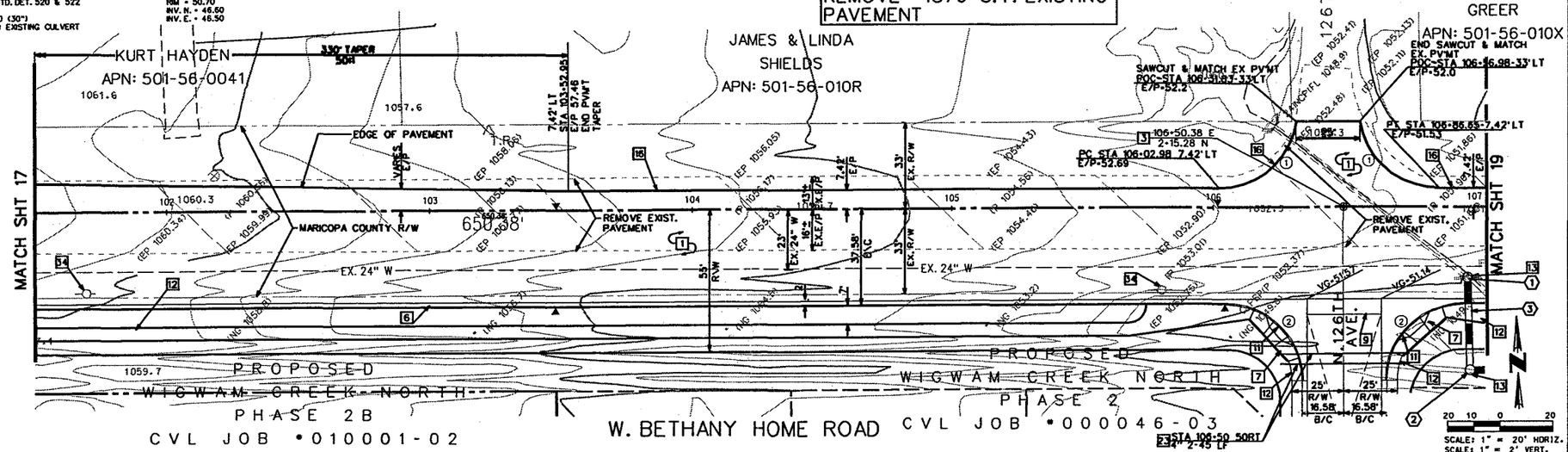
1. STA 106+98.00-29' RT
   REMOVE EX. HEADWALL
   CONSTRUCT 5' DIAMETER STORM DRAIN MANHOLE #1
   PER M.A.G. STD. DET. 520 & 522
   RIM = 50.70
   INVS - 46.70 (30")
   CONNECT TO EXISTING CULVERT
2. STA 106+93-63' RT
   CONSTRUCT 5' DIAMETER STORM DRAIN MANHOLE #2
   PER M.A.G. STD. DET. 520 & 522
   RIM = 50.70
   INV. N. = 46.60
   INV. E. = 46.50
3. INSTALL 34 LF 30" RGRCP (CLV) S=0.0029'/'

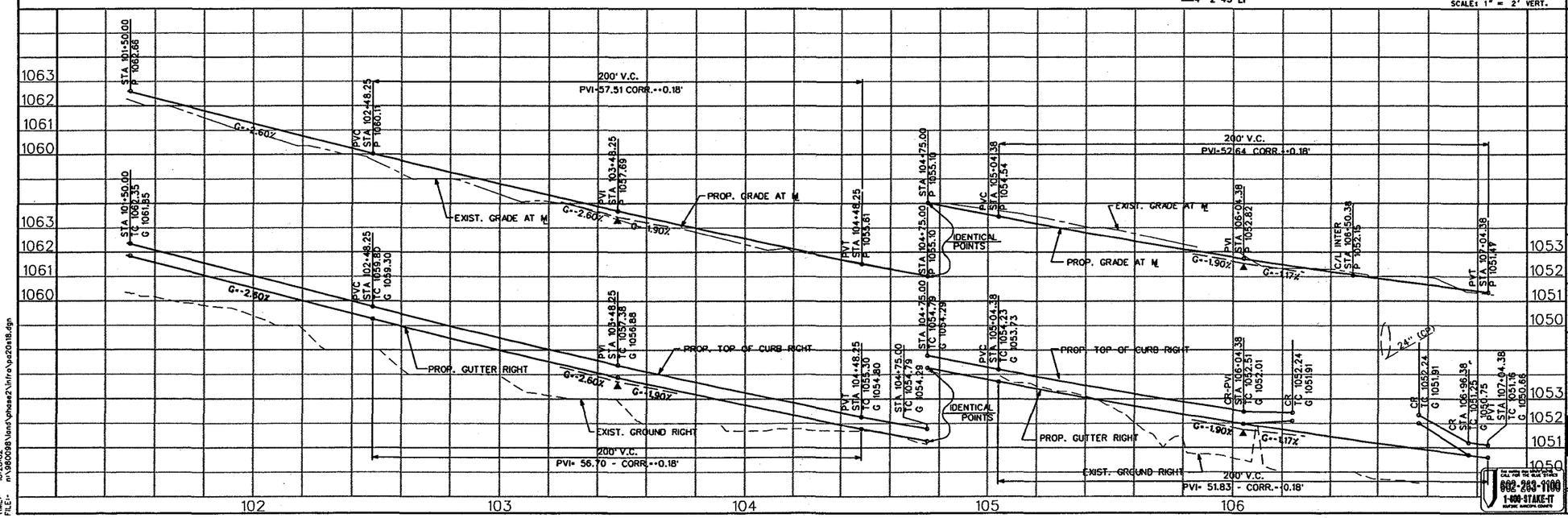
BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
* 1	0030.00'	081°31'39"	0042.69'	0025.86'
2	0029.42'	090°00'00"	0046.21'	0029.42'

* EDGE OF PAVEMENT

STA 101+50.00 TO 107+05.00
REMOVE 1879 S.Y. EXISTING PAVEMENT





DATE- Jan 07 2002
TIME- 09:30:02
FILE- m:\980098\land\phase2\infra\pa20s18.dgn

REVISIONS	DATE	BY

DESIGNED	C.W.V.	D.J.H
DRAWN	D.J.H	
CHECKED	C.W.V.	D.J.H
DATE	MAR-2001	

COE & VAN LOO
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WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

PAVING AND STORM DRAIN PLANS

CVL

SHEET 18 OF 30

CVL PROJECT NO.: 000046-04

CALL FOR THE BLUE STAKE
602-263-1100
1-800-STAKE-IT
MARICOPA COUNTY

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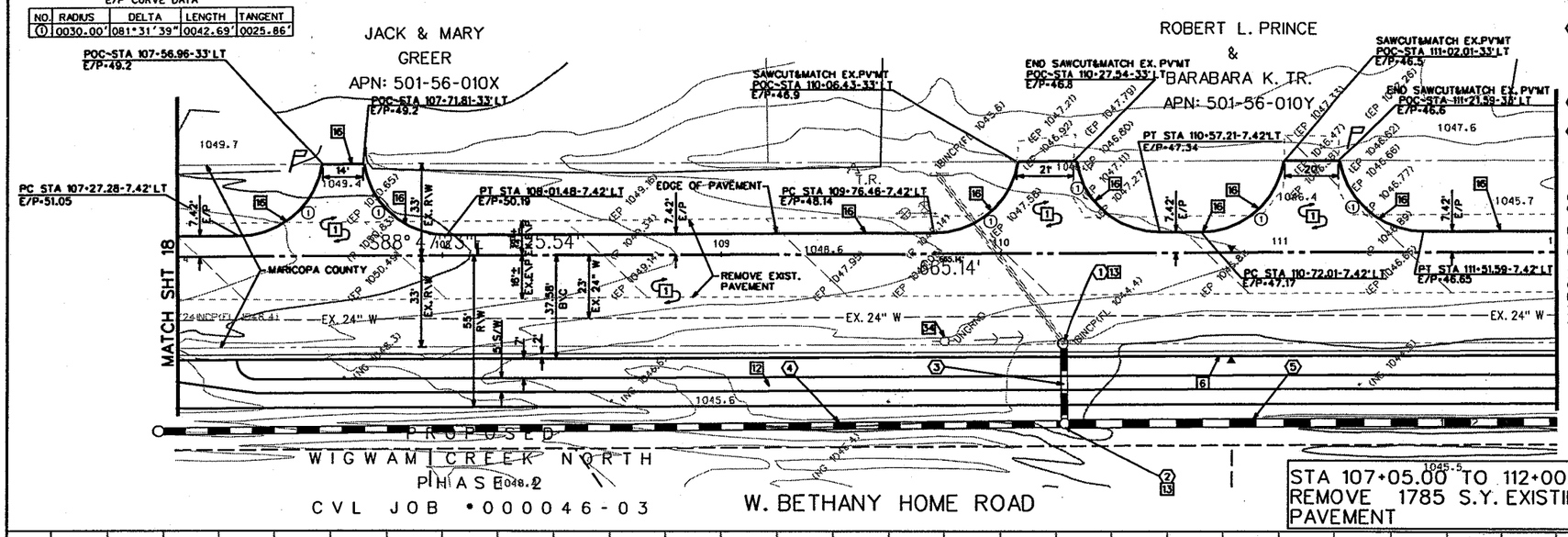
27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2 (UNLESS OTHERWISE NOTED)
28. WROUGHT IRON FENCE (SEE LANDSCAPE PLANS FOR TYPE & INSTALLATION)
29. SINGLE GATE (SEE LANDSCAPE PLANS FOR TYPE & INSTALLATION)
30. INSTALL CUTOFF WALL (LF GIVEN) SEE SHT 2 FOR CUTOFF DETAIL
31. INSTALL 6" SINGLE CURB AND APRON PER MAG STD. DET. 222 TYPE A AND M.A.G. STD. DET. 240 (MODIFIED) SEE ROUNDABOUT DETAIL SHT 24
32. INSTALL 9-36" CYLINDER SYSTEMS BY REACT 350 (36"I (ENERGY ABSORPTION SYSTEM INC. SEE DETAIL SHT. 3)
33. INSTALL BARRIER TRANSISTION-TANGENT DEPARTURE TYPE 1PER A.D.O.T. DWG. NO. C-10.75 SEE SHT. 3
34. RELOCATE POWER POLE (BY UTILITY COMPANY)

E/P CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0030.00'	081°31'39"	0042.69'	0025.86'

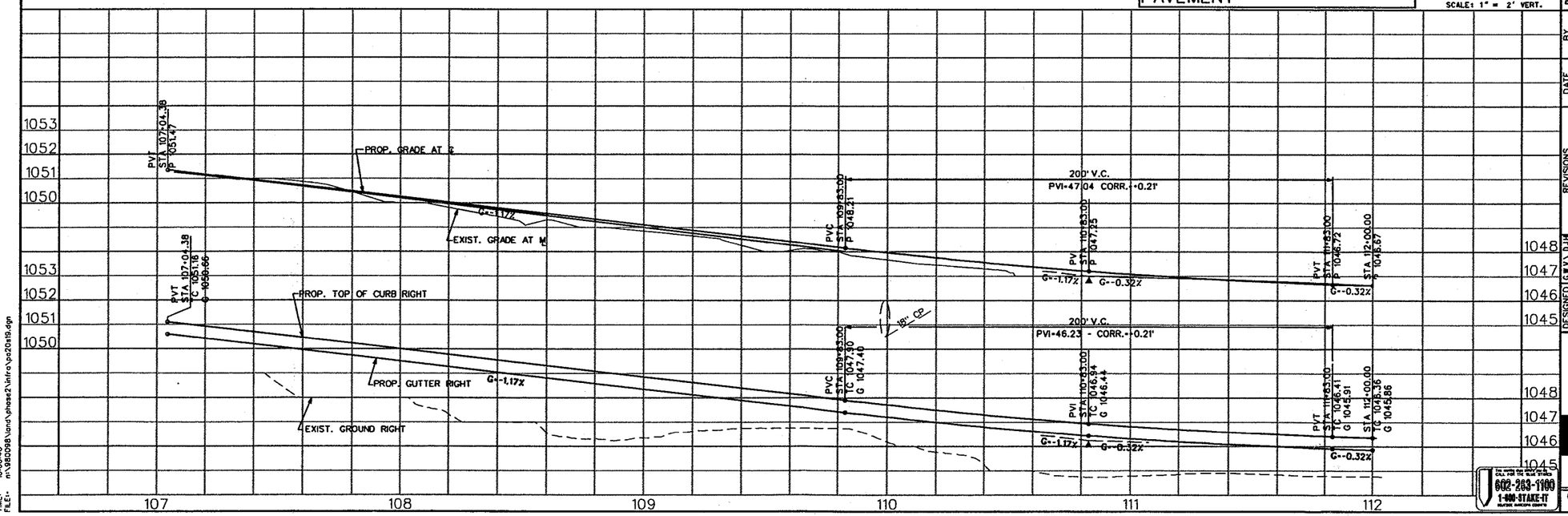
STORM DRAIN CONSTRUCTION NOTES

1. STA 110+22 - 33'RT
   REMOVE EX. HEADWALL
   CONSTRUCT 5' DIAMETER STORM DRAIN MANHOLE #3
   PER M.A.G. STD. DET. 520 & 522
   RIM = 46.80
   INV. S. = 42.80 (30")
   CONNECT TO EXISTING CULVERT
2. INSTALL 20 LF
   30" RGRCP (CL. IV)
   S=0.0050'/'
3. STA 110+22 - 62'RT
   CONSTRUCT 5' DIAMETER STORM DRAIN MANHOLE #4
   PER M.A.G. STD. DET. 520 & 522
   RIM = 46.80
   INV. N&W =42.70
   INV. E. = 42.70
4. INSTALL 318 LF
   30" RGRCP (CL. IV)
   S=0.0119'/'
5. INSTALL 460 LF
   36" RGRCP (CL. IV)
   S=0.0089'/'



STA 107+05.00 TO 112+00.00
REMOVE 1785 S.Y. EXISTING PAVEMENT

SCALE: 1" = 20' HORIZ.
SCALE: 1" = 2' VERT.



DATE:- Dec. 14, 2001
REC:- 95-0046
FILE:- m:\980098\land\phase2\infra\pa20s19.dgn

WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED G.W.Y.V. D.J.H.
DRAWN D.J.H.
CHECKED G.W.Y.V. D.J.H.
DATE MAR-2001

PAVING AND STORM DRAIN PLANS

CVL

SHEET 19 OF 30

CVL PROJECT NO.: 000046-04

CALL FOR 24 HOUR NOTICE BEFORE YOU DIG
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1-800-STAKE-IT

.../land/phase2/infra/pa20s19.dgn Aug. 15, 2003 11:55:12

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE E)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE D)
4. INSTALL ROLL CURB & GUTTER-M.C.D.O.T. STD. DET. 2030
5. INSTALL SIDEWALK RAMP-MCDOT STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL SIDEWALK RAMP-MCDOT STD. DET. 2031-A
8. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
9. INSTALL 6' VALLEY GUTTER & APRON-M.A.G. STD. DET. 240 (MODIFIED)
10. INSTALL 5' CURB TRANSITION FROM VERTICAL TO ROLL CURB-M.A.G. STD. DET. 221
11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
12. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
13. MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422
14. WATER VALVE/CLEANOUT ADJUSTMENT- M.A.G. STD. DET. 270
15. INSTALL SIDEWALK RAMP PER MCDOT STD.DET. 2032-B
16. INSTALL THICKENED EDGE OF PAVEMENT PER M.A.G. STD. DET. 201, TYPE 'B'
17. INSTALL CONC. SCUPPER PER M.A.G. STD. DET. 206.2 WITH OPENING WIDTH AS INDICATED ON PLAN.
18. DEPRESS LIP OF GUTTER ½" BELOW FLOWLINE.
19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-A WITH M3 OBJECT MARKERS
20. INSTALL 16' DRIVEWAY PER MCDOT STD. DET. 2034
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. SAWCUT, REMOVE, AND REPLACE A 2' WIDE STRIP OF EXIST. A.C. PAVEMENT, REPLACE PER MAG SEC. 336 AND MAG STD. DET. 200 OR IN KIND WHICH EVER IS GREATER.
23. INSTALL PVC SLEEVE SCH. 40 - SEE PLANS FOR SIZE & LENGTH
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS=12"@D +6" (UNLESS OTHERWISE NOTED)
25. CONSTRUCT 3-8'X4' C.B.C WITH INLET/OUTLET HEADWALLS & WINGWALLS TYPE 'A' PER A.D.O.T. STD. DET. B-02.30 & 08.10 SEE DET. SHTS. 27,28&29
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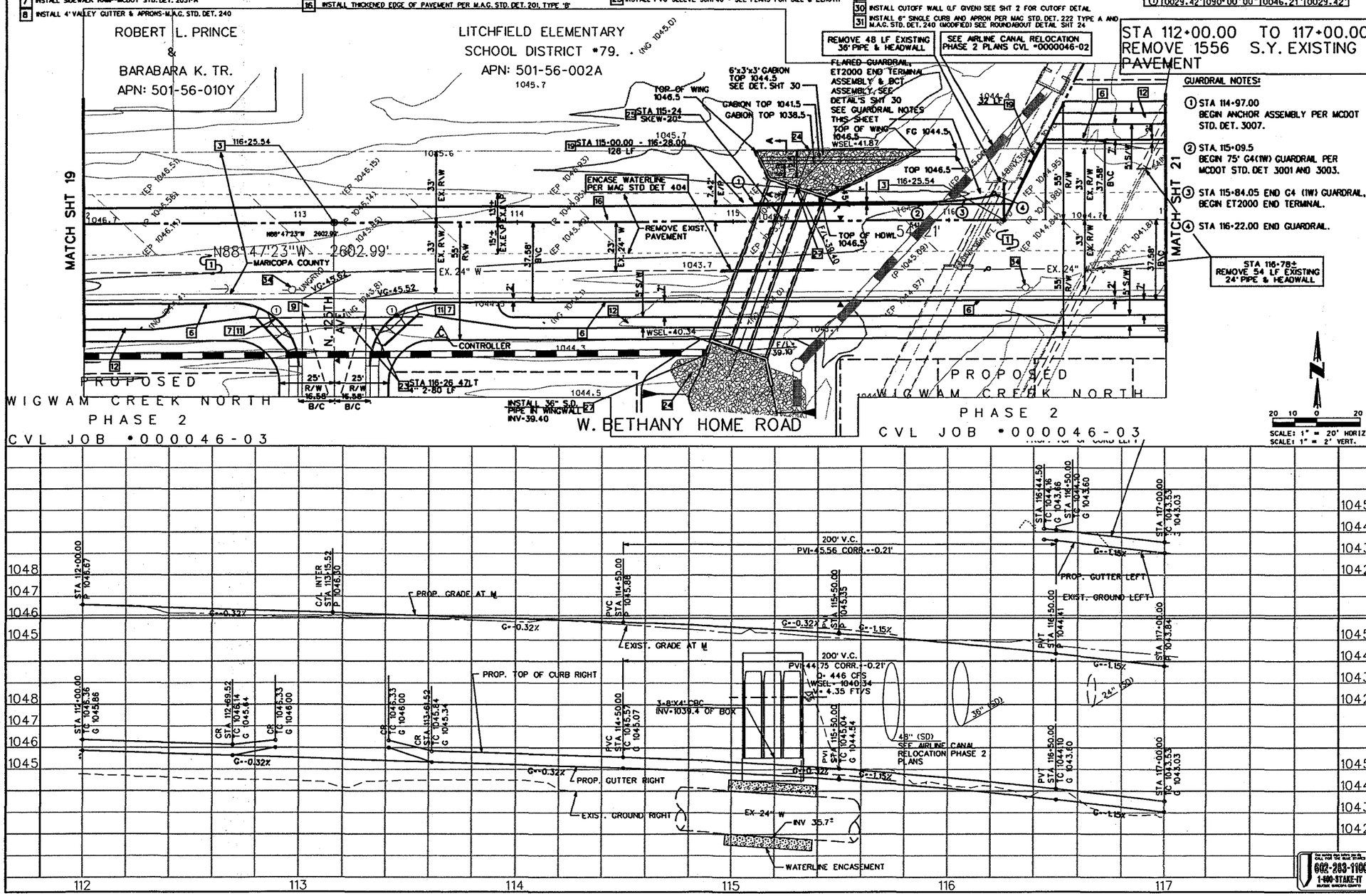
33. INSTALL BARRIER TRANSISTION-TANGENT DEPARTURE TYPE 1 PER A.D.O.T. DWG. NO. C-10.75 SEE SHT. 3
34. RELOCATE POWER POLE (BY UTILITY COMPANY)

BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0029.42'	090°00'00"	0046.21'	0029.42'



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PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

	BY	DATE	REVISIONS

DESIGNED C.W.V. D.J.H.
DRAWN D.J.H.
CHECKED C.W.V. D.J.H.
DATE MAR-2001

PAVING AND STORM DRAIN PLANS

CVL

SHEET 20 OF 30

CVL PROJECT NO.: 000046-04

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DATE:- Jan. 07, 2002
TIME:- 11:21:46
FILE:- n:\980098\land\phase2\infra\pa20s20.dgn

.../land/phase2/infra/pa20s20.dgn Aug. 15, 2003 11:55:17

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
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6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
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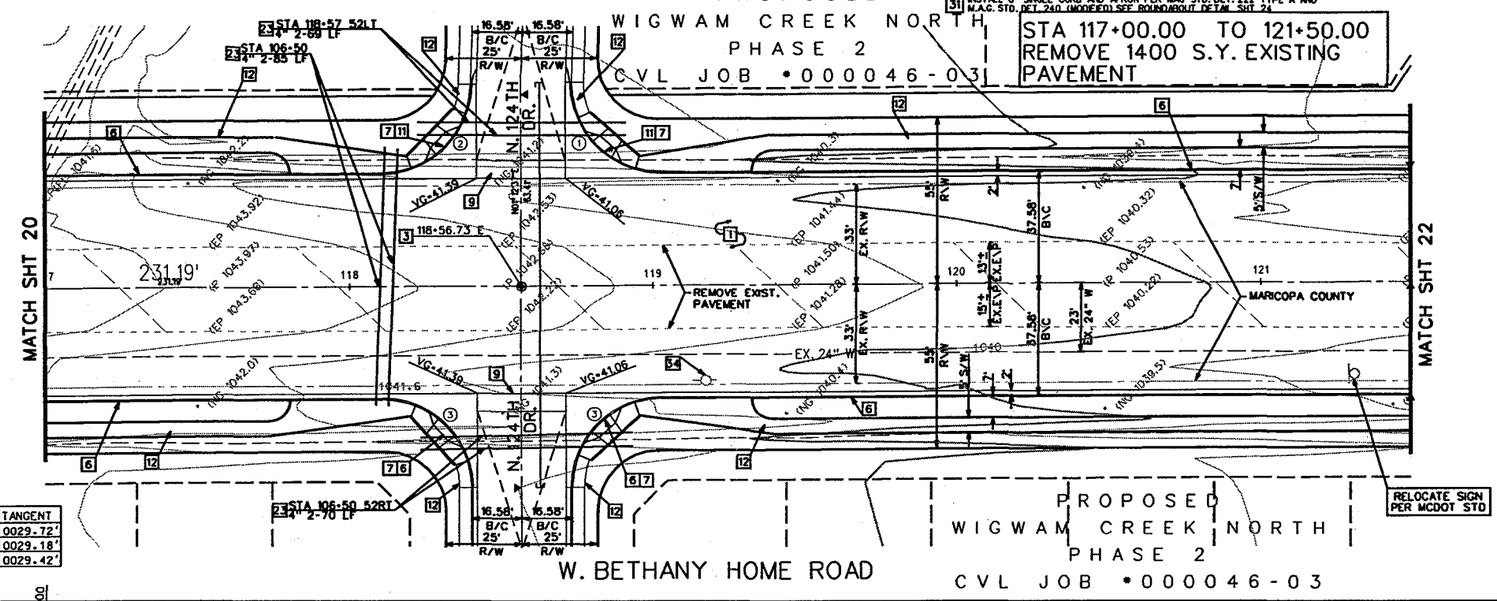
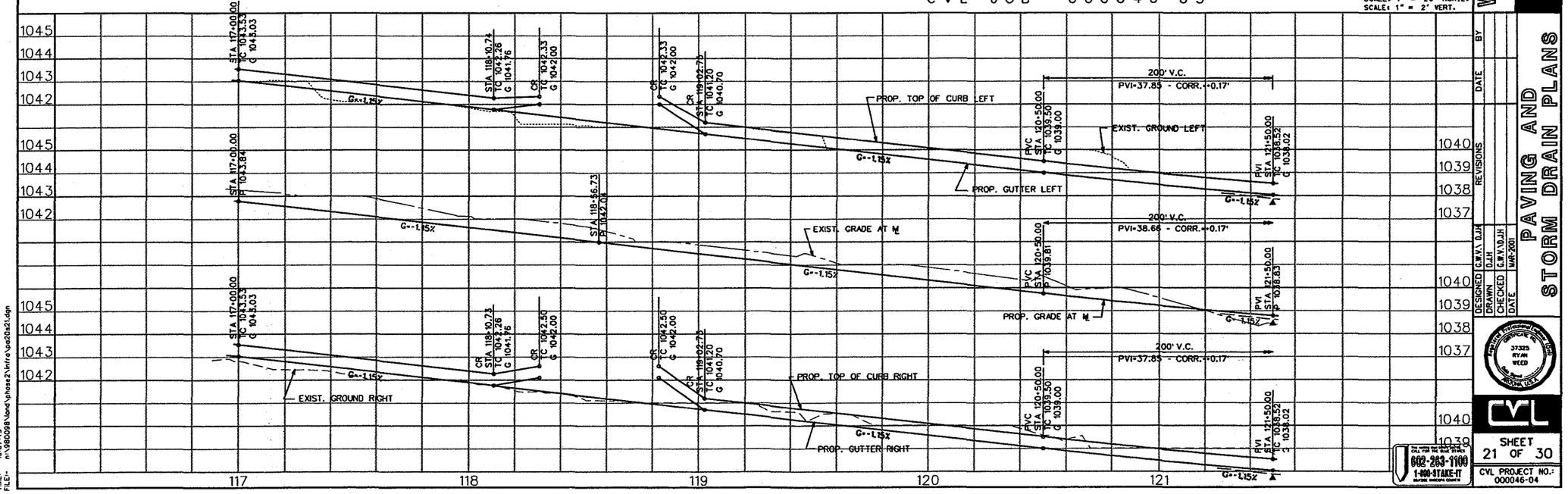
34. RELOCATE POWER POLE (BY UTILITY COMPANY)



BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0029.42'	090°34'50"	0046.51'	0029.72'
2	0029.42'	089°32'20"	0045.98'	0029.18'
3	0029.42'	090°00'00"	0046.21'	0029.42'



DATE:- Dec. 14, 2001
TIME:- 16:07:49
FILE:- n:\980098\land\phase2\infra\pa20s21.dgn

602-263-1100
1-800-STAKE-IT

WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

DATE	BY	REVISIONS

DESIGNED G.W.K. D.J.H.
DRAWN D.J.H.
CHECKED G.W.K. D.J.H.
DATE MAR-2001

PAVING AND STORM DRAIN PLANS

CVL

SHEET 21 OF 30

CVL PROJECT NO.: 000046-04

.../land/phase2/infra/pa20s21.dgn Aug. 15, 2003 11:55:23

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-2 (TYPE E)
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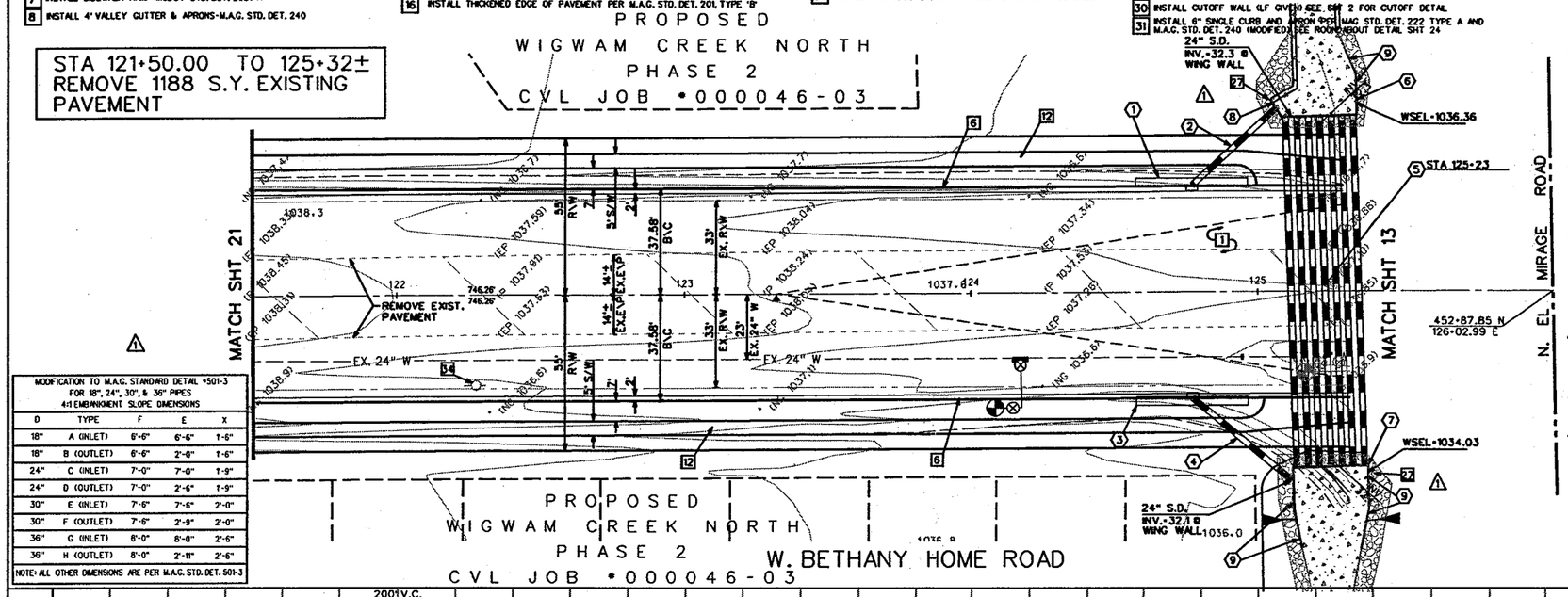
33. INSTALL BARRIER TRANSISTION-TANGENT DEPARTURE TYPE 1 PER A.D.O.T. DWG. NO. C-10.73 SEE SHT. 3
34. RELOCATE POWER POLE (BY UTILITY COMPANY)

STA 121+50.00 TO 125+32±
REMOVE 1188 S.Y. EXISTING PAVEMENT



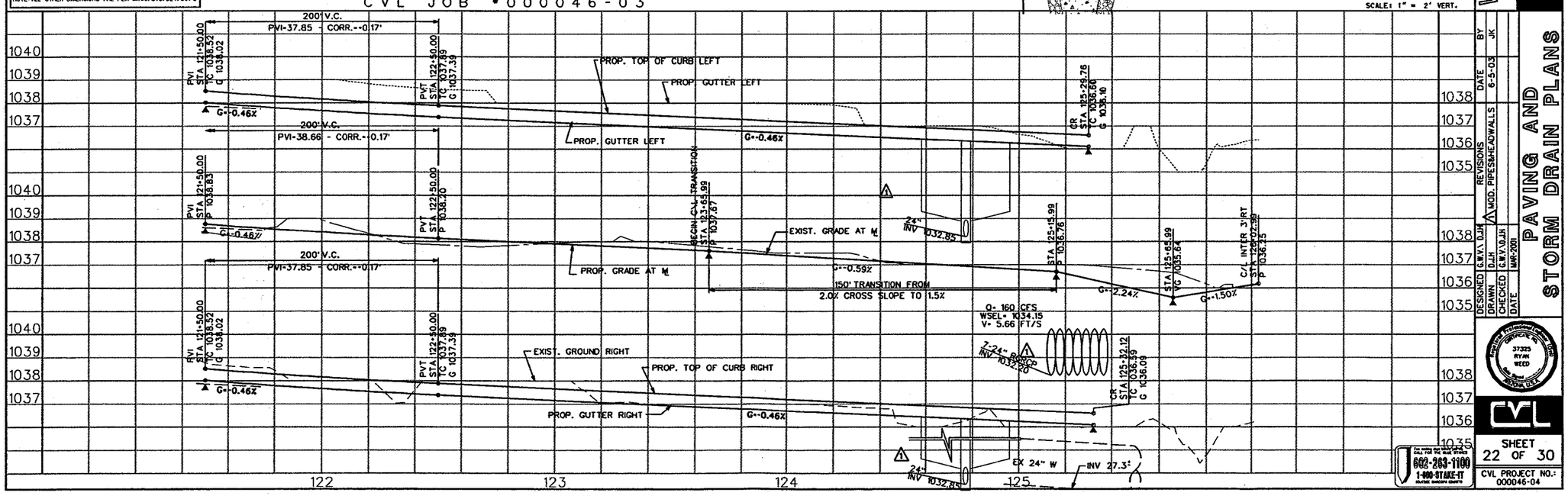
MODIFICATION TO M.A.G. STANDARD DETAIL #501-3 FOR 18", 24", 30", & 36" PIPES 4:1 EMBANKMENT SLOPE DIMENSIONS

D	TYPE	F	E	X
18"	A (INLET)	6'-6"	6'-6"	1'-6"
18"	B (OUTLET)	6'-6"	2'-0"	1'-6"
24"	C (INLET)	7'-0"	7'-0"	1'-9"
24"	D (OUTLET)	7'-0"	2'-6"	1'-9"
30"	E (INLET)	7'-6"	7'-6"	2'-0"
30"	F (OUTLET)	7'-6"	2'-9"	2'-0"
36"	G (INLET)	8'-0"	8'-0"	2'-6"
36"	H (OUTLET)	8'-0"	2'-11"	2'-6"

NOTE: ALL OTHER DIMENSIONS ARE PER M.A.G. STD. DET. 501-3

STORM DRAIN NOTES:

1. STA 124+77 CONSTRUCT CATCH BASIN #0-1 PER M.A.G. STD. DETAIL 533-1 TYPE 'D' AND GRATE PER M.A.G. STD. DTL. 540-1, TW-1 AND C&G TRANSITION PER M.A.G. STD. DET. 532 L =17', L =17', V=3.50', TC=36.35 IN/OUT=32.85
2. INSTALL 45 LF, 24" R.G.P.C.P. (CLIII) S=0.0122'/'
3. STA 124+77 CONSTRUCT CATCH BASIN #0-2 PER M.A.G. STD. DETAIL 533-1 TYPE 'D' AND GRATE PER M.A.G. STD. DTL. 540-1, TW-1 AND C&G TRANSITION PER M.A.G. STD. DET. 532 L =17', L =17', V=3.50', TC=36.35 IN/OUT=32.85
4. INSTALL 45 LF, 24" R.G.R.C.P. (CLIII) S=0.0167'/'
5. INSTALL 7-126 LF-24" R.G.R.C.P. (CLIV) S=0.0014'/'
6. STA 125+22-63' LT CONSTRUCT HEADWALL PER M.A.G. STD. DETAIL 501-3 (MODIFIED SEE TABLE LEFT) W/ TRASH RACK PER M.A.G. STD. DTL. 502-2 (Z DIMENSION MODIFIED TO 4.5' BAR LENGTHS TO BE ADJUSTED ACCORDINGLY) INV 7-24"=32.3 TOP OF HDWL=37.9 HDWL LENTH=26.52'
7. STA 125+22-63' LT CONSTRUCT HEADWALL PER M.A.G. STD. DETAIL 501-3 (MODIFIED SEE TABLE LEFT) W/ TRASH RACK PER M.A.G. STD. DTL. 502-2 (Z DIMENSION MODIFIED TO 4.5' BAR LENGTHS TO BE ADJUSTED ACCORDINGLY) INV 7-24"=32.1 TOP OF HDWL=37.9 HDWL LENTH=26.52'
8. WINGWALL LENGTH=7.5'
9. WINGWALL LENGHT=15'



DATE:- Dec. 14, 2001
TIME:- 16:08:08
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CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
(ALAND ARIZONA ONLY)

BY	DATE	REVISIONS
JK	6-5-03	MOD. PIPES&HEADWALLS

DESIGNED G.W.V.\ D.J.H
DRAWN D.J.H
CHECKED G.W.V.\D.J.H
DATE MAR-2001

WIGWAM CREEK NORTH PHASE 2 - INFRASTRUCTURE
INTERSECTION OF BETHANY HOME ROAD & EL MIRAGE ROAD

COE & VAN LOO
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PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

PAVING AND STORM DRAIN PLANS

CVL

SHEET 22 OF 30

CVL PROJECT NO.: 000046-04

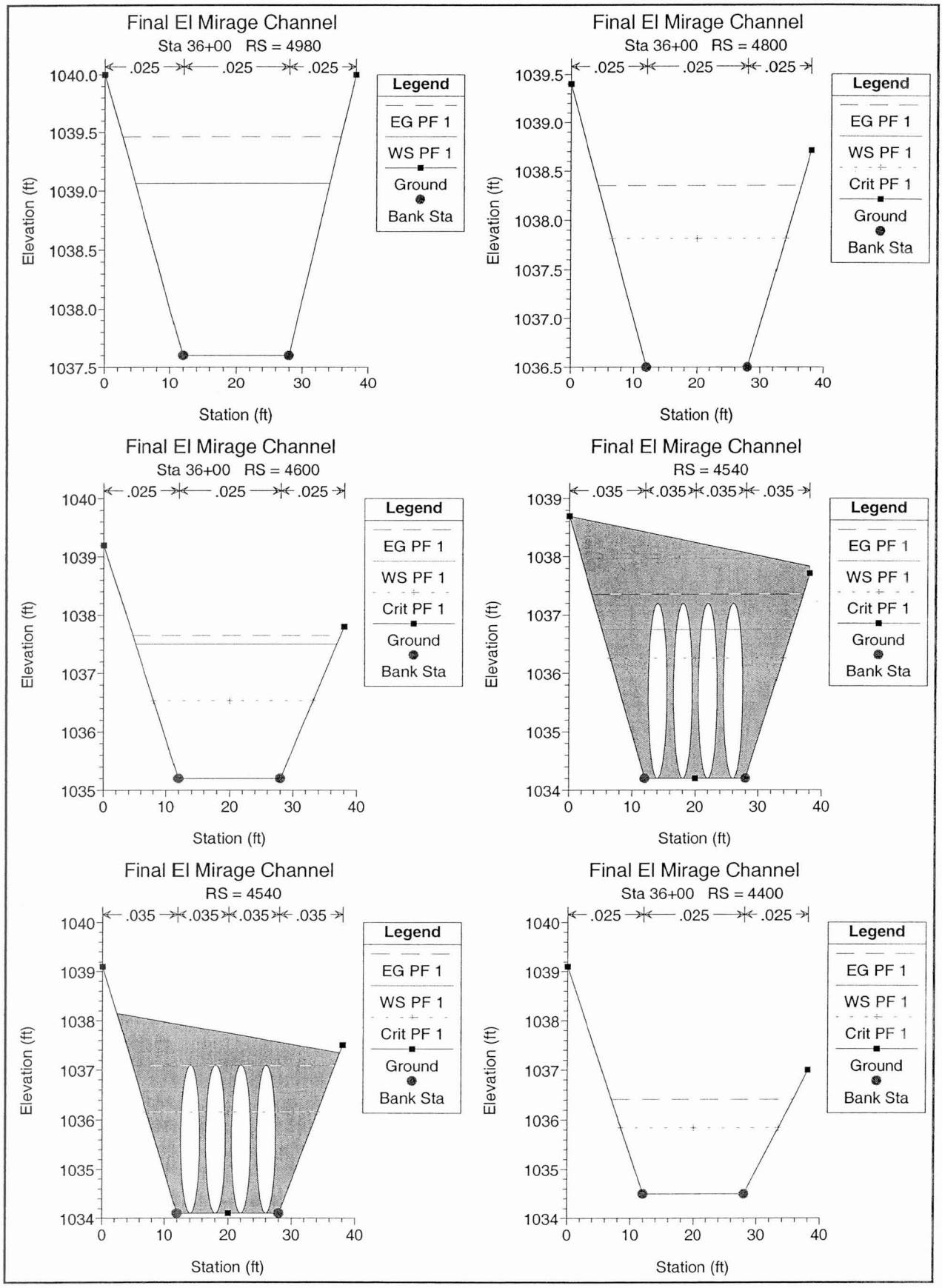
.../land/phase2/infra/pa20s22.dgn Aug. 15, 2003 11:55:26

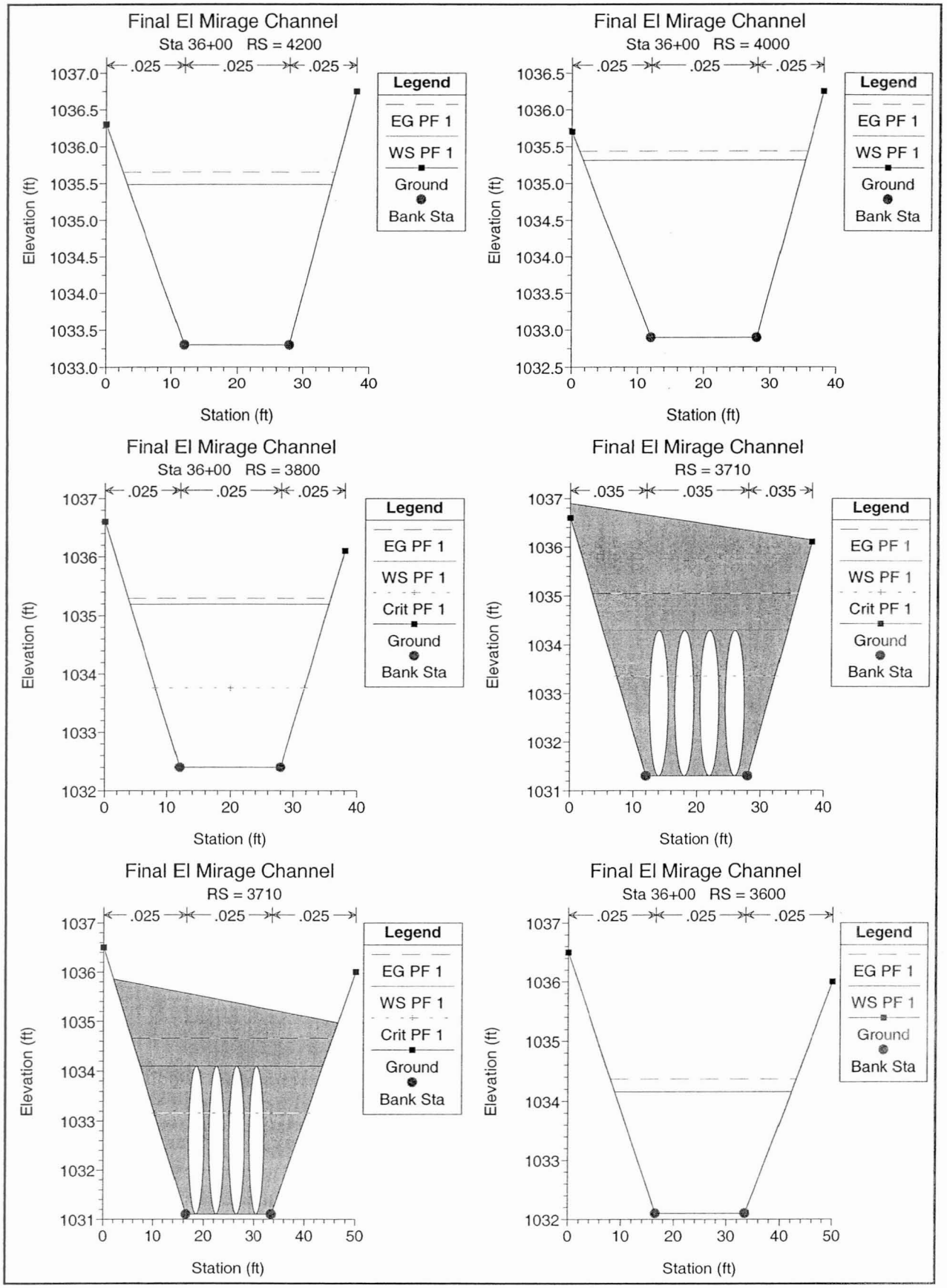
APPENDIX F

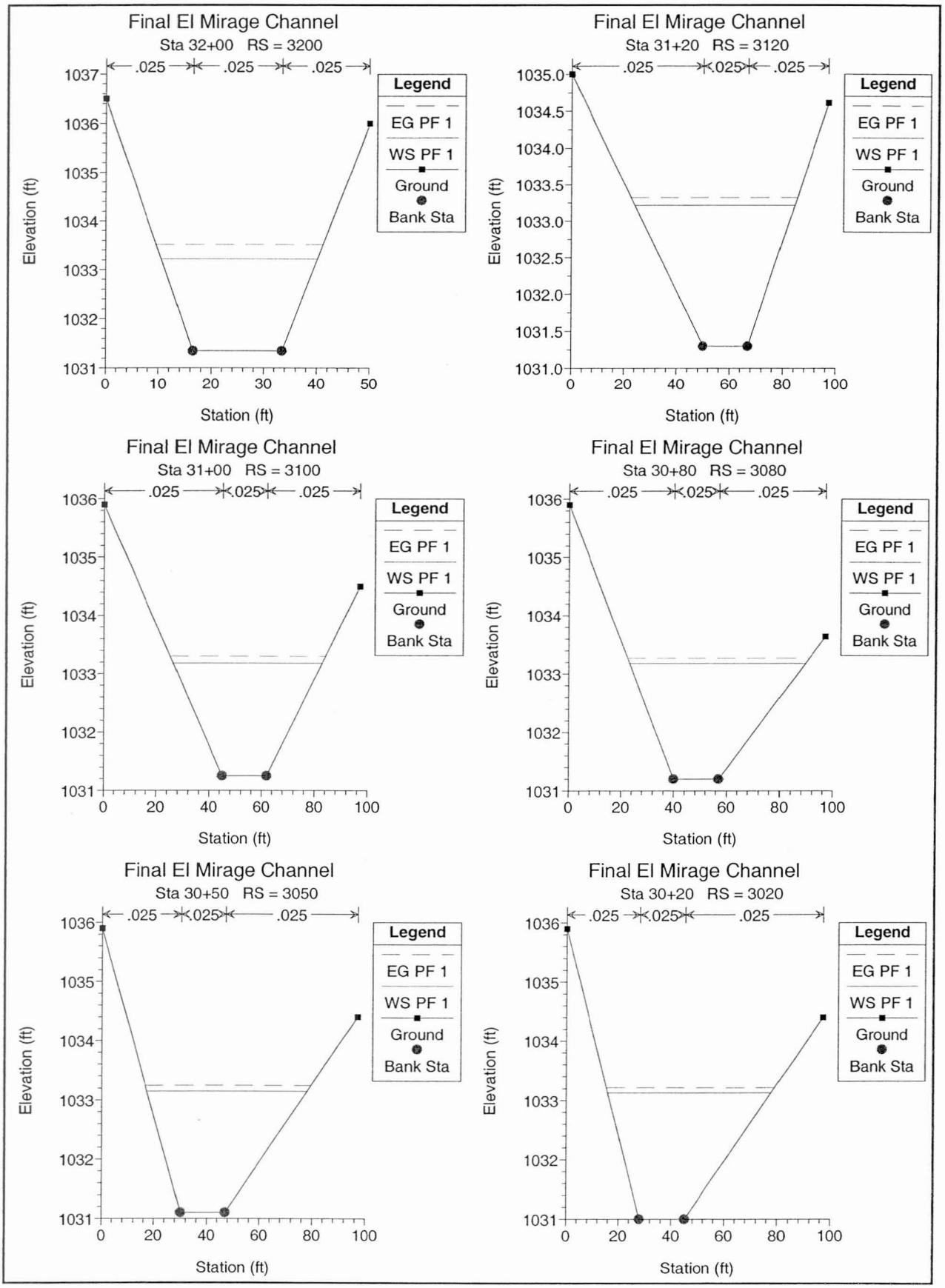
El Mirage Channel Hydraulics

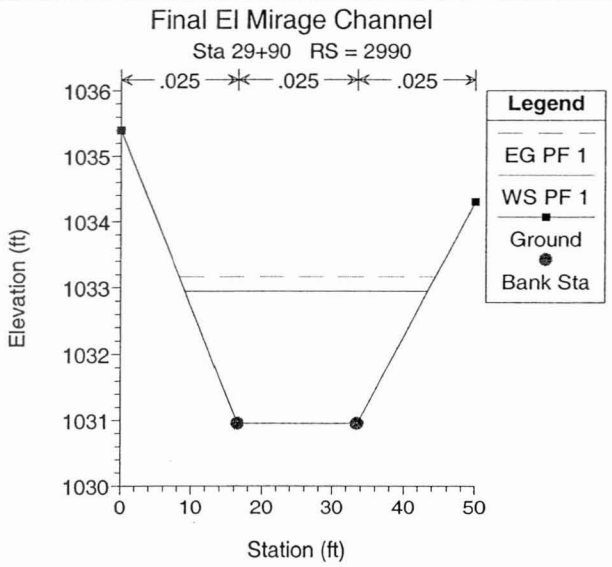
HEC-RAS Plan: ch_9 River: Channel 8 Reach: 1

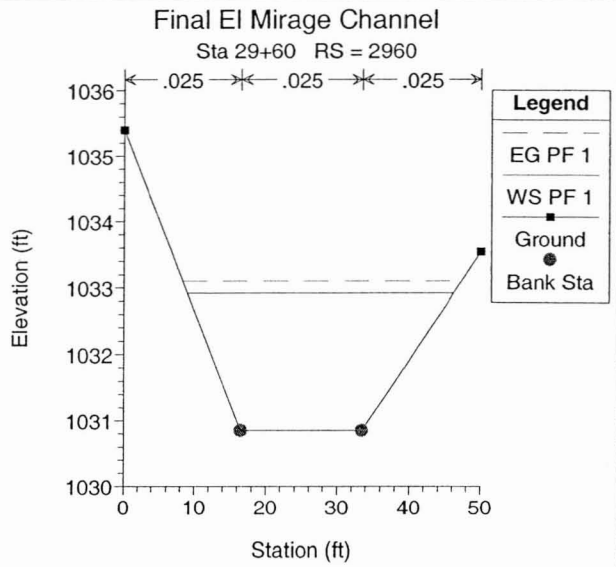
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	4980	160.00	1037.60	1039.06		1039.46	0.004991	5.42	33.28	29.43	0.79
1	4800	160.00	1036.50	1037.81	1037.81	1038.35	0.007638	6.23	28.52	27.39	0.96
1	4600	160.00	1035.20	1037.50	1036.54	1037.65	0.001035	3.33	55.01	31.77	0.39
1	4540	Culvert									
1	4400	160.00	1034.50	1035.84	1035.84	1036.42	0.007731	6.36	27.46	24.88	0.97
1	4200	160.00	1033.30	1035.48		1035.65	0.001259	3.55	51.43	31.07	0.42
1	4000	160.00	1032.90	1035.31		1035.44	0.000844	3.10	59.69	33.53	0.35
1	3800	160.00	1032.40	1035.19	1033.76	1035.29	0.000552	2.77	66.36	31.53	0.29
1	3710	Culvert									
1	3600	181.00	1032.10	1034.16		1034.37	0.001724	3.99	51.82	33.41	0.49
1	3200	181.00	1031.35	1033.22		1033.51	0.002660	4.65	43.51	29.61	0.60
1	3120	181.00	1031.30	1033.22		1033.32	0.001135	3.09	74.00	60.25	0.39
1	3100	181.00	1031.25	1033.18		1033.30	0.001196	3.19	70.96	56.49	0.40
1	3080	181.00	1031.20	1033.18		1033.27	0.000895	2.81	82.68	66.38	0.35
1	3050	181.00	1031.10	1033.15		1033.24	0.000895	2.87	79.82	60.87	0.35
1	3020	181.00	1031.00	1033.13		1033.21	0.000776	2.74	83.80	61.72	0.33
1	2990	181.00	1030.95	1032.94		1033.16	0.001868	4.07	51.03	34.21	0.51
1	2960	181.00	1030.85	1032.92		1033.10	0.001524	3.76	55.98	37.17	0.46
1	2930	181.00	1030.80	1032.87		1033.05	0.001524	3.77	55.87	36.98	0.46
1	2900	181.00	1030.75	1032.80		1033.01	0.001709	3.96	52.41	34.20	0.49
1	2870	181.00	1030.65	1032.76		1032.95	0.001492	3.78	55.22	35.25	0.46
1	2840	181.00	1030.55	1032.73		1032.90	0.001332	3.65	57.36	35.61	0.44
1	2800	181.00	1030.45	1032.70	1031.82	1032.85	0.001142	3.44	61.37	37.64	0.40
1	2765	Culvert									
1	2700	181.00	1030.32	1032.02		1032.36	0.003500	5.00	40.75	31.06	0.68
1	2400	181.00	1029.30	1031.06		1031.37	0.003019	4.77	42.87	31.59	0.63
1	2000	181.00	1027.85	1030.85	1029.25	1030.94	0.000438	2.59	81.90	37.56	0.26
1	1980	Culvert									
1	1900	240.00	1027.70	1030.52		1030.69	0.000919	3.60	78.37	38.52	0.38
1	1880	240.00	1027.70	1030.50		1030.67	0.000946	3.63	77.56	38.36	0.38
1	1500	240.00	1027.10	1030.22		1030.36	0.000680	3.31	84.94	37.47	0.33
1	1100	240.00	1026.60	1030.04		1030.14	0.000416	2.76	104.45	43.69	0.26
1	1070	240.00	1026.46	1030.02		1030.12	0.000420	2.84	99.81	39.08	0.27
1	1040	240.00	1026.41	1030.00		1030.11	0.000422	2.86	98.48	37.80	0.27
1	1010	240.00	1026.35	1030.00		1030.09	0.000364	2.69	106.42	41.28	0.25
1	980	240.00	1026.31	1030.00		1030.08	0.000336	2.60	110.90	43.17	0.24
1	950	240.00	1026.25	1029.99		1030.07	0.000301	2.49	114.93	43.45	0.23
1	920	240.00	1026.20	1029.98		1030.06	0.000318	2.57	111.74	42.18	0.23
1	890	240.00	1026.16	1029.97		1030.05	0.000283	2.44	117.20	43.48	0.22
1	860	240.00	1026.10	1029.96		1030.04	0.000309	2.57	111.33	40.75	0.23
1	830	240.00	1026.04	1029.95		1030.03	0.000260	2.38	120.09	43.36	0.21
1	800	277.00	1026.00	1029.91		1030.01	0.000388	2.90	113.93	41.31	0.26
1	600	277.00	1025.69	1029.85		1029.94	0.000315	2.73	121.58	41.50	0.24
1	550	277.00	1025.60	1029.83	1027.44	1029.92	0.000295	2.67	124.07	41.61	0.23
1	535	Culvert									
1	470	277.00	1025.50	1029.01		1029.16	0.000574	3.29	97.80	37.67	0.31
1	200	277.00	1024.98	1028.91		1029.02	0.000384	2.90	113.93	40.94	0.26
1	0	277.00	1024.62	1028.86		1028.95	0.000289	2.65	121.26	38.25	0.23
1	-55	277.00	1024.50	1028.82	1026.54	1028.93	0.000360	2.99	113.44	38.51	0.25
1	-101	Culvert									
1	-160	277.00	1024.00	1027.82	1026.04	1027.98	0.000597	3.55	94.13	35.28	0.32

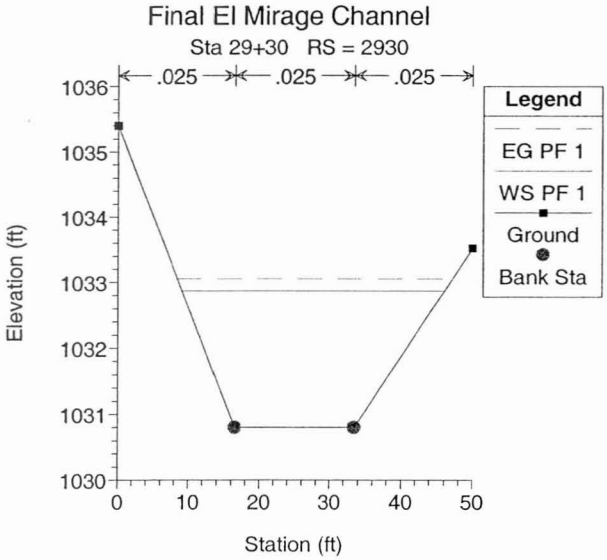

Final El Mirage Channel
Sta 36+00 RS = 4980
.025 .025 .025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Final El Mirage Channel
Sta 36+00 RS = 4800
.025 .025 .025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Final El Mirage Channel
Sta 36+00 RS = 4600
.025 .025 .025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Final El Mirage Channel
RS = 4540
.035 .035 .035 .035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Final El Mirage Channel
RS = 4540
.035 .035 .035 .035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Final El Mirage Channel
Sta 36+00 RS = 4400
.025 .025 .025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

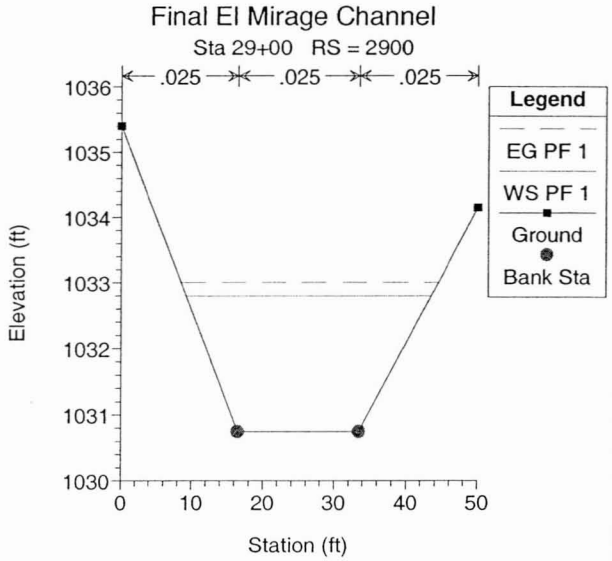

Final El Mirage Channel
Sta 36+00 RS = 4200
.025 .025 .025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Final El Mirage Channel
Sta 36+00 RS = 4000
.025 .025 .025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Final El Mirage Channel
Sta 36+00 RS = 3800
.025 .025 .025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Final El Mirage Channel
RS = 3710
.035 .035 .035
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Final El Mirage Channel
RS = 3710
.025 .025 .025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Final El Mirage Channel
Sta 36+00 RS = 3600
.025 .025 .025
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta

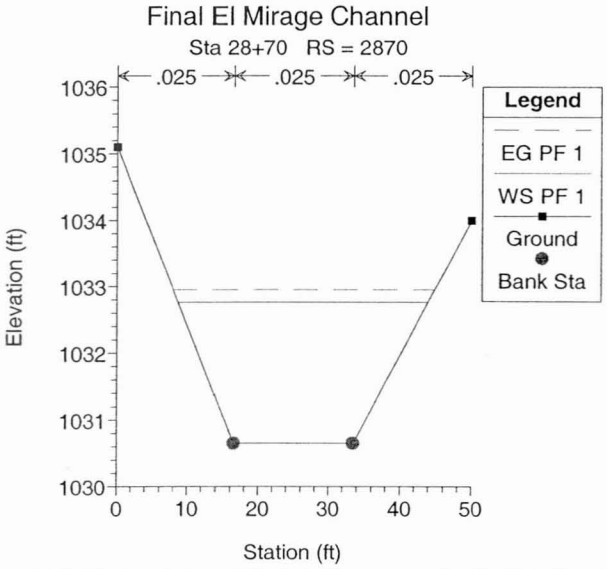

Final El Mirage Channel
Sta 32+00 RS = 3200
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Final El Mirage Channel
Sta 31+20 RS = 3120
.025 .025 .025
Final El Mirage Channel
Sta 31+00 RS = 3100
.025 .025 .025
Final El Mirage Channel
Sta 30+80 RS = 3080
.025 .025 .025
Final El Mirage Channel
Sta 30+50 RS = 3050
.025 .025 .025
Final El Mirage Channel
Sta 30+20 RS = 3020
.025 .025 .025

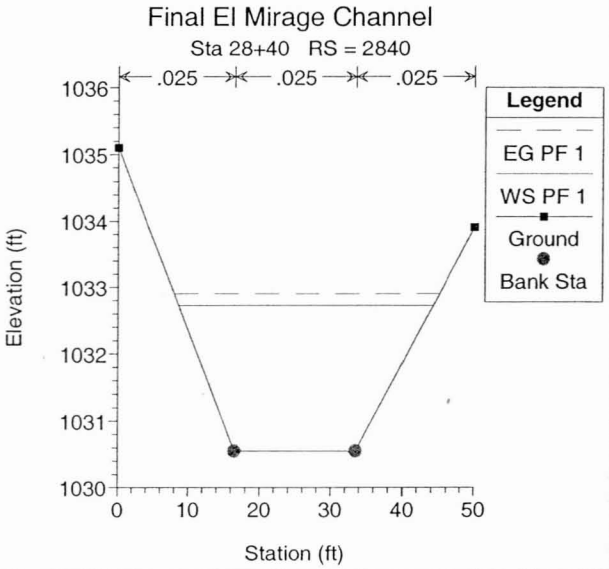

Final El Mirage Channel
Sta 29+90 RS = 2990
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1036
1035
1034
1033
1032
1031
1030
0 10 20 30 40 50
Station (ft)

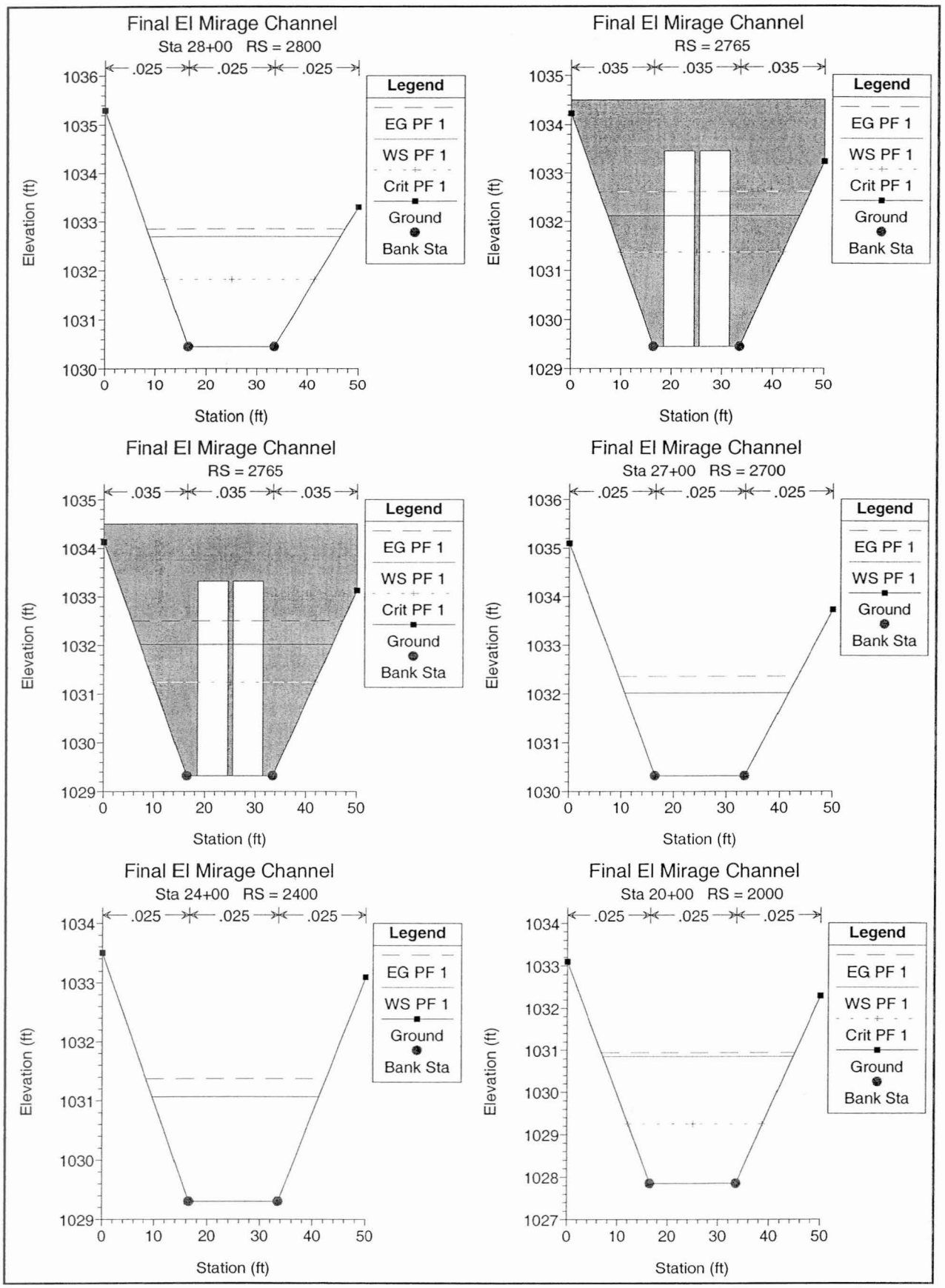

Final El Mirage Channel
Sta 29+60 RS = 2960
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1036
1035
1034
1033
1032
1031
1030
0 10 20 30 40 50
Station (ft)

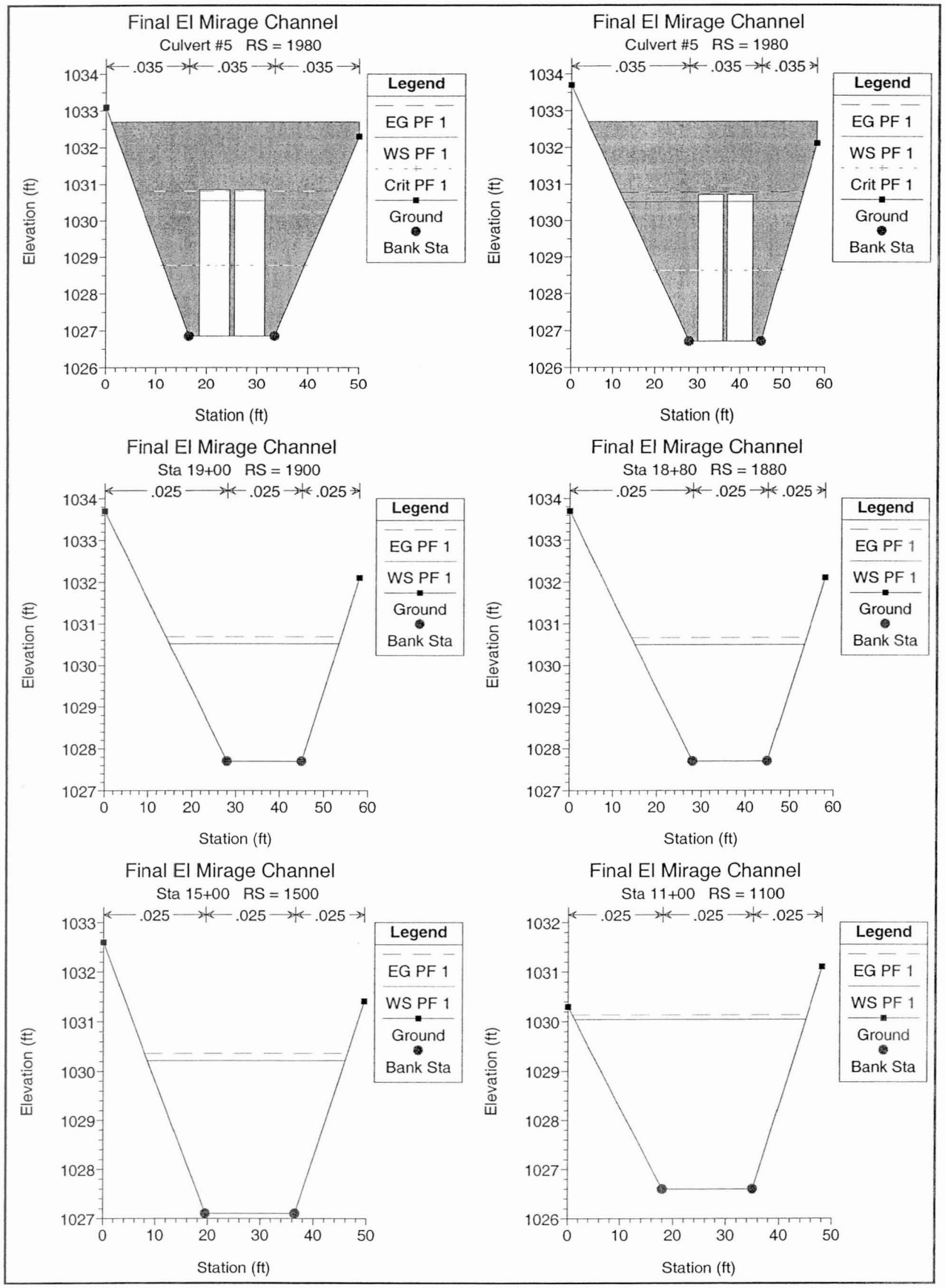

Final El Mirage Channel
Sta 29+30 RS = 2930
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1036
1035
1034
1033
1032
1031
1030
0 10 20 30 40 50
Station (ft)

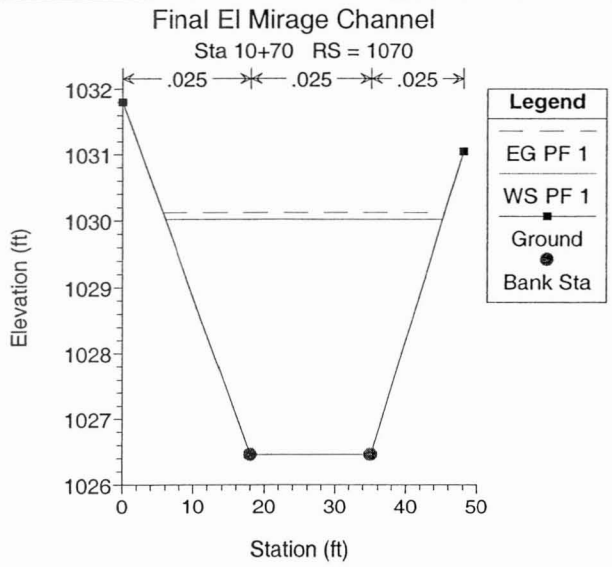

Final El Mirage Channel
Sta 29+00 RS = 2900
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1036
1035
1034
1033
1032
1031
1030
0 10 20 30 40 50
Station (ft)

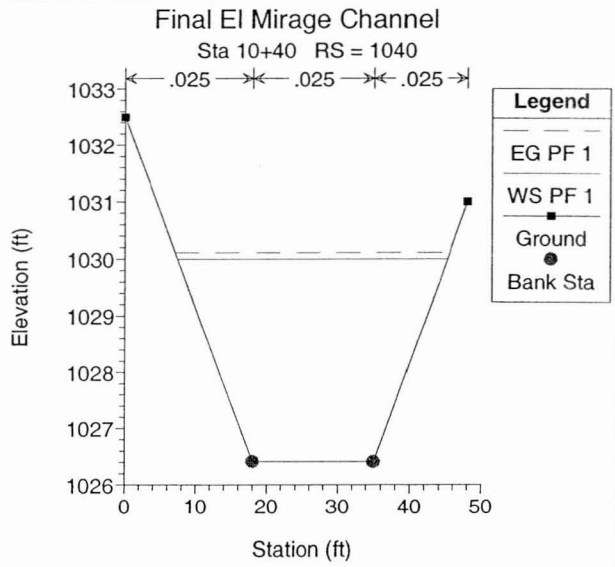

Final El Mirage Channel
Sta 28+70 RS = 2870
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1036
1035
1034
1033
1032
1031
1030
0 10 20 30 40 50
Station (ft)

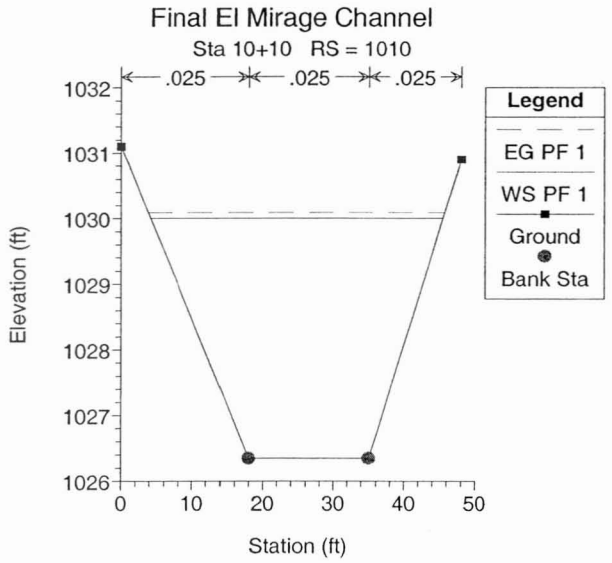

Final El Mirage Channel
Sta 28+40 RS = 2840
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1036
1035
1034
1033
1032
1031
1030
0 10 20 30 40 50
Station (ft)

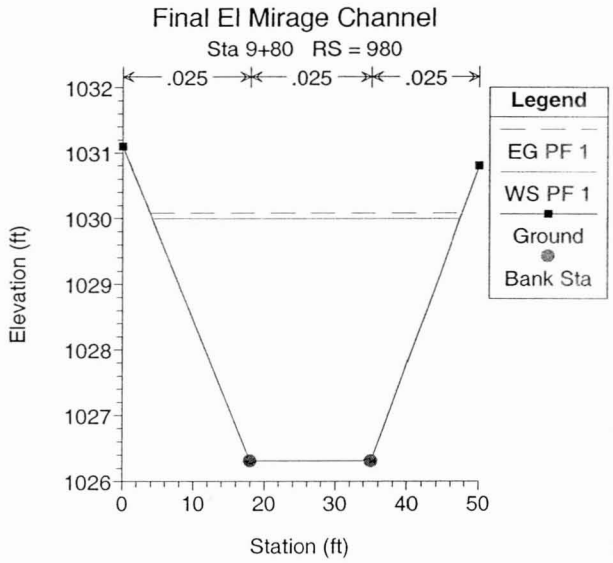

Final El Mirage Channel
Sta 28+00 RS = 2800
.025 .025 .025
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Final El Mirage Channel
RS = 2765
.035 .035 .035
Final El Mirage Channel
RS = 2765
.035 .035 .035
Final El Mirage Channel
Sta 27+00 RS = 2700
.025 .025 .025
Final El Mirage Channel
Sta 24+00 RS = 2400
.025 .025 .025
Final El Mirage Channel
Sta 20+00 RS = 2000
.025 .025 .025

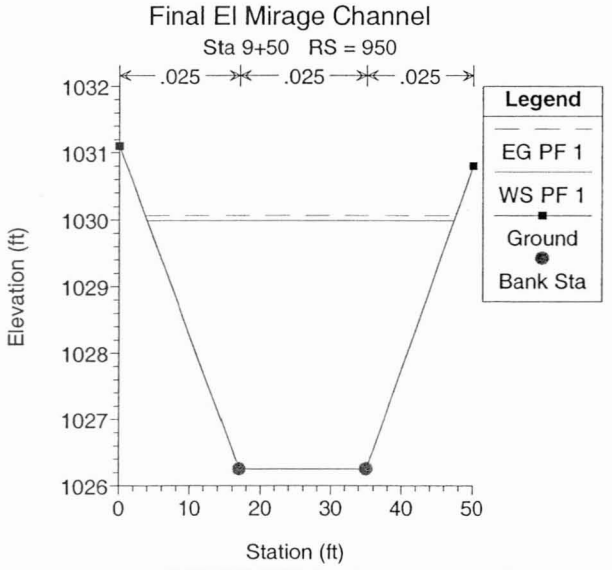

Final El Mirage Channel
Culvert #5 RS = 1980
.035 .035 .035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Final El Mirage Channel
Culvert #5 RS = 1980
.035 .035 .035
Final El Mirage Channel
Sta 19+00 RS = 1900
.025 .025 .025
Final El Mirage Channel
Sta 18+80 RS = 1880
.025 .025 .025
Final El Mirage Channel
Sta 15+00 RS = 1500
.025 .025 .025
Final El Mirage Channel
Sta 11+00 RS = 1100
.025 .025 .025

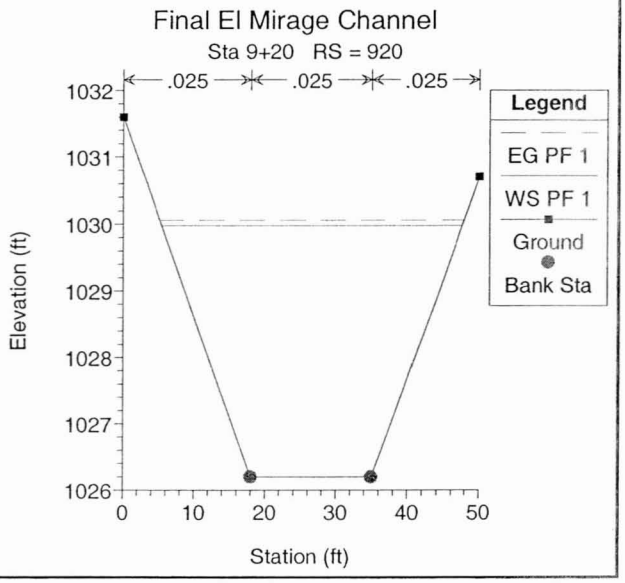

Final El Mirage Channel
Sta 10+70 RS = 1070
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

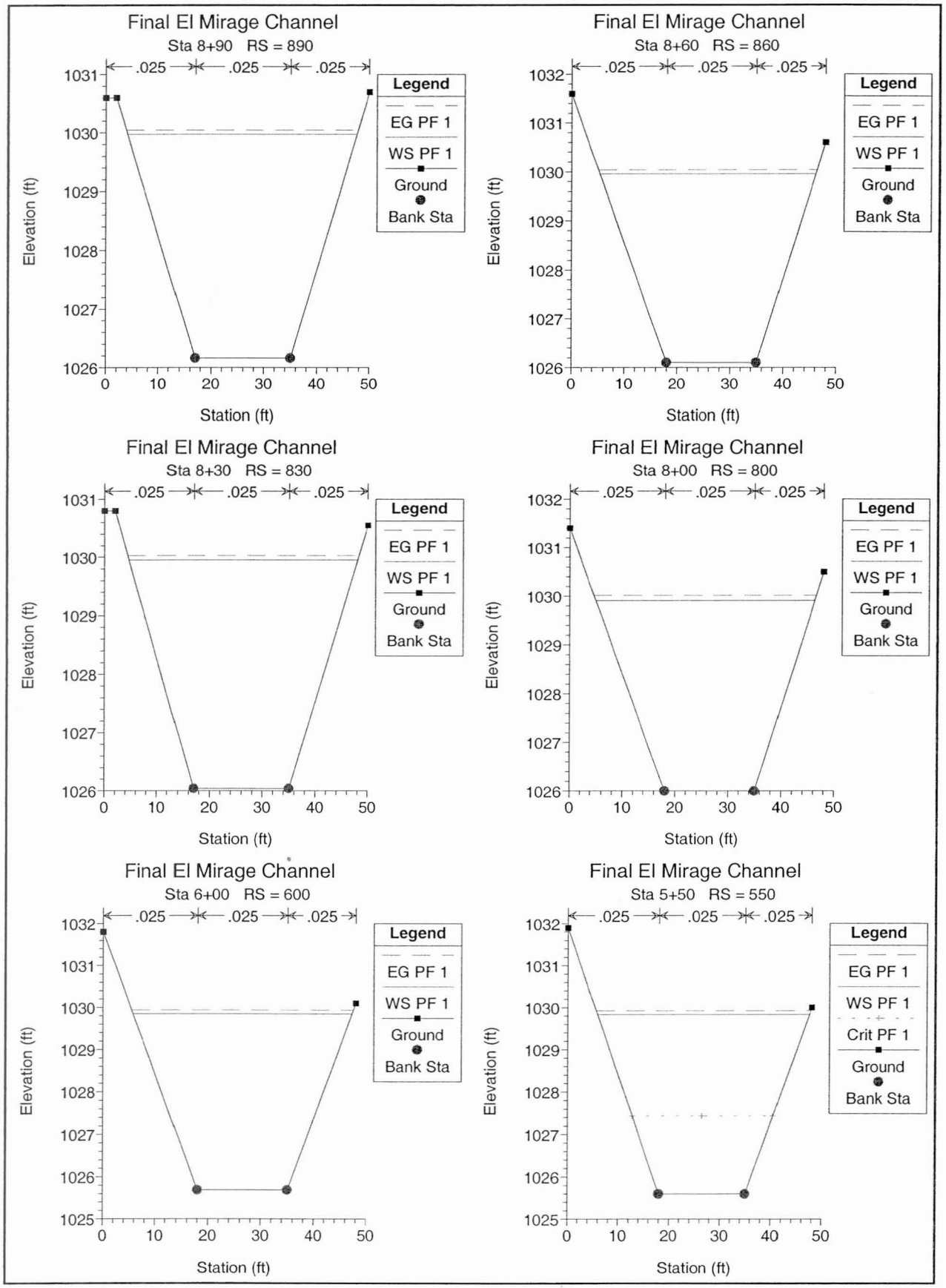

Final El Mirage Channel
Sta 10+40 RS = 1040
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

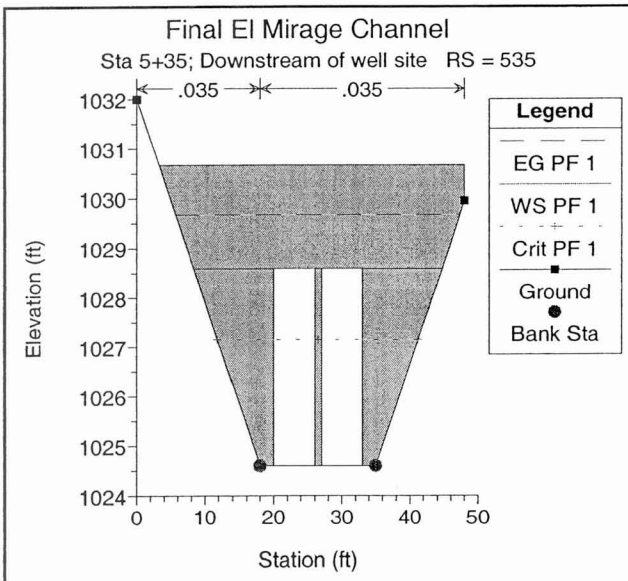

Final El Mirage Channel
Sta 10+10 RS = 1010
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

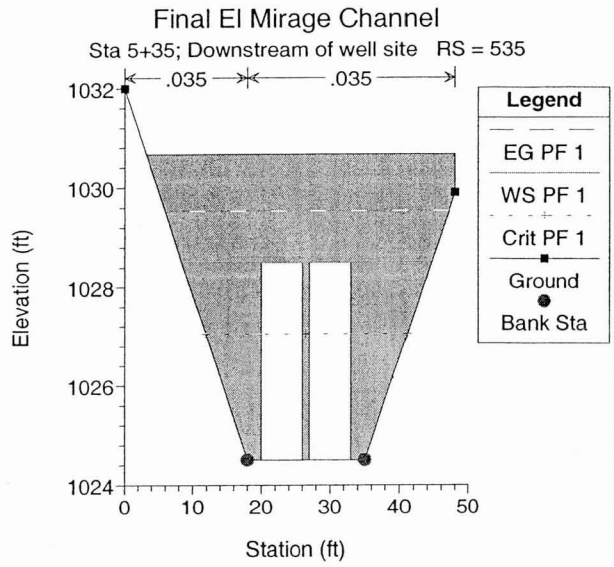

Final El Mirage Channel
Sta 9+80 RS = 980
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

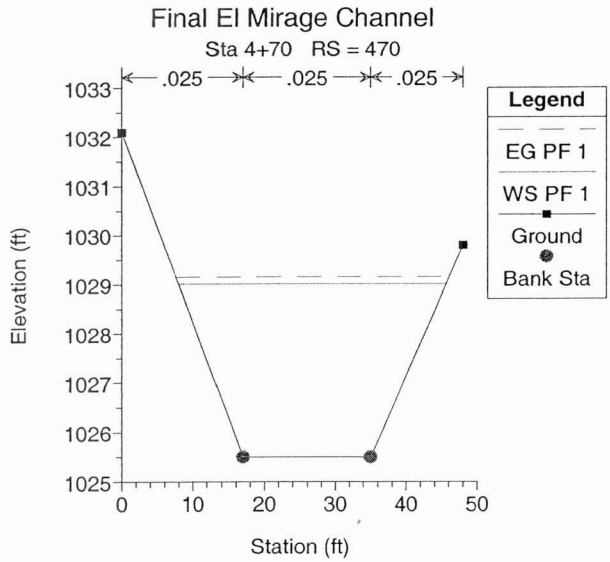

Final El Mirage Channel
Sta 9+50 RS = 950
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

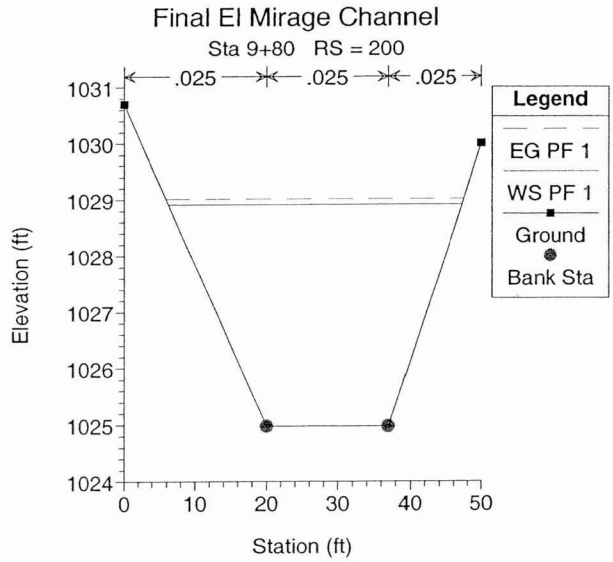

Final El Mirage Channel
Sta 9+20 RS = 920
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

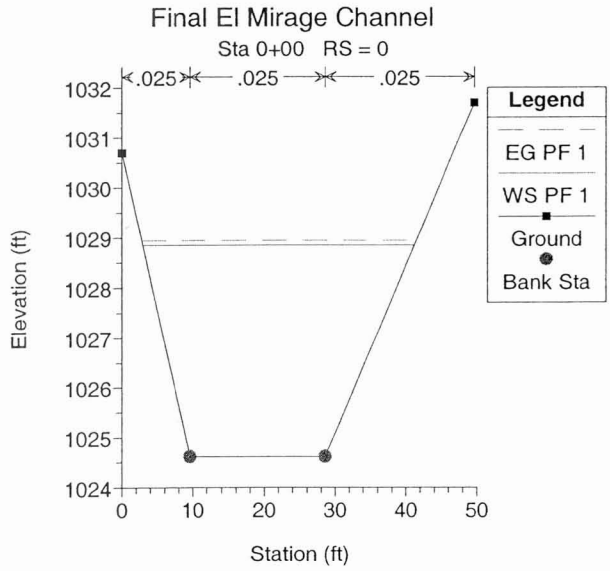

Final El Mirage Channel
Sta 8+90 RS = 890
.025 .025 .025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Final El Mirage Channel
Sta 8+60 RS = 860
Final El Mirage Channel
Sta 8+30 RS = 830
Final El Mirage Channel
Sta 8+00 RS = 800
Final El Mirage Channel
Sta 6+00 RS = 600
Final El Mirage Channel
Sta 5+50 RS = 550
Crit PF 1

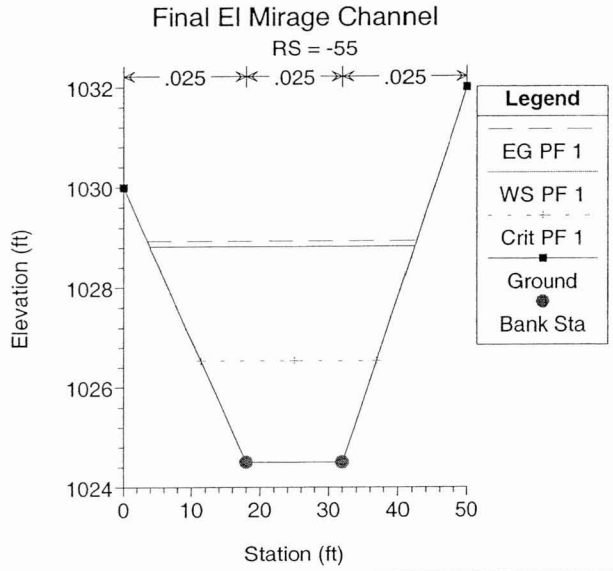

Final El Mirage Channel
Sta 5+35; Downstream of well site RS = 535
.035
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

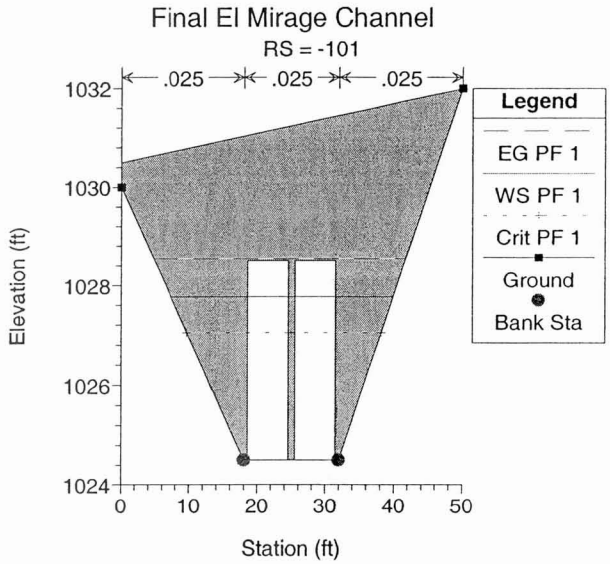

Final El Mirage Channel
Sta 5+35; Downstream of well site RS = 535
.035
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

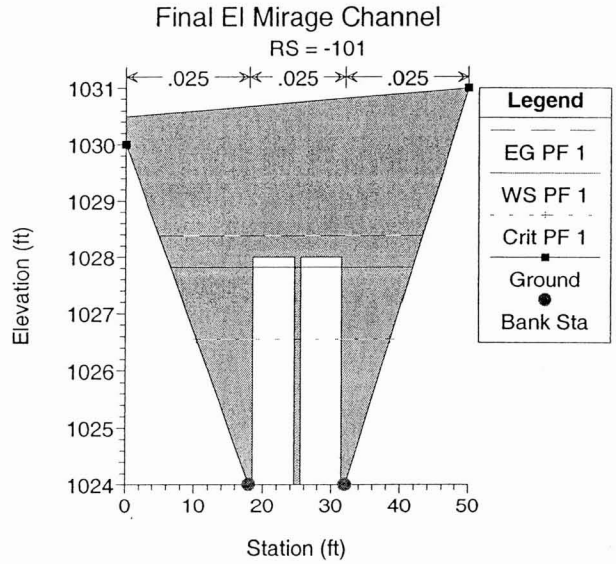

Final El Mirage Channel
Sta 4+70 RS = 470
.025
.025
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

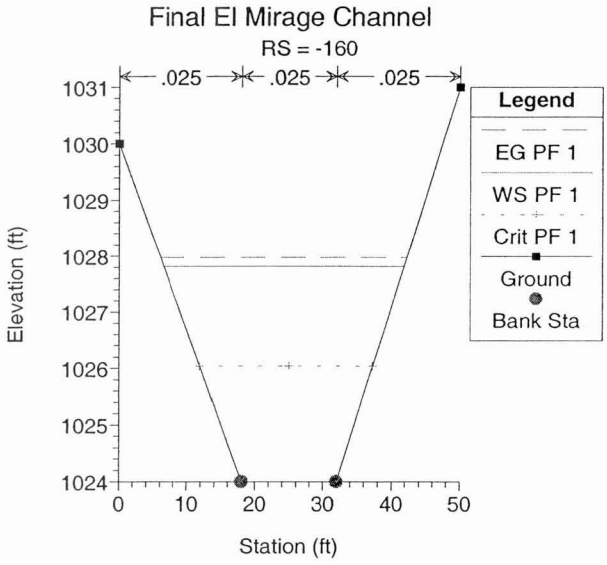

Final El Mirage Channel
Sta 9+80 RS = 200
.025
.025
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

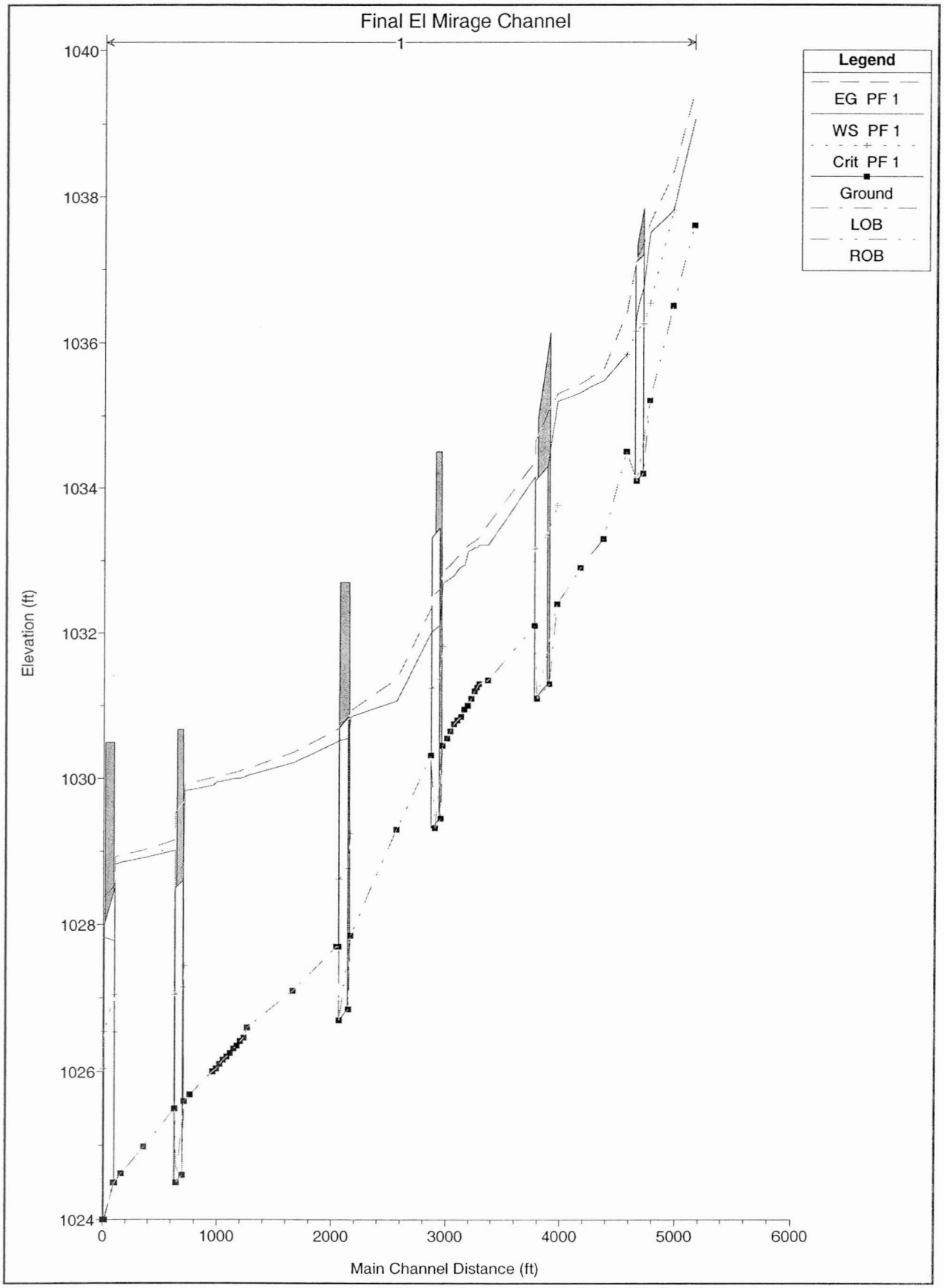

Final El Mirage Channel
Sta 0+00 RS = 0
.025
.025
.025
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Final El Mirage Channel
RS = -55
.025
.025
.025
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Final El Mirage Channel
RS = -101
.025
.025
.025
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1032
1030
1028
1026
1024
0
10
20
30
40
50


Final El Mirage Channel
RS = -101
.025
.025
.025
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1031
1030
1029
1028
1027
1026
1025
1024
0
10
20
30
40
50


Final El Mirage Channel
RS = -160
.025
.025
.025
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1031
1030
1029
1028
1027
1026
1025
1024
0
10
20
30
40
50


Final El Mirage Channel
1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
LOB
ROB
Elevation (ft)
1040
1038
1036
1034
1032
1030
1028
1026
1024
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)

Colter Channel

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	19080	70.00	1058.80	1060.31		1060.51	0.006224	3.60	19.43	21.70	0.67
Reach-1	19000	70.00	1058.30	1059.90		1060.07	0.004927	3.31	21.16	22.52	0.60
Reach-1	18750	70.00	1056.80	1058.22		1058.47	0.008287	4.01	17.44	20.51	0.77
Reach-1	18700	70.00	1056.50	1058.10		1058.20	0.002837	2.64	26.51	26.21	0.46
Reach-1	18500	125.00	1055.30	1057.12		1057.36	0.005332	3.92	31.90	27.97	0.65
Reach-1	18250	125.00	1053.80	1055.46		1055.76	0.007720	4.45	28.10	26.93	0.77
Reach-1	18000	125.00	1052.30	1055.30		1055.34	0.000546	1.66	75.10	43.07	0.22
Reach-1	17750	340.00	1050.80	1055.07		1055.16	0.000768	2.44	139.60	58.36	0.28
Reach-1	17580	340.00	1049.80	1054.97		1055.05	0.000541	2.33	145.81	49.42	0.24
Reach-1	17550	340.00	1049.80	1054.98		1055.03	0.000291	1.75	194.84	64.00	0.18
Reach-1	17480	340.00	1049.60	1054.97		1055.01	0.000251	1.67	203.76	64.00	0.16
Reach-1	17420	340.00	1049.50	1054.95	1051.88	1054.99	0.000230	1.62	209.34	64.00	0.16
Reach-1	17390	Culvert									
Reach-1	17360	340.00	1049.40	1052.92		1053.11	0.002017	3.52	96.59	47.91	0.44
Reach-1	17310	340.00	1049.30	1052.98		1053.03	0.000391	1.77	192.19	78.72	0.20
Reach-1	17250	540.00	1049.30	1052.84		1052.98	0.001166	2.98	181.21	77.01	0.34
Reach-1	16900	540.00	1048.70	1052.53		1052.64	0.000774	2.58	209.13	81.01	0.28
Reach-1	16600	620.00	1048.20	1052.29		1052.40	0.000777	2.69	230.38	84.07	0.29
Reach-1	16350	900.00	1047.70	1051.87		1052.10	0.001611	3.88	232.11	84.65	0.41
Reach-1	16300	900.00	1047.60	1051.80		1052.02	0.001450	3.73	241.23	86.10	0.39
Reach-1	16250	900.00	1047.60	1051.71		1051.94	0.001592	3.86	233.33	84.99	0.41
Reach-1	16000	900.00	1047.20	1051.32		1051.55	0.001586	3.85	233.63	85.03	0.41
Reach-1	15750	900.00	1046.70	1050.93		1051.16	0.001508	3.79	237.47	85.26	0.40
Reach-1	15500	900.00	1046.30	1050.57		1050.79	0.001459	3.75	240.14	85.56	0.39
Reach-1	15250	900.00	1045.90	1050.24		1050.44	0.001265	3.56	253.15	87.68	0.37
Reach-1	15080	900.00	1045.60	1050.07		1050.24	0.000996	3.28	274.59	89.75	0.33
Reach-1	14950	900.00	1045.40	1049.95		1050.11	0.001018	3.17	283.84	99.37	0.33
Reach-1	14750	1060.00	1045.00	1049.62		1049.85	0.001445	3.91	271.05	89.92	0.40
Reach-1	14707	1060.00	1044.90	1049.56		1049.79	0.001388	3.85	275.00	90.44	0.39
Reach-1	14662	1060.00	1044.90	1049.48		1049.73	0.001493	3.96	267.94	89.50	0.40
Reach-1	14652	1060.00	1044.90	1049.28	1047.93	1049.69	0.002773	5.12	207.04	65.45	0.51
Reach-1	14600	Bridge	DYSART		ROAD						
Reach-1	14548	1060.00	1044.70	1048.93		1049.38	0.003184	5.38	197.17	64.52	0.54
Reach-1	14538	1060.00	1044.70	1049.02		1049.30	0.001797	4.23	250.50	86.95	0.44
Reach-1	14487	1060.00	1044.60	1048.93		1049.21	0.001781	4.22	251.30	87.06	0.44
Reach-1	14250	1080.00	1044.20	1048.46		1048.76	0.001989	4.41	244.84	86.17	0.46
Reach-1	14000	1080.00	1043.70	1047.90		1048.23	0.002246	4.60	234.64	84.88	0.49
Reach-1	13750	1080.00	1043.30	1047.19		1047.59	0.002915	5.06	213.62	81.64	0.55
Reach-1	13630	1080.00	1043.08	1046.05	1045.96	1046.96	0.009437	7.64	141.43	70.36	0.95
Reach-1	13628	1080.00	1042.08	1046.48		1046.76	0.001792	4.25	254.11	87.43	0.44
Reach-1	13500	1080.00	1041.90	1046.25		1046.53	0.001814	4.26	253.63	87.82	0.44
Reach-1	13250	1080.00	1041.40	1045.77		1046.07	0.001890	4.33	249.50	86.93	0.45
Reach-1	13000	1080.00	1041.00	1045.29		1045.59	0.001926	4.36	247.54	86.42	0.45
Reach-1	12750	1080.00	1040.60	1044.74		1045.07	0.002221	4.58	235.96	85.35	0.49
Reach-1	12500	1080.00	1040.10	1043.99		1044.41	0.003103	5.16	209.12	81.14	0.57
Reach-1	12400	1080.00	1039.95	1042.83	1042.83	1043.82	0.010769	8.00	135.00	69.15	1.01
Reach-1	12398	1080.00	1037.95	1042.27		1042.57	0.001940	4.38	246.79	86.26	0.46
Reach-1	12250	1080.00	1037.70	1041.94		1042.26	0.002152	4.53	238.19	85.35	0.48
Reach-1	12000	1080.00	1037.20	1041.36		1041.70	0.002340	4.67	231.20	84.36	0.50
Reach-1	11900	1080.00	1037.10	1041.08		1041.45	0.002618	4.85	222.54	83.44	0.52
Reach-1	11825	1210.00	1036.92	1039.98	1039.98	1041.02	0.010497	8.20	147.62	71.52	1.01
Reach-1	11820	1210.00	1034.57	1040.53		1040.67	0.000618	3.00	403.64	105.40	0.27
Reach-1	11801	1210.00	1034.50	1040.53	1037.59	1040.66	0.000600	2.95	409.82	107.04	0.27
Reach-1	11776.5	Culvert									
Reach-1	11752	1210.00	1034.40	1039.09		1039.38	0.001716	4.32	280.15	91.05	0.43
Reach-1	11652	1210.00	1034.20	1038.91		1039.20	0.001725	4.33	279.68	91.02	0.43
Reach-1	11500	1210.00	1033.90	1038.66		1038.95	0.001648	4.26	284.27	91.63	0.43
Reach-1	11250	1210.00	1033.40	1038.32		1038.56	0.001351	3.96	305.73	94.70	0.39
Reach-1	11000	1210.00	1032.80	1038.04	1035.88	1038.25	0.001097	3.68	329.07	97.35	0.35
Reach-1	10921	Culvert	WIGWAM		CREEK		BLVD				
Reach-1	10750	1210.00	1032.30	1036.67		1037.02	0.002249	4.76	253.96	87.30	0.49
Reach-1	10688	1210.00	1032.00	1036.57		1036.88	0.001854	4.45	272.14	89.73	0.45
Reach-1	10628	1210.00	1031.90	1036.46		1036.77	0.001878	4.47	270.87	89.57	0.45
Reach-1	10500	1210.00	1031.80	1036.14		1036.50	0.002284	4.78	253.34	87.78	0.50
Reach-1	10250	1210.00	1031.20	1035.52		1035.90	0.002508	4.95	244.58	86.25	0.52
Reach-1	10040	1210.00	1030.78	1033.84	1033.84	1034.88	0.010495	8.20	147.49	71.34	1.01
Reach-1	10038	1210.00	1028.78	1033.00		1033.40	0.002682	5.07	238.59	85.23	0.53
Reach-1	10000	1210.00	1028.70	1032.91		1033.30	0.002613	5.01	241.47	86.13	0.53
Reach-1	9750	1210.00	1028.00	1032.21		1032.62	0.002794	5.14	235.35	84.95	0.54
Reach-1	9500	1210.00	1027.40	1031.42		1031.87	0.003185	5.39	224.41	83.19	0.58
Reach-1	9385	1210.00	1027.10	1030.15	1030.15	1031.20	0.010587	8.22	147.14	71.40	1.01
Reach-1	9384	1210.00	1023.75	1028.03		1028.41	0.000719	4.97	243.51	85.81	0.52
Reach-1	9337	1210.00	1023.70	1027.99		1028.38	0.000741	5.03	240.76	85.27	0.53
Reach-1	9327	1210.00	1023.70	1027.60	1026.96	1028.33	0.001617	6.85	176.58	62.31	0.72

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 Profile: PF 1 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	9285	Bridge	EL	MIRAGE		ROAD					
Reach-1	9243	1210.00	1023.50	1026.75	1026.75	1027.96	0.003332	8.81	137.38	58.05	1.01
Reach-1	9233	1210.00	1023.50	1026.56	1026.56	1027.60	0.010380	8.17	148.16	71.57	1.00
Reach-1	9133	1210.00	1023.30	1025.94		1026.13	0.001626	3.52	343.42	146.12	0.41
Reach-1	9000	1210.00	1023.10	1025.72		1025.91	0.001677	3.56	339.97	145.83	0.41
Reach-1	8750	1210.00	1022.70	1025.28		1025.48	0.001774	3.63	333.15	144.58	0.42
Reach-1	8500	1210.00	1022.30	1024.79		1025.01	0.002002	3.78	320.33	143.52	0.45
Reach-1	8250	1210.00	1021.90	1024.11		1024.40	0.003002	4.30	281.52	140.87	0.54
Reach-1	8000	1210.00	1021.50	1023.71		1023.86	0.001415	3.02	401.05	194.28	0.37
Reach-1	7978	1210.00	1021.50	1023.67		1023.82	0.001520	3.08	392.32	194.01	0.38
Reach-1	7973	1210.00	1021.50	1023.65		1023.81	0.001845	3.23	375.12	187.74	0.40
Reach-1	7968	1210.00	1021.50	1023.64		1023.80	0.001577	3.12	387.77	193.73	0.39
Reach-1	7750	1210.00	1021.10	1023.33		1023.47	0.001374	2.98	405.37	195.16	0.36
Reach-1	7500	1210.00	1020.60	1023.06		1023.17	0.000985	2.69	450.50	197.95	0.31
Reach-1	7300	1210.00	1020.20	1022.86		1022.95	0.000760	2.48	488.55	199.55	0.28
Reach-1	7250	1210.00	1020.10	1022.83		1022.92	0.000618	2.28	531.11	210.45	0.25
Reach-1	7000	1210.00	1019.90	1022.69		1022.77	0.000579	2.23	542.25	211.08	0.25
Reach-1	6750	1210.00	1019.70	1022.55		1022.63	0.000535	2.17	556.96	212.68	0.24
Reach-1	6660	1210.00	1019.80	1022.49	1020.91	1022.57	0.000654	2.32	522.22	210.69	0.26
Reach-1	6630	Culvert									
Reach-1	6600	1210.00	1019.80	1022.43		1022.52	0.000703	2.37	510.33	210.00	0.27
Reach-1	6500	1210.00	1019.50	1022.38		1022.45	0.000515	2.15	563.46	213.06	0.23
Reach-1	6250	1210.00	1019.30	1022.26		1022.33	0.000471	2.09	579.15	213.15	0.22
Reach-1	6000	1210.00	1019.00	1022.16		1022.22	0.000376	1.94	622.35	215.54	0.20
Reach-1	5750	1210.00	1018.80	1022.08		1022.13	0.000333	1.87	647.16	216.90	0.19
Reach-1	5500	1210.00	1018.60	1022.00		1022.05	0.000293	1.79	674.36	218.38	0.18
Reach-1	5250	1210.00	1018.40	1021.94		1021.98	0.000256	1.71	705.73	221.03	0.17
Reach-1	5000	1210.00	1018.20	1021.88		1021.92	0.000223	1.64	737.48	222.77	0.16
Reach-1	4750	1210.00	1018.00	1021.83		1021.87	0.000200	1.61	751.81	214.73	0.15
Reach-1	4576	1210.00	1017.80	1021.80	1018.91	1021.84	0.000166	1.52	794.76	213.33	0.14

RIPRAP CALCULATIONS FOR THE EL MIRAGE CHANNEL

HEC-RAS Plan: ch_9 River: Channel 8 Reach: 1 Profile: PF 1

River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Depth (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	
4980	160	1037.6	1038.9	1.3	0.01	6.19	
4800	160	1035.75	1037.66	1.91	0.00	4.22	
4600.00	160.00	1034.83	1037.55	2.72	0.00	2.79	
4540.00 Culvert							
4400.00	160.00	1033.96	1035.32	1.36	0.01	6.41	
4200.00	160.00	1032.47	1034.9	2.43	0.00	3.3	
4000.00	160.00	1031.97	1034.79	2.82	0.00	2.74	
3800.00	160.00	1031.47	1034.72	3.25	0.00	2.42	
3710.00 Culvert							
3600.00	181.00	1031.1	1033.26	2.16	0.00	3.94	
3200.00	181.00	1030.3	1032.82	2.52	0.00	3.38	
3120.00	181.00	1030.2	1032.85	2.65	0.00	2.18	
3100.00	181.00	1030.2	1032.84	2.64	0.00	2.27	
3080.00	181.00	1030.16	1032.84	2.68	0.00	2.08	
3050.00	181.00	1030	1032.83	2.83	0.00	2.03	
3020.00	181.00	1029.96	1032.82	2.86	0.00	1.99	
2990.00	181.00	1029.9	1032.75	2.85	0.00	2.78	
2960	181.00	1029.85	1032.74	2.89	0.00	2.65	
2930	181.00	1029.80	1032.73	2.93	0.00	2.62	
2900	181.00	1029.71	1032.71	3	0.00	2.61	
2870	181.00	1029.65	1032.7	3.05	0.00	2.53	
2840	181.00	1029.60	1032.69	3.09	0.00	2.49	
2800	181.00	1029.50	1032.69	3.19	0.00	2.36	
2765 Culvert							
2700	181.00	1029.30	1031.63	2.33	0.00	3.59	
2400	181.00	1028.70	1031.42	2.72	0.00	2.89	
2000	181.00	1027.90	1031.3	3.4	0.00	2.2	
1980 Culvert							
1900	240.00	1027.73	1030.63	2.9	0.00	3.47	
1880	240.00	1027.70	1030.62	2.92	0.00	3.45	
1500	240.00	1027.20	1030.35	3.15	0.00	3.24	
1100	240.00	1026.60	1030.21	3.61	0.000346	2.6	
1070	240	1026.46	1030.19	3.73	0.000352	2.68	
1040	240	1026.41	1030.17	3.76	0.000353	2.7	
1010	240	1026.35	1030.17	3.82	0.000305	2.54	
980	240	1026.31	1030.17	3.86	0.000281	2.45	
950	240	1026.25	1030.16	3.91	0.000253	2.35	
920	240	1026.2	1030.15	3.95	0.000267	2.42	
890	240	1026.16	1030.15	3.99	0.000237	2.3	
860	240	1026.1	1030.13	4.03	0.000259	2.42	
830	240	1026.04	1030.13	4.09	0.000218	2.25	
800	277	1026	1030.09	4.09	0.000324	2.73	
600	277	1025.69	1030.04	4.35	0.000263	2.57	
550	277	1025.62	1030.03	4.41	0.000251	2.53	
535 Culvert							
470	277	1025.5	1028.94	3.44	0.000622	3.38	
200	277	1024.98	1028.83	3.85	0.000417	2.98	
0	277	1024.62	1028.77	4.15	0.000313	2.72	
-55	277	1024.3	1028.75	4.45	0.000329	2.91	
-101 Culvert							
-160	277	1024	1027.82	3.82	0.000597	3.55	(Colter Channel)

From the Clark county Regional Flood Control District Hydrologic Criteria and Drainage Design Manual

For the length of apron Section 707.4.3 outlines a max Length of 10H or 40ft in this case. Therefore 40ft is specified in the paving and storm drain plans

For the determination of rock size the following equation was used:

Equation 761a $d_{50} = \frac{0.014\,(Q/WH^{1.5})\,H}{(Yt/H)}$

$d_{50} = \frac{0.014\,(277/12(4)^{1.5})\,4}{(3.44/4)}$ Yt assumed to be max tailwater depth (Sta 470) wihtin the channel

$d_{50} =$ 0.19 ft

For scuppers (using maximum flow at CP-29)

$d_{50} = \frac{0.014\,(Q/WH^{1.5})\,H}{(Yt/H)}$

$d_{50} = \frac{0.014\,(33/48(0.5)^{1.5})\,0.5}{(0.5/0.5)}$ Tailwater assumed to be 0.5ft

$d_{50} =$ 0.013 ft

Note: d_{50} =0.5ft was specified in the paving and storm drain plans for all riprap structures

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

ADOPTED

AUGUST 12, 1999

on one side of the channel, that side should be used as the upstream of the ladder pairs. The side of the channel with the better access should be downstream of the ladder pairs to allow rescue crews to mobilize their equipment. Main-gates in the perimeter fencing should be located at the ladder locations. The bottom rung of the ladder should be placed 1 foot vertically above the channel invert with the remaining rungs at a comfortable spacing for climbing. Yellow stripes (3 feet wide) will be painted on either side of each ladder to assist rescue crews in locating the ladders. The ladders should be made of either galvanized steel or some other UV-resistant material.

707.4 Outlet Protection

Scour resulting from highly turbulent rapidly decelerating flow is a common problem at conduit outlets. Both riprap and gabions have been used for outlet protection in unlined or vegetation lined channels. The following riprap protection is suggested for outlet Froude Numbers up to 2.5 (Froude Parameters $Q/D^{2.5}$ or $Q/WH^{1.5} < 14$ $ft^{0.5}/sec$) where the outlet of the conduit slope is parallel with the channel gradient and the conduit outlet invert is flush with the riprap channel protection (USDCM, 1969). Here Q is the discharge in cubic feet per second, D is the diameter of a circular conduit in feet and W and H are the width and height of a rectangular conduit in feet.

707.4.1 Configuration of Protection

Figure 711 illustrates a typical riprap basin at a conduit outlet. The additional thickness of the riprap just downstream from the outlet is to assure protection from extreme flow conditions which might cause rock movement in this region. Note that protection is required under the conduit barrel and an end slope is provided to accommodate degradation of the downstream channel.

707.4.2 Rock Size

The required rock size may be selected from **Figure 712** for circular conduits and from **Figure 713** for rectangular conduits. **Figure 712** is valid for $Q/D^{2.5} \leq 6.0$ and **Figure 713** is valid for $Q/WH^{1.5} \leq 8.0$. The parameters in these two figures are:

a. $Q/D^{1.5}$ or $Q/WH^{0.5}$ in which Q is the design discharge in cubic feet per second and D is a circular conduit diameter in feet and W and H are the width and height of a rectangular conduit in feet.

b. Y_t /D or Y_t /H in which Y_t is the tailwater depth in feet, D is the diameter of a circular conduit and H is the height of a rectangular conduit in feet. In cases where Y_t is unknown or a hydraulic jump is suspected downstream of the outlet. Use Y_t /D = Y_t /H = 0.40 when using **Figures 712** and **713**.

The riprap size requirements in **Figures 712** and **713** are based on the following non-dimensional parametric equations (USDCM,1969):

Circular Culvert:

$$(d_{50}/D)\ (Y_t/D)^{1.2}/(Q/D^{2.5}) = 0.023 \qquad (760)$$

Rectangular Culvert:

(a) For Q/WH1.5 < 4.0, use (USDCM, 1969):

$$(d_{50}/H)\ (Y_t/H)/(Q/WH^{1.5}) = 0.014 \qquad (761a)$$

(b) For Q/WH1.5 ≥ 4.0, use (CHEN, 1970, 1969):

$$(d_{50}/H)\ (Y_t/H)^2/(Q/WH^{1.5})^{2.5} = 0.0019 \qquad (761b)$$

The rock size requirements were determined assuming that the flow in the culvert barrel is not super-critical. **Equations 760** and **761** can be used when the flow in the culvert is less than a pipe full and is super-critical if the value of D or H is modified for use with **Figures 712** and **713**. Whenever the flow is super-critical in the culvert, substitute the average depth (D_a) for D and average height (H_a) for H, in which D_a is defined as:

$$D_a = 1/2\ (D + Y_n) \qquad (762)$$

in which maximum D_a shall not exceed D, and:

$$H_a = 1/2\ (H + Y_n) \qquad (763)$$

in which maximum H_a shall not exceed H and:

D_a = A Parameter to be Used in **Figure 712** Whenever the Culvert Flow is Super-Critical

D = Diameter of a Circular Culvert, in ft

H_a = A Parameter to be Used in **Figure 713** Whenever the Culvert Flow is Super-Critical

H = Height of a Rectangular Culvert, in ft

Y_n = Normal Depth of Super-Critical Flow in the Culvert

707.4.3 Extent of Protection

The length of the riprap protection downstream from the outlet depends on the degree of protection desired. To prevent all erosion, the riprap must be continued until the velocity has been reduced to the allowable velocity in the outlet channel. The rate at which the velocity of a jet from a conduit outlet decreases is not well known. For the procedure recommended here, the velocity decrease is assumed to be related to the angle of lateral expansions, θ, of the jet. The velocity is related to the expansion factor, (1/ (2 tan θ)), which may be determined directly using **Figures 714** or **715**.

Assuming that the expanding jet has a rectangular shape:

$$L = (1/(2 \tan \theta))(A_t / Y_t - W) \quad (764)$$

In which:

L = Length of Protection, in ft

W = Width of the Conduit, in ft (Use Diameter for Circular Conduits)

Y_t = Tailwater Depth, in ft

θ = The Expansion Angle of the Culvert Flow

$$A_t = Q / V \quad (765)$$

Q = Design Discharge in cfs

V = The Allowable Non-Eroding Velocity in the Downstream Channel in fps

A_t = Required Area of Flow at Allowable Velocity, in sq ft

In certain circumstances, **Equation 764** may yield unreasonable results. Therefore, in no case should L be less than 3D or 3H, nor does L need to be greater than 10D or 10H whenever the Froude parameter $Q/D^{2.5} \leq 6.0$ or $Q/WH^{1.5} \leq 8.0$. Whenever the Froude parameter is greater than these maximums, increase the maximum L required by one-fourth D or H for each whole number the Froude parameter is greater than 6 or 8 for circular or rectangular pipe, respectively.

707.4.4 Multiple Conduits

The procedures outlined in the sections above can be used to design outlet erosion protection for multi-barrel culvert installations by hypothetically replacing the multiple barrels with a single hydraulically equivalent rectangular conduit. The dimensions of the equivalent conduit may be established as follows: First, distribute the total discharge, Q, among the individual conduits. Where all the conduits are hydraulically similar and identically situated, the flow can be assumed to be equally distributed, otherwise, the flow through each barrel must be computed. Next, compute the Froude parameter $Q_i/D_i^{2.5}$ or $Q_i/W_i\ H_i^{1.5}$, where the subscript i indicates the discharge and dimensions associated with an individual conduit. If the installation includes dissimilar conduits, select the conduit with the largest value of the Froude parameter to determine the dimensions of the equivalent conduit. Make the height of the equivalent conduit, H_e, equal to the height, or diameter, of the selected individual conduit. The width of the equivalent conduit, W_e, is determined by equating the Froude parameter from the selected individual conduit with the Froude parameter associated with the equivalent conduit, $Q_e/W_eH_e^{1.5}$.

708 EXAMPLE APPLICATIONS

708.1 Example: Degradation and Aggradation

a. Channel Design Using the Equilibrium Slope Concept (Refer to Section 704.2.1.2). The following is an example of the procedure by which the equilibrium slope of a channel can be calculated. The physical layout of the system is given in the following figure. The upstream channelized section has been in existence for many years

APPENDIX G

Greenbelt Channel Hydraulics

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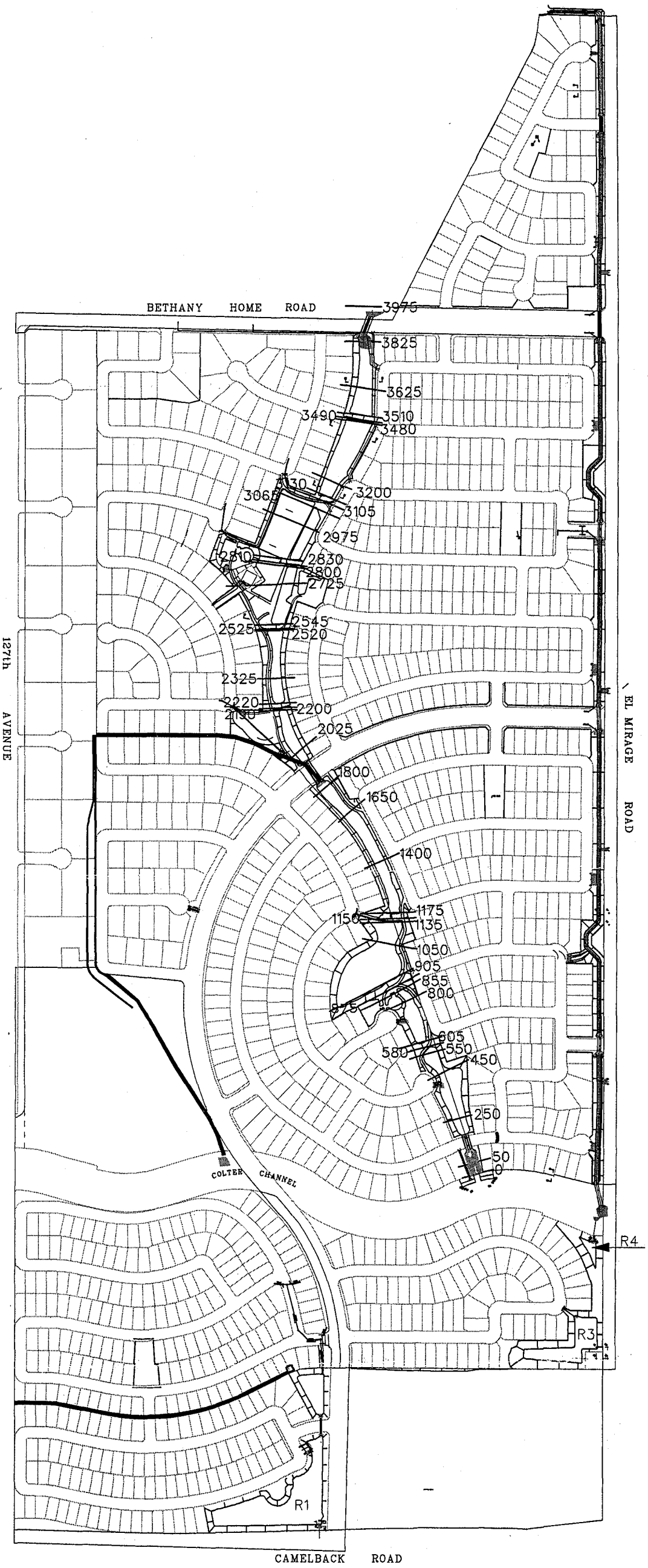
FILE:- [redacted]



N

500' 250' 0 500'

SCALE IN FEET

FIGURE 4

JOB NO. 000046-04

HEC-RAS CROSS SECTIONS

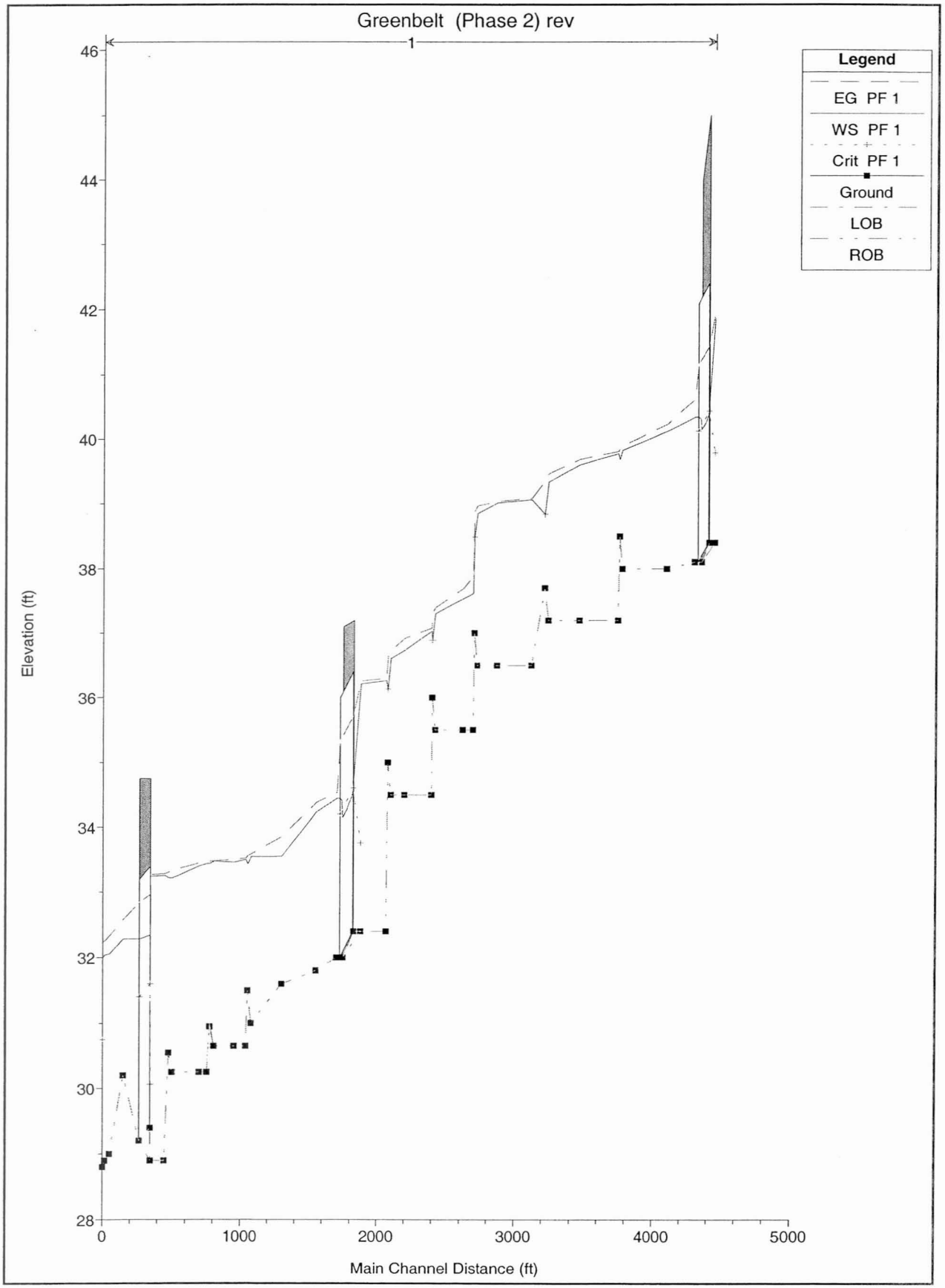
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

WIGWAM CREEK

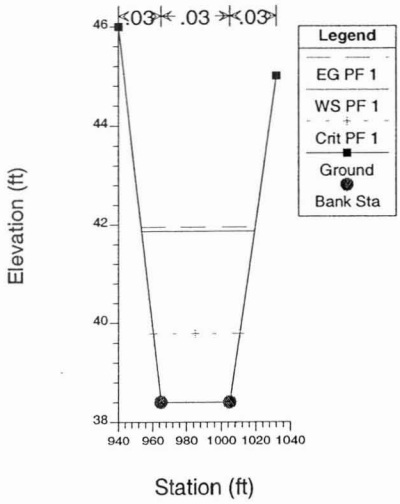
COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

HEC-RAS Plan: gb River: Greenbelt Reach: 1

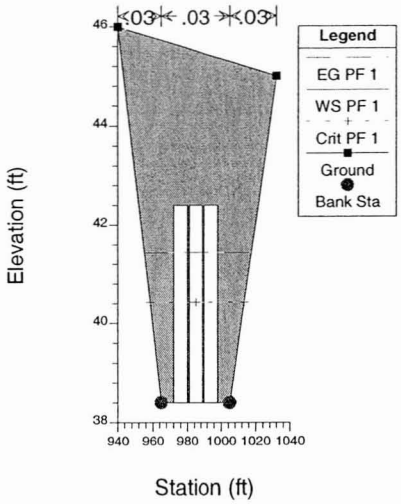
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	3975	393.00	38.40	41.87	39.79	41.95	0.000435	2.37	183.09	65.59	0.22
1	3900	Culvert									
1	3825	446.00	38.10	40.34		40.61	0.002631	4.35	110.34	58.39	0.51
1	3625	446.00	38.00	40.12		40.24	0.001138	2.76	169.56	89.72	0.33
1	3510	446.00	38.00	39.83		39.90	0.000842	2.15	215.99	130.73	0.28
1	3490	446.00	38.50	39.69		39.86	0.003670	3.37	136.76	124.84	0.54
1	3480	446.00	37.20	39.78		39.81	0.000266	1.52	307.90	133.92	0.17
1	3200	446.00	37.20	39.61		39.69	0.000744	2.43	200.10	101.28	0.28
1	3130	446.00	37.20	39.34		39.47	0.001321	2.99	161.67	91.12	0.36
1	3105	446.00	37.70	38.84	38.84	39.35	0.011908	5.91	79.66	79.45	0.97
1	3065	446.00	36.50	39.06		39.08	0.000200	1.31	411.51	235.99	0.14
1	2975	446.00	36.50	39.02		39.04	0.000190	1.26	434.83	259.74	0.14
1	2830	446.00	36.50	38.85		38.97	0.001258	3.11	192.80	177.54	0.36
1	2810	446.00	37.00	38.49	38.49	38.89	0.007271	5.50	103.11	150.45	0.80
1	2800	446.00	35.50	37.62		37.88	0.002720	4.26	110.76	59.69	0.52
1	2725	446.00	35.50	37.54		37.69	0.001651	3.24	147.22	84.46	0.40
1	2545	446.00	35.50	37.31		37.40	0.001167	2.51	186.94	117.08	0.33
1	2525	446.00	36.00	36.89	36.89	37.31	0.013365	5.29	86.86	105.55	0.99
1	2520	446.00	34.50	37.03		37.08	0.000372	1.78	265.33	119.63	0.20
1	2325	446.00	34.50	36.73		36.92	0.001911	3.70	132.66	73.85	0.44
1	2220	446.00	34.50	36.61		36.73	0.001330	2.97	164.09	95.54	0.36
1	2200	446.00	35.00	36.13	36.13	36.64	0.011987	5.89	80.39	82.09	0.98
1	2190	446.00	32.40	36.26		36.30	0.000168	1.58	312.30	101.67	0.14
1	2025	446.00	32.40	36.21	33.76	36.26	0.000243	1.88	275.82	99.67	0.17
1	1900	Culvert									
1	1800	446.00	32.00	34.44		34.54	0.000849	2.62	184.46	90.92	0.30
1	1650	446.00	31.80	34.23		34.38	0.001325	3.26	152.91	80.59	0.37
1	1400	446.00	31.60	33.55		33.86	0.003519	4.58	103.22	60.91	0.58
1	1175	446.00	31.00	33.55		33.59	0.000363	1.76	297.36	163.42	0.19
1	1150	446.00	31.50	33.43		33.56	0.001858	3.31	168.23	133.95	0.42
1	1135	446.00	30.65	33.51		33.52	0.000114	1.07	446.47	182.54	0.11
1	1050	446.00	30.65	33.46		33.51	0.000311	1.74	274.99	115.57	0.18
1	905	446.00	30.65	33.48		33.48	0.000027	0.51	909.13	357.59	0.05
1	875	446.00	30.95	33.44		33.48	0.000353	1.70	315.50	186.27	0.19
1	855	446.00	30.25	33.44		33.47	0.000275	1.78	342.03	184.45	0.18
1	800	446.00	30.25	33.41		33.45	0.000353	2.00	279.92	137.43	0.20
1	605	446.00	30.25	33.22		33.34	0.000953	3.16	172.33	86.15	0.32
1	580	446.00	30.55	33.22		33.31	0.000689	2.50	196.96	92.51	0.27
1	550	446.00	28.90	33.26		33.28	0.000102	1.34	365.27	102.66	0.11
1	250	446.00	28.90	33.24	30.07	33.27	0.000117	1.43	344.97	98.87	0.12
1	248	Culvert									
1	150	446.00	30.20	32.28		32.58	0.003220	4.59	105.69	61.42	0.56
1	50	446.00	29.00	32.06		32.33	0.001886	4.53	112.11	48.31	0.46
1	15	446.00	28.90	32.04		32.26	0.001497	4.11	126.82	55.78	0.41
1	0	446.00	28.80	32.00	30.75	32.23	0.001530	4.21	122.10	51.31	0.41


Greenbelt (Phase 2) rev
1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
LOB
ROB
Elevation (ft)
46
44
42
40
38
36
34
32
30
28
0
1000
2000
3000
4000
5000
Main Channel Distance (ft)

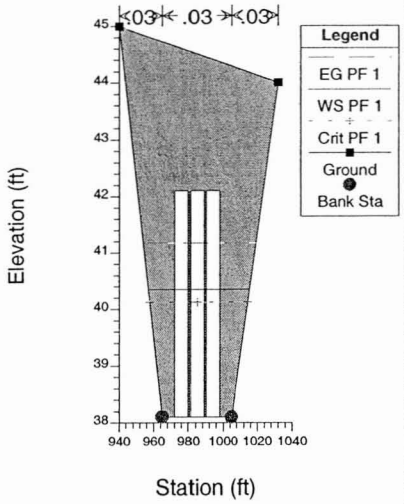
Greenbelt (Phase 2) rev
Sta 39+75 RS = 3975



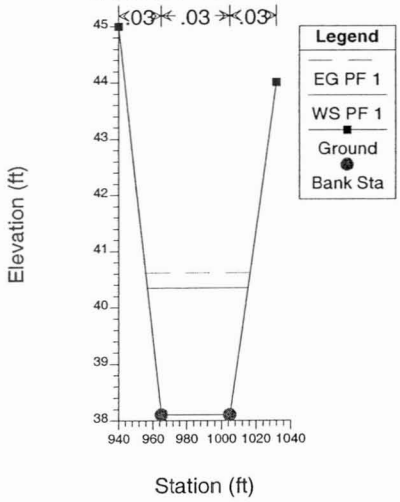
Greenbelt (Phase 2) rev
RS = 3900



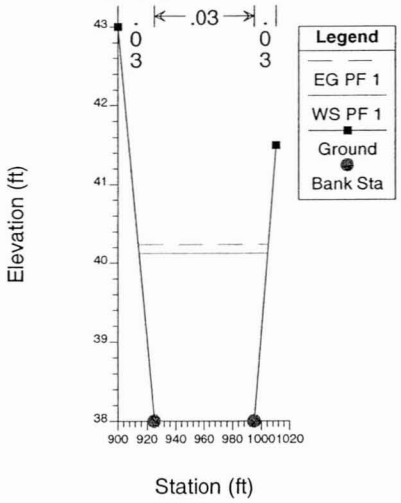
Greenbelt (Phase 2) rev
RS = 3900



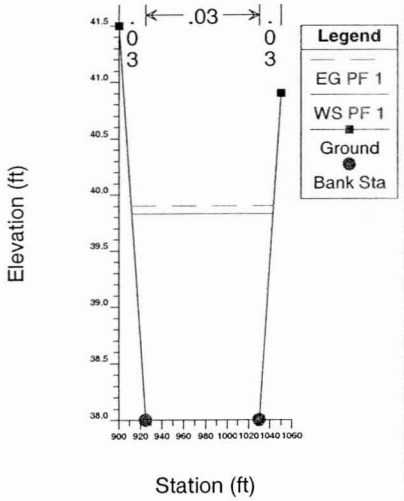
Greenbelt (Phase 2) rev
Sta 38+25 RS = 3825



Greenbelt (Phase 2) rev
Sta 36+25 RS = 3625



Greenbelt (Phase 2) rev
Sta 35+10 RS = 3510



Greenbelt (Phase 2) rev
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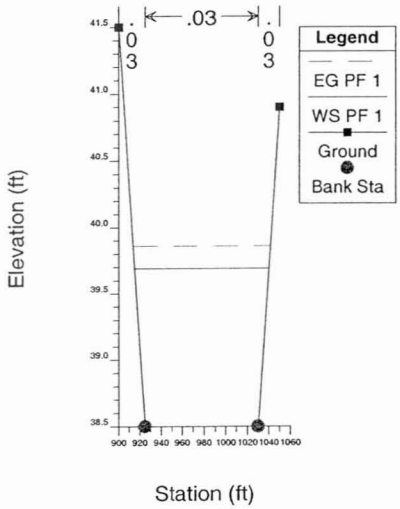

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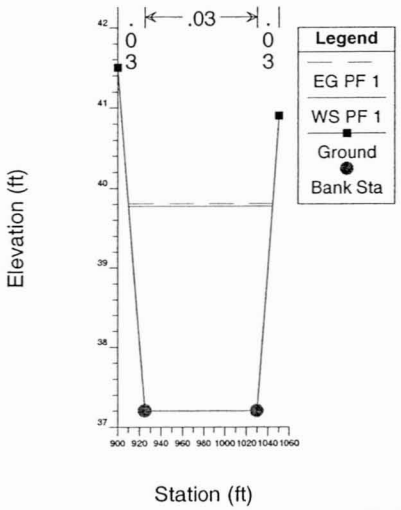

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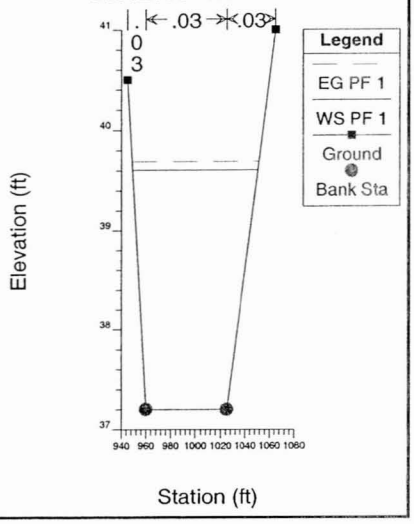
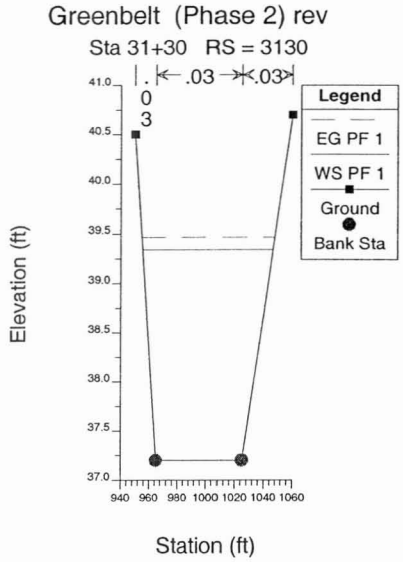
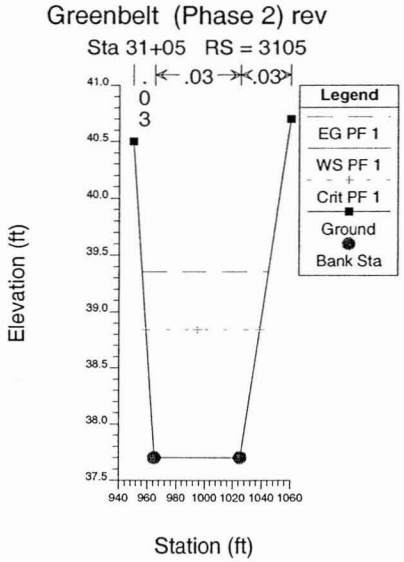



Greenbelt (Phase 2) rev
Sta 31+30 RS = 3130
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Legend
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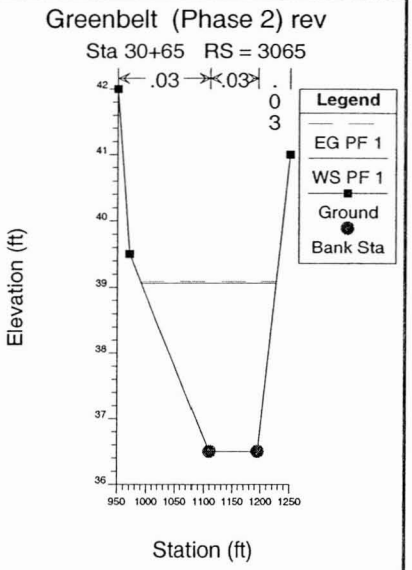
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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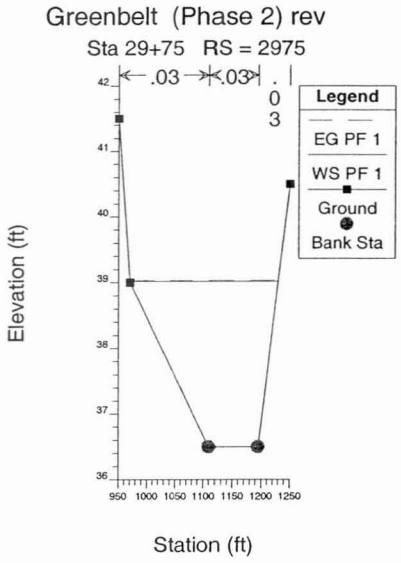
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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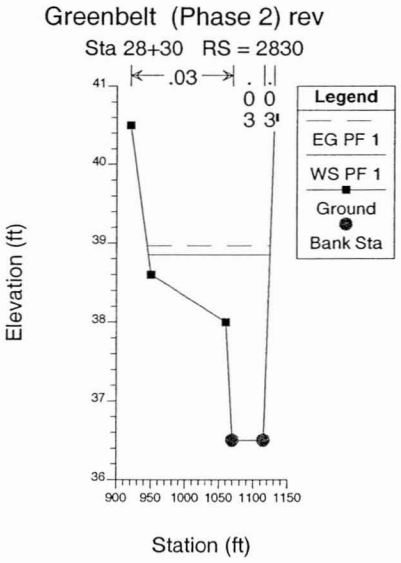
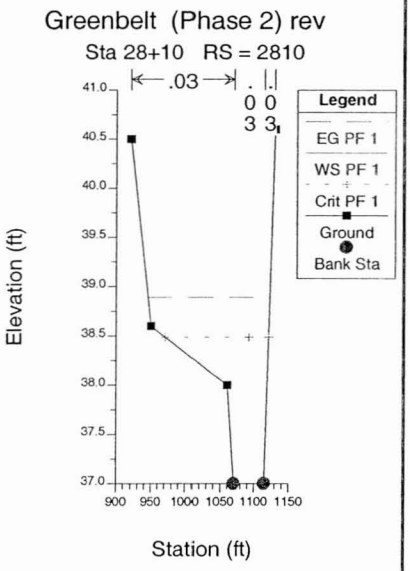
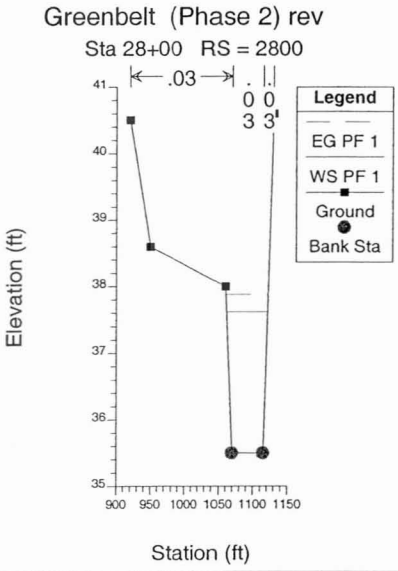
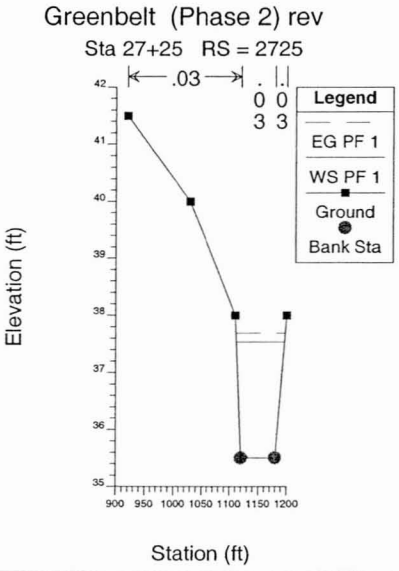
Sta 29+75 RS = 2975
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Greenbelt (Phase 2) rev
Sta 28+30 RS = 2830
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Greenbelt (Phase 2) rev
Sta 28+10 RS = 2810
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Greenbelt (Phase 2) rev
Sta 28+00 RS = 2800
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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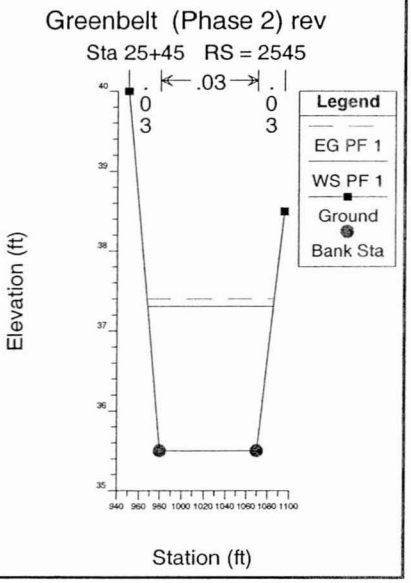
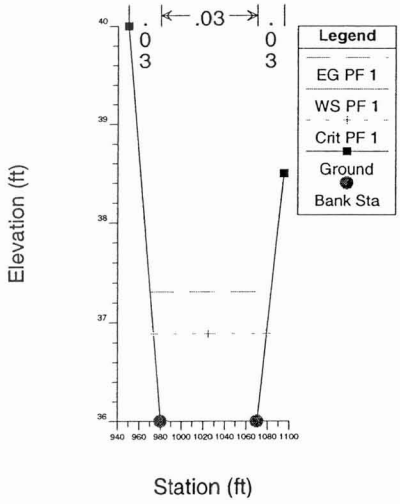
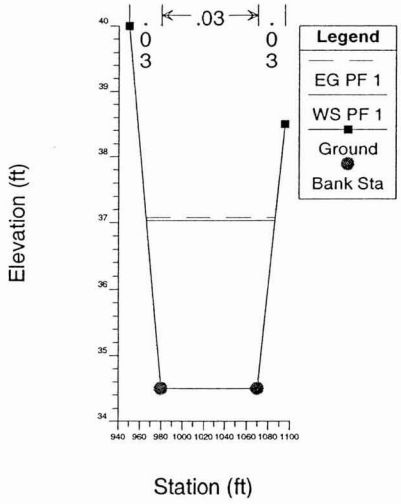
Sta 27+25 RS = 2725
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Greenbelt (Phase 2) rev
Sta 25+45 RS = 2545
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

Greenbelt (Phase 2) rev
Sta 25+25 RS = 2525



Greenbelt (Phase 2) rev
Sta 25+20 RS = 2520



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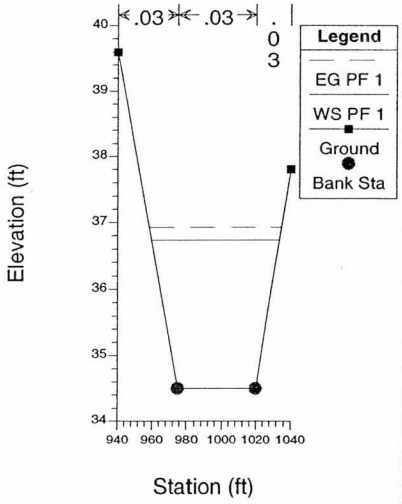

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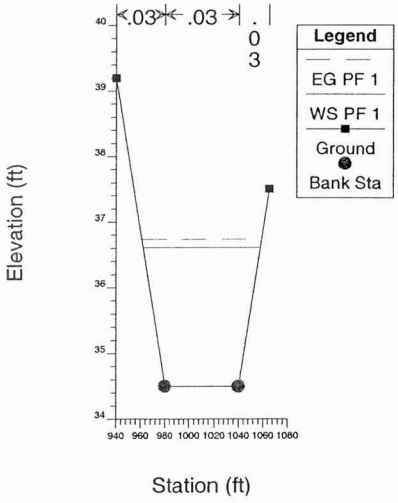
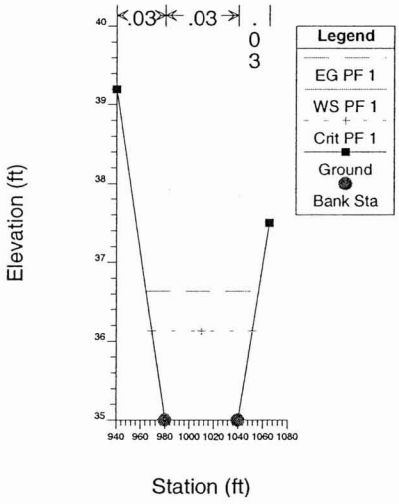
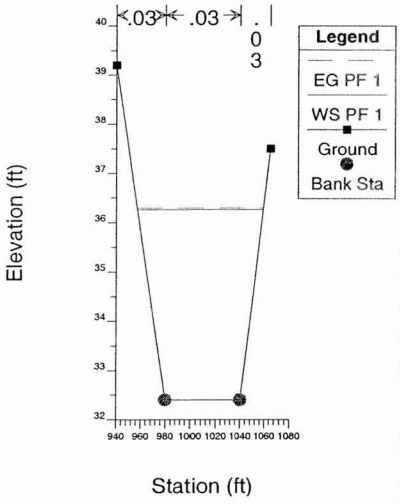


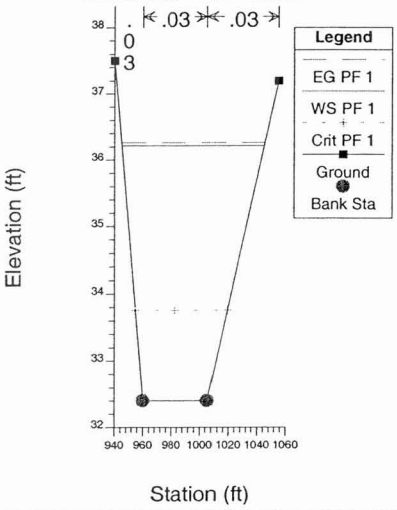
Greenbelt (Phase 2) rev
Sta 22+00 RS = 2200



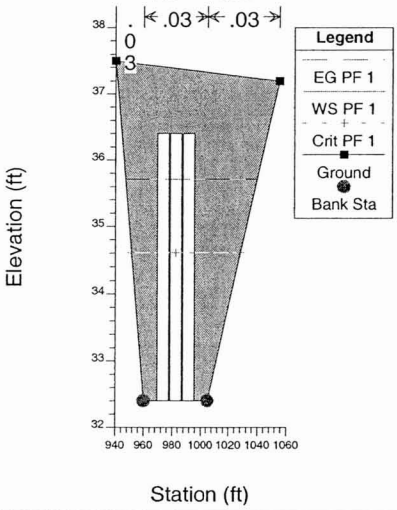
Greenbelt (Phase 2) rev
Sta 22+25 RS = 2190



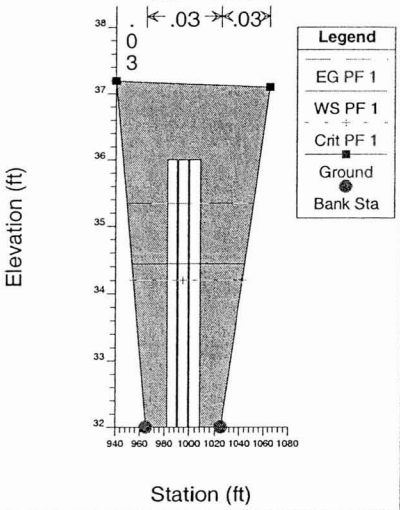
Greenbelt (Phase 2) rev
Sta 20+25 RS = 2025



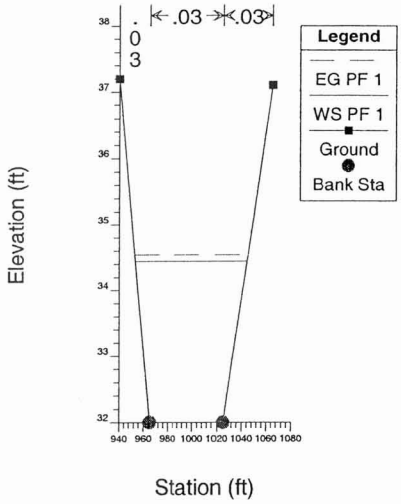
Greenbelt (Phase 2) rev
RS = 1900



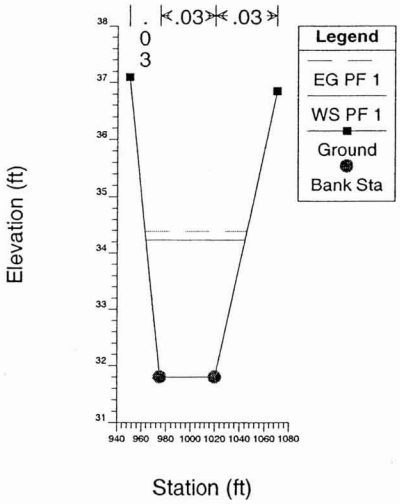
Greenbelt (Phase 2) rev
RS = 1900



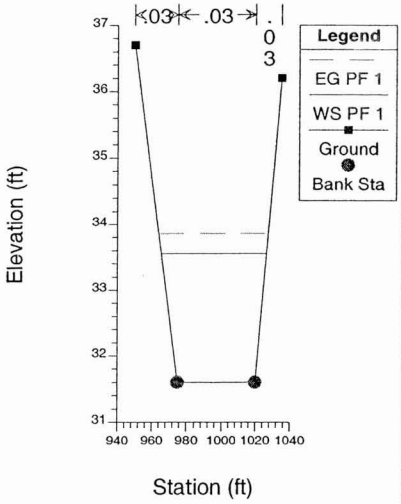
Greenbelt (Phase 2) rev
Sta 18+50 RS = 1800



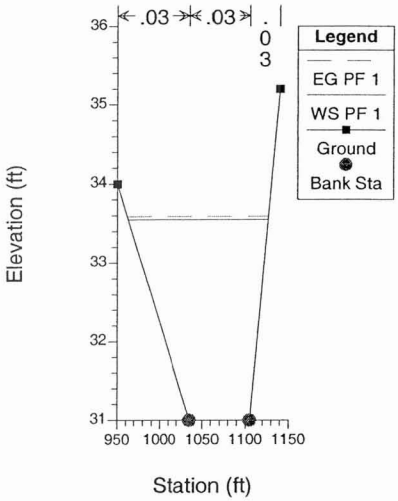
Greenbelt (Phase 2) rev
Sta 16+50 RS = 1650



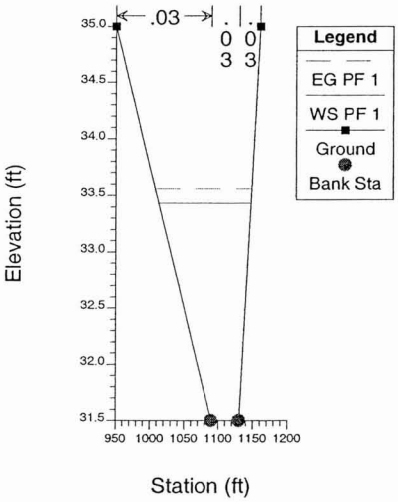
Greenbelt (Phase 2) rev
Sta 14+00 RS = 1400



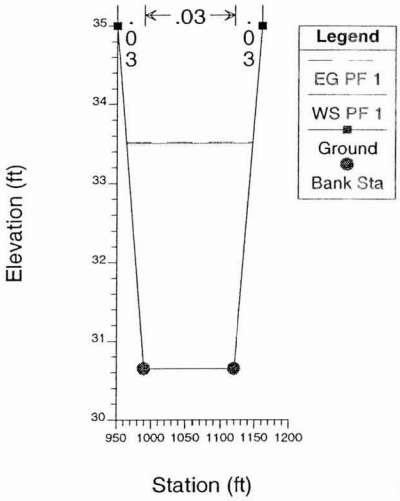
Greenbelt (Phase 2) rev
Sta 11+75 RS = 1175



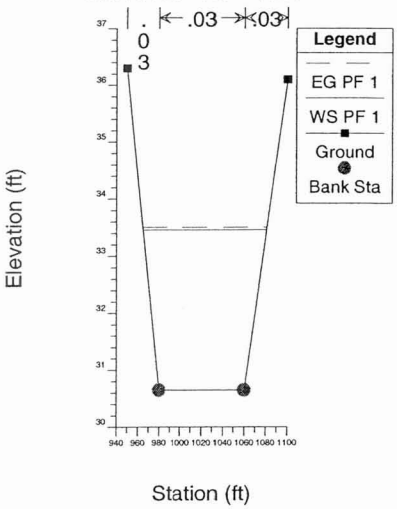
Greenbelt (Phase 2) rev
Sta 11+50 RS = 1150



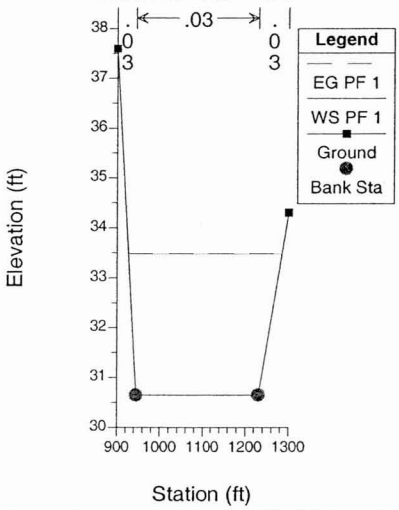
Greenbelt (Phase 2) rev
Sta 11+35 RS = 1135



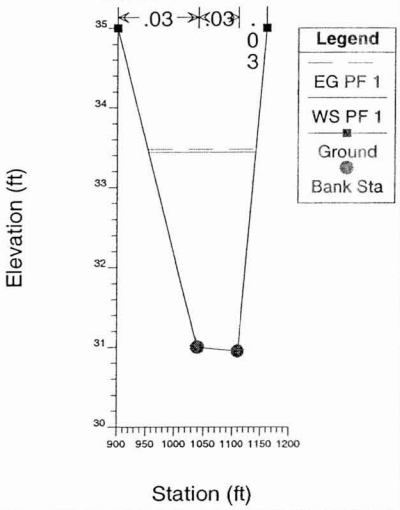
Greenbelt (Phase 2) rev
Sta 10+50 RS = 1050



Greenbelt (Phase 2) rev
Sta 9+05 RS = 905

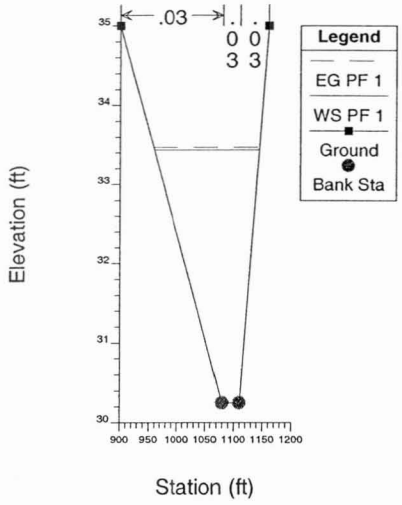


Greenbelt (Phase 2) rev
Sta 8+75 RS = 875



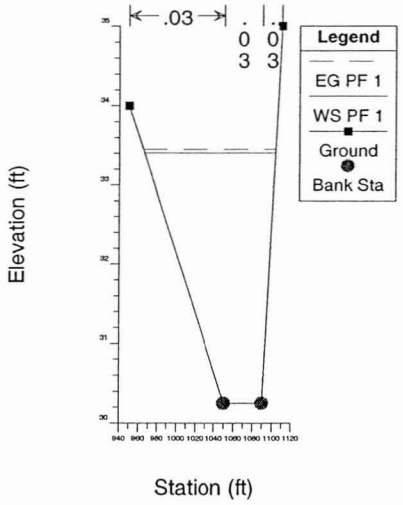
Greenbelt (Phase 2) rev

Sta 8+55 RS = 855



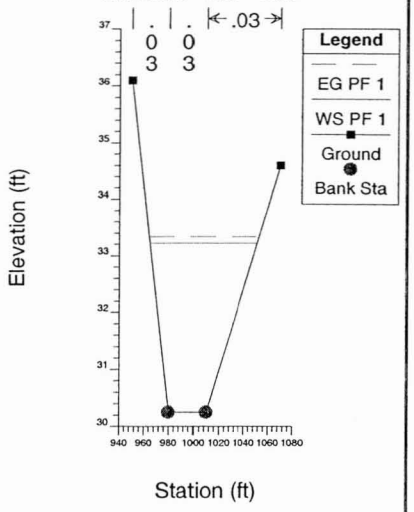
Greenbelt (Phase 2) rev

Sta 8+00 RS = 800



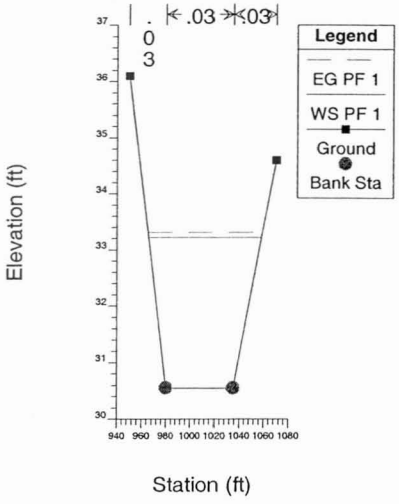
Greenbelt (Phase 2) rev

Sta 6+05 RS = 605



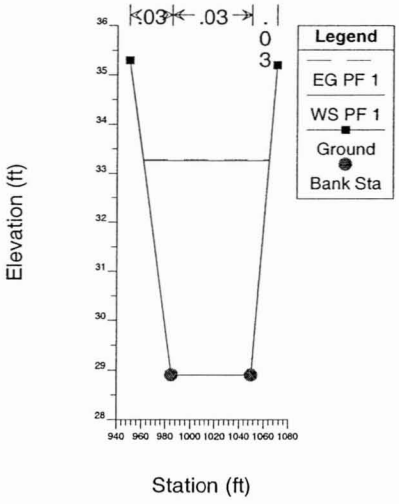
Greenbelt (Phase 2) rev

Sta 5+80 RS = 580



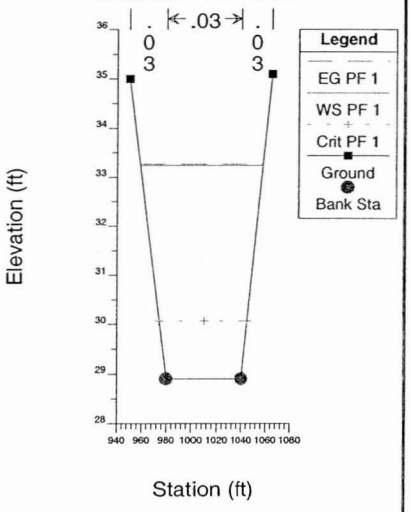
Greenbelt (Phase 2) rev

Sta 5+50 RS = 550



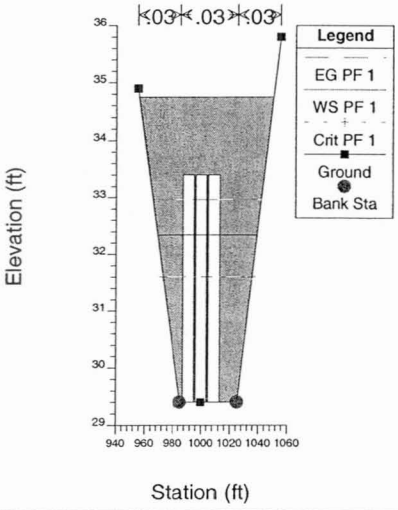
Greenbelt (Phase 2) rev

Sta 2+50 RS = 250



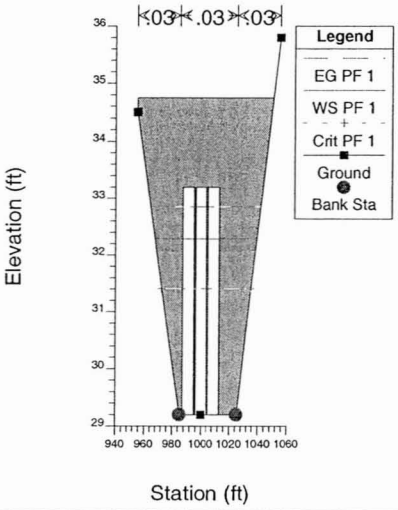
Greenbelt (Phase 2) rev

Sta 2+48; Last crossing before Colter Ch RS = 248



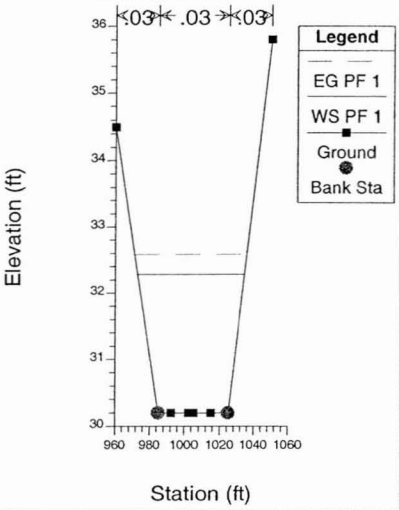
Greenbelt (Phase 2) rev

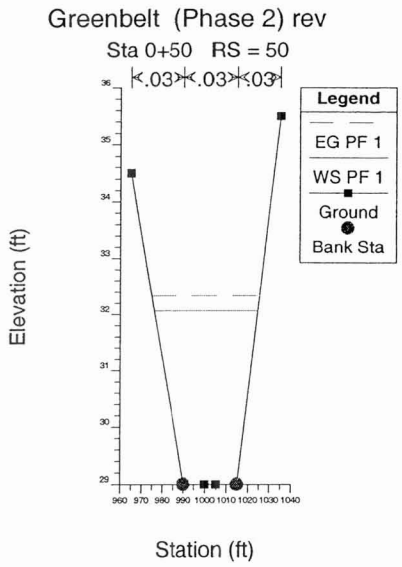
Sta 2+48; Last crossing before Colter Ch RS = 248

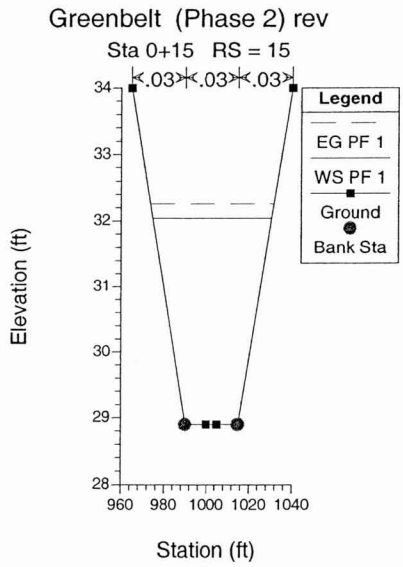


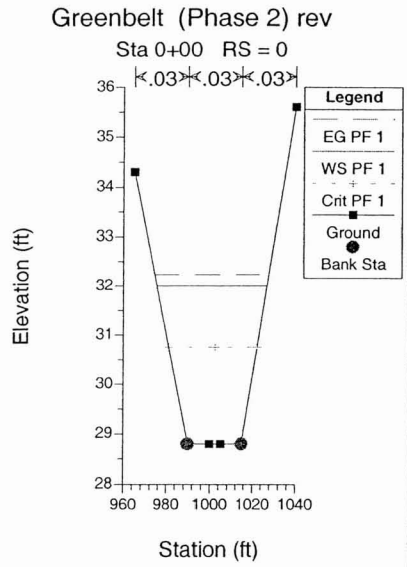
Greenbelt (Phase 2) rev

Sta 1+50 RS = 150




Greenbelt (Phase 2) rev
Sta 0+50 RS = 50
.03 .03 .03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Greenbelt (Phase 2) rev
Sta 0+15 RS = 15
.03 .03 .03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
34
33
32
31
30
29
28
960 980 1000 1020 1040
Station (ft)


Greenbelt (Phase 2) rev
Sta 0+00 RS = 0
.03 .03 .03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
36
35
34
33
32
31
30
29
28
960 980 1000 1020 1040
Station (ft)

RIPRAP CALCULATIONS FOR THE GREENBELT CHANNEL

HEC-RAS Plan: gb River: Greenbelt Reach: 1 Profile: PF 1

River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Depth (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)
3925	446	38.00	40.57	2.57	0.0055	5.82
3825	446	37.75	40.16	2.41	0.0049	4.99
3525	446	37.00	39.69	2.69	0.0012	2.61
3225	446	36.30	38.32	2.02	0.0113	6.33
3200	446	36.24	38.12	1.88	0.0021	2.19
2975	446	35.63	37.54	1.91	0.0029	2.66
2925	446	35.50	37.55	2.05	0.0005	1.17
2825	446	35.25	37.50	2.25	0.0004	1.20
2725	446	35.00	37.42	2.42	0.0008	1.84
2525	446	34.25	36.58	2.33	0.0070	5.88
2325	446	33.50	36.16	2.66	0.0019	3.30
2225	446	33.14	36.21	3.07	0.0002	1.17
2125	446	32.77	36.16	3.39	0.0003	1.68
2025	446	32.40	36.09	3.69	0.0005	2.26
2010	Culvert					
1850	446	32.00	34.87	2.87	0.0010	2.50
1650	446	31.70	34.58	2.88	0.0015	3.16
1250	446	31.10	33.80	2.70	0.0022	3.67
1150	446	30.95	33.81	2.86	0.0005	1.77
1050	446	30.80	33.81	3.01	0.0001	0.78
950	446	30.65	33.81	3.16	0.0001	0.62
850	446	30.50	33.75	3.25	0.0004	1.70
750	446	30.35	33.66	3.31	0.0006	2.28
650	446	30.20	33.63	3.43	0.0005	2.04
550	446	30.00	33.59	3.59	0.0004	1.89
250	446	29.40	33.40	4.00	0.0006	2.67
248	Culvert					
150	446	29.20	32.40	3.20	0.0025	3.89
50	446	29.00	32.10	3.10	0.0024	4.46
15	446	28.90	32.05	3.15	0.0020	4.09
0	446	28.80	32.00	3.20	0.0021	4.21

From the Clark county Regional Flood Control District Hydrologic Criteria and Drainage Design Manual

For the length of apron Section 707.4.3 outlines a max Length of 10H or 40ft in this case. Therefore 40ft is specified in the ....plans

For the determination of rock size the following equation was used:

Equation 761a

$$d_{50} = \frac{0.014\,(Q/WH^{1.5})\,H}{(Yt/H)}$$

$$d_{50} = \frac{0.014\,(446/24(4)^{1.5})\,4}{(3.2/4)}$$

Yt assumed to be max tailwater depth (Sta 34)

$$d_{50} = 0.16 \text{ ft}$$

Although 0.16ft was calculated, 0.5ft was specified in the .....plans

APPENDIX H

Culvert Calculations

CVL

Culvert Calculator Report
GreenBelt Culvert 2010

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	36.40	ft	Headwater Depth/ Height	1.27	
Computed Headwater Elevation	36.19	ft	Discharge	446.00	cfs
Inlet Control HW Elev	36.19	ft	Tailwater Elevation	0.00	ft
Outlet Control HW Elev	36.18	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	32.37	ft	Downstream Invert	32.09	ft
Length	100.00	ft	Constructed Slope	0.002800	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	2.21	ft
Slope Type	Mild		Normal Depth	2.36	ft
Flow Regime	Subcritical		Critical Depth	2.21	ft
Velocity Downstream	8.42	ft/s	Critical Slope	0.003398	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	8.00	ft
Section Size	8 x 3 ft		Rise	3.00	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev	36.18	ft	Upstream Velocity Head	0.97	ft
Ke	0.50		Entrance Loss	0.48	ft

Inlet Control Properties					
Inlet Control HW Elev	36.19	ft	Flow Control	N/A	
Inlet Type	90 and 15 ° wingwall flares		Area Full	72.0	ft^2
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	2	
C	0.04000		Equation Form	1	
Y	0.80000				

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Coe & Van Loo Consultants
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
Greenbelt Culvert 248

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	34.75	ft	Headwater Depth/ Height	1.27	
Computed Headwater Elevation	33.22	ft	Discharge	446.00	cfs
Inlet Control HW Elev	33.22	ft	Tailwater Elevation	0.00	ft
Outlet Control HW Elev	33.20	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	29.40	ft	Downstream Invert	29.20	ft
Length	80.00	ft	Constructed Slope	0.002500	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	2.21	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	2.21	ft
Velocity Downstream	8.42	ft/s	Critical Slope	0.003398	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	8.00	ft
Section Size	8 x 3 ft		Rise	3.00	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev	33.20	ft	Upstream Velocity Head	0.92	ft
Ke	0.50		Entrance Loss	0.46	ft

Inlet Control Properties					
Inlet Control HW Elev	33.22	ft	Flow Control	N/A	
Inlet Type	90 and 15 ° wingwall flares		Area Full	72.0	ft^2
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	2	
C	0.04000		Equation Form	1	
Y	0.80000				

Culvert Calculator Report
Wigwam Creek Phase 2 - Bethany Culvert

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	1,045.51	ft	Headwater Depth/ Height	1.18	
Computed Headwater Elevation	1,042.55	ft	Discharge	393.00	cfs
Inlet Control HW Elev	1,042.46	ft	Tailwater Elevation	1,040.67	ft
Outlet Control HW Elev	1,042.55	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	1,039.00	ft	Downstream Invert	1,038.00	ft
Length	80.00	ft	Constructed Slope	0.012500	ft/ft

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	2.67	ft
Slope Type	Steep		Normal Depth	1.30	ft
Flow Regime	N/A		Critical Depth	2.03	ft
Velocity Downstream	6.13	ft/s	Critical Slope	0.003361	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	8.00	ft
Section Size	8 x 3 ft		Rise	3.00	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev	1,042.55	ft	Upstream Velocity Head	1.01	ft
Ke	0.50		Entrance Loss	0.51	ft

Inlet Control Properties					
Inlet Control HW Elev	1,042.46	ft	Flow Control	Unsubmerged	
Inlet Type	90 and 15 ° wingwall flares		Area Full	72.0	ft^2
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	2	
C	0.04000		Equation Form	1	
Y	0.80000				

APPENDIX I

Off-site Calculations

CVL

KEY TO SYMBOLS

(A) SUB BASIN ID.
(NOTE AREAS SOUTH OF THE COLTER CHANNEL WILL BE ANALYZED IN THE FINAL DRAINAGE REPORT)

FLOW DIRECTION

CHANNEL

BASIN

CONTOUR (1 FOOT INTERVALS)

500' 250' 0 500'
SCALE IN FEET

WIGWAM CREEK

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

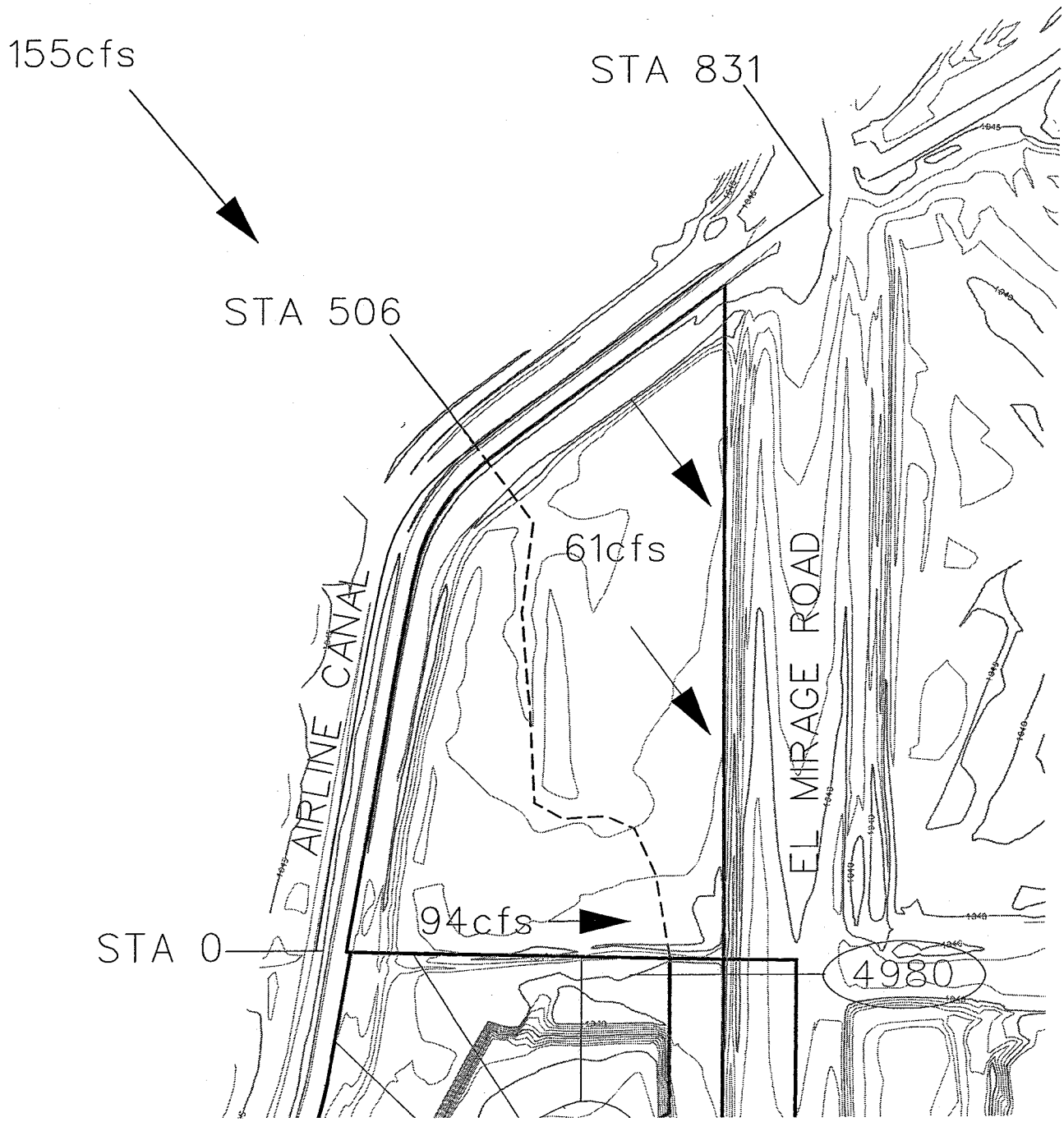
PROPOSED DRAINAGE PLAN

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

JOB NO.
000046-04

FIGURE 4

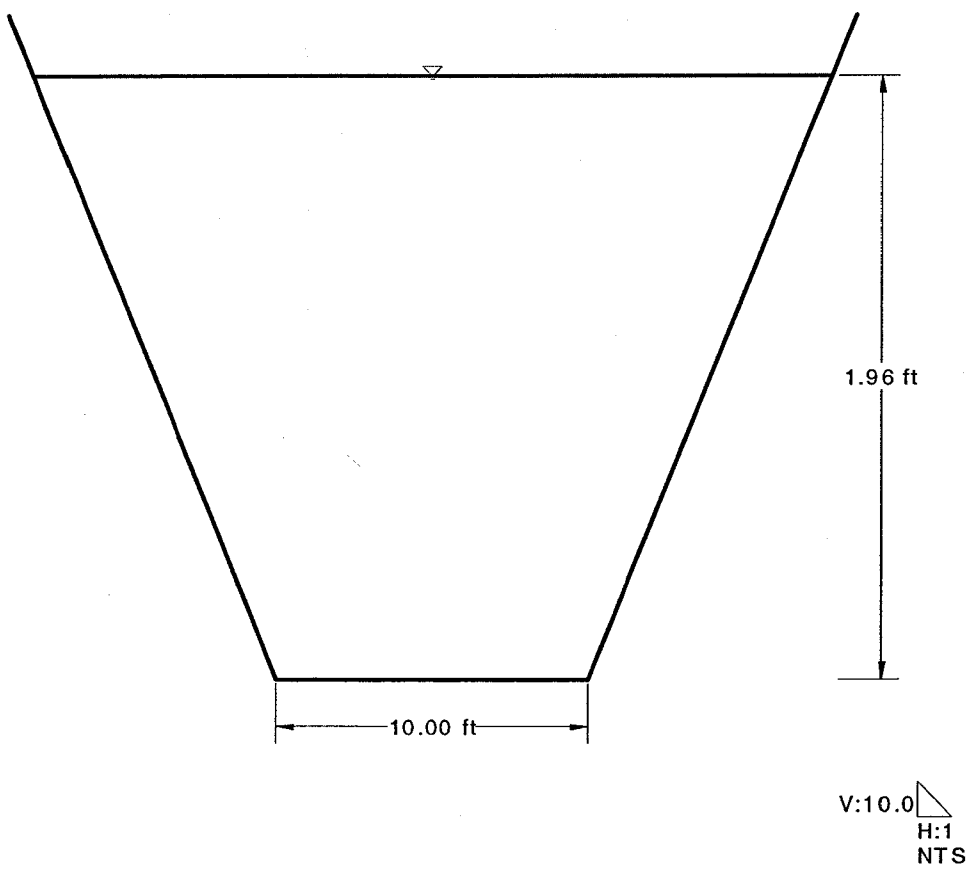
NOTE: FLOWS WERE SPLIT BASED ON THE TOPOGRAPHY AND A RATIO WAS CALCULATED ALONG THE LENGTH OF THE CANAL (STA 0 TO 831)



Cross Section Channel 7
Cross Section for Trapezoidal Channel

Project Description	
Worksheet	Trapezoidal Channel - 1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.030	
Slope	0.002000	ft/ft
Depth	1.96	ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	10.00	ft
Discharge	94.00	cfs



Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Trapezoidal Channel - 1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

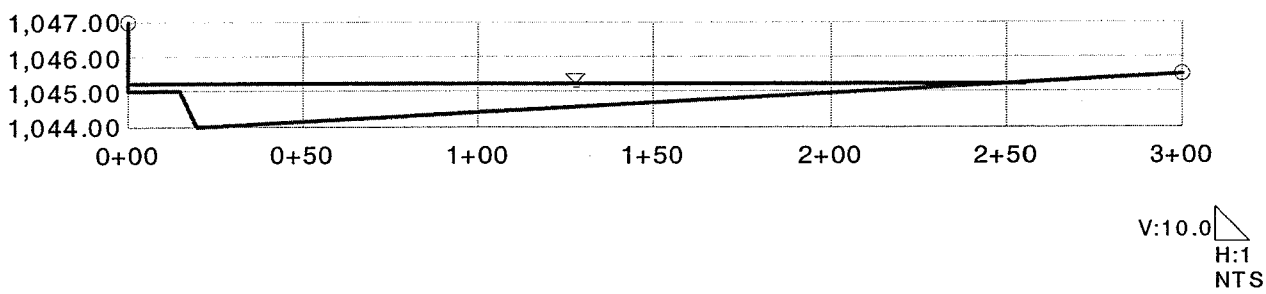
Input Data		
Mannings Coefficient	0.030	
Slope	0.002000	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	10.00	ft
Discharge	94.00	cfs

Results		
Depth	1.96	ft
Flow Area	35.0	ft^2
Wetted Perimeter	26.16	ft
Top Width	25.68	ft
Critical Depth	1.19	ft
Critical Slope	0.013868	ft/ft
Velocity	2.69	ft/s
Velocity Head	0.11	ft
Specific Energy	2.07	ft
Froude Number	0.41	
Flow Type	Subcritical	

Cross Section Channel 14
Cross Section for Irregular Channel

Project Description	
Worksheet	XS B-B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.030	
Slope	0.005000	ft/ft
Water Surface Elevation	1,045.26	ft
Elevation Range	1,044.00 to 1,047.00	
Discharge	393.00	cfs



CROSS SECTION CHANNEL 14
Worksheet for Irregular Channel

Project Description	
Worksheet	XS B-B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.005000	ft/ft
Discharge	393.00	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Metho	Improved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.030	
Water Surface Elevation	1,045.26	ft
Elevation Range	1,044.00 to 1,047.00	
Flow Area	156.0	ft²
Wetted Perimeter	255.64	ft
Top Width	255.28	ft
Actual Depth	1.26	ft
Critical Elevation	1,045.02	ft
Critical Slope	0.016805	ft/ft
Velocity	2.52	ft/s
Velocity Head	0.10	ft
Specific Energy	1,045.36	ft
Froude Number	0.57	
Flow Type	subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	3+00	0.030

Natural Channel Points

Station (ft)	Elevation (ft)
0+00	1,047.00
0+00	1,045.00
0+15	1,045.00
0+20	1,044.00
3+00	1,045.50

© Haestad Methods, Inc.
Coe & Van Loo Consultants Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

APPENDIX J

FCD Table

FCD Table Wigwam Creek (980098-02)		
Miles/Acres of Protected Natural Watercourse	0	0
Miles of Improved Watercourse or Storm Drain	0.28	
Acres of Retention or Detention Areas	0	

APPENDIX K

First Flush Addendum Calculations

CVL

COE & VAN LOO CONSULTANTS, INC.

Land Planning • Civil Engineering • Water Resources Engineering • Environmental Sciences • Landscape Architecture • Surveying • Construction Management

Founded 1958 by
P.E. Coe, P.E. (1915-1977)
H.W. Van Loo, P.E.

May 6, 2002

Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, AZ 85009
United States of America

Attn: Todd G. Williams, M.Sc.
Water Quality Branch Manager, Engineering Division

Re: Wigwam Creek North - Phase 2
First Flush Calculations
CVL Project No.: 00-0046-10-01

Dear Mr. Williams:

Please find submitted with this letter calculations and information regarding first flush remediation measures for Wigwam Creek North – Phase 2.

The general concept is to treat first flush flows by utilizing an "Inceptor" by Storm Drain Solutions. Flows are intercepted by grate inlet catch basins at various concentration points and treated by a "PolyDak" pillow, which is contained in a suspended cage. Information about the Inceptor and its performance has been included.

The location of the inlet catch basins containing the Inceptor can be found within the accompanying drainage map and paving and storm drain plans.

If you have any questions, please feel free to call.

Sincerely,

COE & VAN LOO
Consultants, Inc.

J. Doug Both
Associate, Project Manager

Chris A. Woodrow, P.E.
Project Manager

JDB:se

N:\000046\Admin\46-023L.doc

4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014-4291 (602) 264-6831 FAX (602) 264-0928

DATE:- May. 02, 2002
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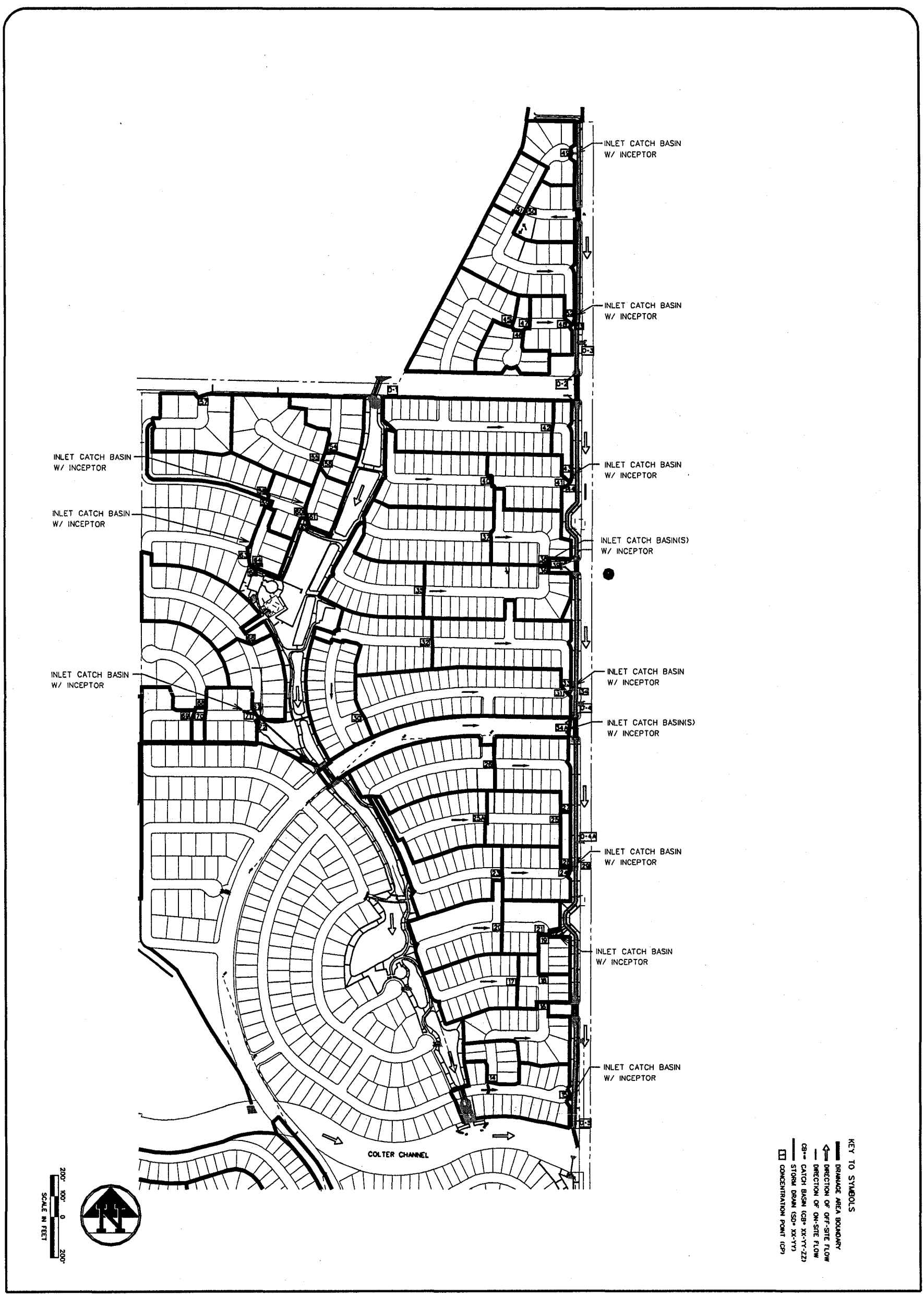

EXHIBIT	JOB NO. 000046	DRAINAGE MAP	WIGWAM CREEK PHASE 2
		4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014 TELEPHONE (602) 264-6831	COE & VAN LOO PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

.../980098/land/phase2/sdmapff.dgn Aug. 18, 2003 10:46:25

WigWam Creek Phase 2
Job Number 000046
First Flush Flow Rate Calculations

Area ID	Area (acres) A	Weighted C value C	Precip. (inches) P	Flow Rate[1] (cfs) Q
CP-72	15.82	1.00	0.5	7.91
CP-65	14.56	1.00	0.5	7.28
CP-62	9.94	1.00	0.5	4.97
CP-49	1.5	1.00	0.5	0.75
CP-53	13.2	1.00	0.5	6.6
CP-44	11.60	1.00	0.5	5.8
CP-39	14	1.00	0.5	7
CP-34	16.3	1.00	0.5	8.15
CP-34A	3.04	1.00	0.5	1.52
CP-29	17.40	1.00	0.5	8.7
CP-22	11.60	1.00	0.5	5.8
CP-15	12.10	1.00	0.5	6.05
Totals	33.34			

(1) Q = A x C x P

WIGWAM CREEK PHASE 2
GRATE INLET CALCULATION
FOR FIRST FLUSH INLET CATCH BASINS

For the inlet flow calculations M.A.G. STD. DET. 537, Type 'G' with a double grate was used.

$$Q = CA(\sqrt{2gH})*Cf$$

Where

Q	=	Flow (cfs)
C	=	Orifice coefficient = 0.6
A	=	Effective Area of opening = $6.86ft^2$
g	=	Gravity = $32.2ft/sec^2$
H	=	Head (Ponding depth of 2")
Cf	=	Clogging factor = 0.65

$$Q = 0.6(6.86)(\sqrt{2(32.2)0.17})*0.65 = 8.9cfs$$

The on-site peak flow for all locations was calculated at 8.7cfs. Therefore, the interception capacity of the catchbasin exceeds the required flow capacity.

PAVING & STORM DRAIN PLANS
FOR
WIGWAM CREEK NORTH PHASE 2

PART OF THE EAST HALF OF SECTION 14 AND PART OF THE SOUTHEAST QUARTER OF SECTION 11,
TOWNSHIP 2 NORTH, RANGE 1 WEST, GILA AND SALT RIVER MERIDIAN,
MARICOPA COUNTY, ARIZONA

ENGINEER'S NOTES/PAVING

THE CONTRACTOR SHALL MAKE NO CLAIM AGAINST THE OWNER OR THE ENGINEER REGARDING ALLEGED INACCURACY OF CONSTRUCTION STAKES SET BY THE ENGINEER UNLESS ALL SURVEY STAKES SET BY THE ENGINEER ARE MAINTAINED INTACT AND CAN BE VERIFIED AS TO THEIR ORIGIN. IF, IN THE OPINION OF THE ENGINEER, THE STAKES ARE NOT MAINTAINED INTACT AND CANNOT BE VERIFIED AS TO THEIR ORIGIN, ANY REMEDIAL WORK REQUIRED TO CORRECT ANY ITEM OR IMPROPER CONSTRUCTION WORK IN THIS DEVELOPMENT SHALL BE PERFORMED AT THE SOLE EXPENSE OF THE RESPONSIBLE CONTRACTOR OR SUBCONTRACTOR.

NOTHING CONTAINED IN THE CONTRACT DOCUMENTS SHALL CREATE, NOR SHALL BE CONSTRUED TO CREATE, ANY CONTRACTUAL RELATIONSHIP BETWEEN THE ENGINEER AND THE CONTRACTOR OR ANY SUBCONTRACTOR.

THE ENGINEER WILL NOT BE RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES OR FOR SAFETY PRECAUTIONS OR PROGRAMS UTILIZED IN CONNECTION WITH THE WORK, AND HE WILL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S FAILURE TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

A THOROUGH ATTEMPT HAS BEEN MADE TO SHOW THE LOCATIONS OF ALL UNDERGROUND OBSTRUCTIONS AND UTILITY LINES IN THE WORK AREA. HOWEVER, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTIONS AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION AND SHALL DETERMINE THE EXACT LOCATION OF UTILITIES IN THE AREA.

THE ENGINEER WILL MAKE FIELD RECORD DRAWING MEASUREMENTS OF THE WORK UPON NOTIFICATION BY THE PAVING CONTRACTOR THAT THE WORK IS COMPLETE AND READY FOR RECORD DRAWING SURVEY.

ALL CURB RETURN RADII SHALL BE 19.42' TO BACK OF CURB (UNLESS OTHERWISE NOTED).

ALL EARTHWORK CONSTRUCTION SHALL CONFORM TO THE LATEST MARICOPA ASSOCIATION OF GOVERNMENTS STANDARD DETAILS AND/OR SPECIFICATIONS INCLUDING ANY SUPPLEMENTS THERETO AND THE SOILS REPORT PREPARED BY:

CONSTRUCTION INSPECTION & TESTING PROJECT NO. 99-8045 DATED: 7-11-99

ALL PARKWAY GRADING TO BE PER M.A.G. SPEC. 424 (4:1 MAX SLOPE).

DATA FOR EARTHWORK CALCULATIONS IS PROVIDED IN THE SOILS REPORT AND (IF APPLICABLE) ANY SUPPLEMENTS THERETO.

ALL CONDUITS (BOX CULVERT, REINFORCED CONCRETE PIPE, CAST-IN-PLACE PIPE, AND/OR CORRUGATED METAL PIPE) SHOWN ON THESE PLANS ARE DESIGNED FOR STANDARD HIGHWAY LOADINGS. THE STANDARD SATISFACTORY MINIMUM COVER REQUIREMENTS AS ESTABLISHED BY THE CONDUIT MANUFACTURER MAY NOT ALWAYS BE ADEQUATE DURING CONSTRUCTION. WHEN CONSTRUCTION EQUIPMENT, FREQUENTLY HEAVIER THAN TRAFFIC LOADS FOR WHICH THE CONDUIT HAS BEEN DESIGNED, IS TO BE DRIVEN OVER OR CLOSE TO THE BURIED CONDUIT, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE CONDUIT. THE ADEQUACY OF THE COVER REQUIREMENTS FOR CONDUITS SHALL BE ANALYZED AND CHECKED BY THE CONTRACTOR TO ADDRESS LOADING CONDITIONS IMPOSED BY CONSTRUCTION ACTIVITY. ANY CONDUIT DAMAGED BY CONSTRUCTION ACTIVITY SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.

MARICOPA COUNTY GENERAL NOTES

1. ALL CONSTRUCTION SHALL CONFORM TO THE LATEST MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION (MCDOT) ROADWAY DESIGN MANUAL AND M.A.G. SPECIFICATIONS AND MARICOPA COUNTY SPECIAL PROVISIONS FOR CONSTRUCTION OF STREET IMPROVEMENTS, ADOPTED 11/03/93.

2. CONTRACTOR TO OBTAIN NECESSARY MCDOT PERMITS PRIOR TO CONSTRUCTION WITHIN COUNTY RIGHT-OF-WAY.

3. CONTRACTOR SHALL NOTIFY THE MCDOT INSPECTION DEPARTMENT AT LEAST 24 HOURS IN ADVANCE OF ANY CONSTRUCTION AT (602) 506-8606.

4. AN APPROVED SET OF PLANS SHALL BE ON THE SITE DURING CONSTRUCTION AND INSPECTIONS.

5. CONTRACTOR PERFORMING EXCAVATING OPERATIONS IS RESPONSIBLE FOR LOCATING, RELOCATING AND/OR PROTECTING ALL UNDERGROUND UTILITIES, AT NO EXPENSE TO MARICOPA COUNTY.

6. ALL COMPACTION AND BACKFILL WITHIN COUNTY RIGHT-OF-WAY SHALL CONFORM TO THE SPECIAL PROVISIONS FOR CONSTRUCTION OF STREET IMPROVEMENTS AND INSTALLATION OF UNDERGROUND UTILITIES, ADOPTED 11/03/93.

7. ALL STRUCTURES, SUCH AS MANHOLES, VALVE BOX & COVERS, AND MONITORING WELLS MUST BE MARKED WITH AT LEAST TWO REFLECTORIZED YELLOW FLEX POST WHEN STRUCTURES ARE LOCATED OUTSIDE THE TRAVELED WAY AND WITHIN THE RIGHT-OF-WAY. ("APPLIES ONLY WHEN THERE IS NO CURB.")

8. ALL EXISTING PAVEMENT MARKING, TRAFFIC SIGNS AND SIGNAL EQUIPMENT THAT NEEDS TO BE REMOVED, REPLACED, RELOCATED OR REPAIRED BECAUSE OF CONTRACTOR'S WORK, WILL BE DONE BY THE CONTRACTOR AT HIS EXPENSE. ALL TRAFFIC SIGNS THAT ARE REMOVED SHALL BE STOCKPILED ON THE PROJECT SITE AND THE CONTRACTOR IS TO NOTIFY THE INSPECTOR WHEN ALL SIGNS HAVE BEEN REMOVED. ALL COUNTY SIGNS WILL BE INSTALLED BY MCDOT CREWS. ALL NEW STREET NAME SIGNS SHALL BE PROVIDED AND INSTALLED BY PERMITTEE AT NO EXPENSE TO MARICOPA COUNTY.

9. PAVEMENT MARKING, SIGNING AND SIGNAL WORK WILL BE INSPECTED AND WILL HAVE TO MEET COUNTY STANDARDS BEFORE RELEASE OF BOND.

10. ASPHALT MIX DESIGN SHALL BE SUBMITTED TO MCDOT A MINIMUM OF 48 HOURS PRIOR TO PLACING ANY ASPHALT COURSES. (TRENCH WORK EXCLUDED.)

11. PRIOR TO CONDUCTING EXCAVATION OPERATIONS, THE CONTRACTOR SHALL OBTAIN FROM THE ARIZONA STATE ENVIRONMENTAL PLANNING GROUP (602) 712-7760, RECOMMENDATIONS REGARDING THE NEED FOR CULTURAL RESOURCES (ARCHAEOLOGICAL) CLEARANCE. ALL DISCOVERIES OF HUMAN REMAINS, CULTURAL ARTIFACTS, OR PALEONTOLOGICAL REMAINS SHALL BE REPORTED TO THE ARIZONA STATE MUSEUM AND MCDOT. UPON DISCOVERY, CONTRACTOR SHALL CEASE OPERATIONS IN THE VICINITY OF THE FIND AND PROTECT THE DISCOVERY AREA FROM FURTHER DISTURBANCE UNTIL THE FIND CAN BE PROFESSIONALLY INVESTIGATED BY THE ARIZONA STATE MUSEUM AND MCDOT.

DATE:- AR. 29, 2002
TIME:- 08:54:02
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CONT. MARICOPA COUNTY GENERAL NOTES

12. PRIOR TO MOVING OR DESTROYING PROTECTED NATIVE PLANT SPECIES, THE CONTRACTOR SHALL FILE A FORMAL NOTICE OF INTENT WITH THE ARIZONA DEPARTMENT OF AGRICULTURE NATIVE PLANTS (602) 542-3292.

13. EXCEPT UNDER EMERGENCY CONDITIONS, ROADS SHALL NOT BE CLOSED FOR CONSTRUCTION ACTIVITY UNLESS PRIOR APPROVAL IS OBTAINED FROM THE TRANSPORTATION DIRECTOR OF HIS REPRESENTATIVE.

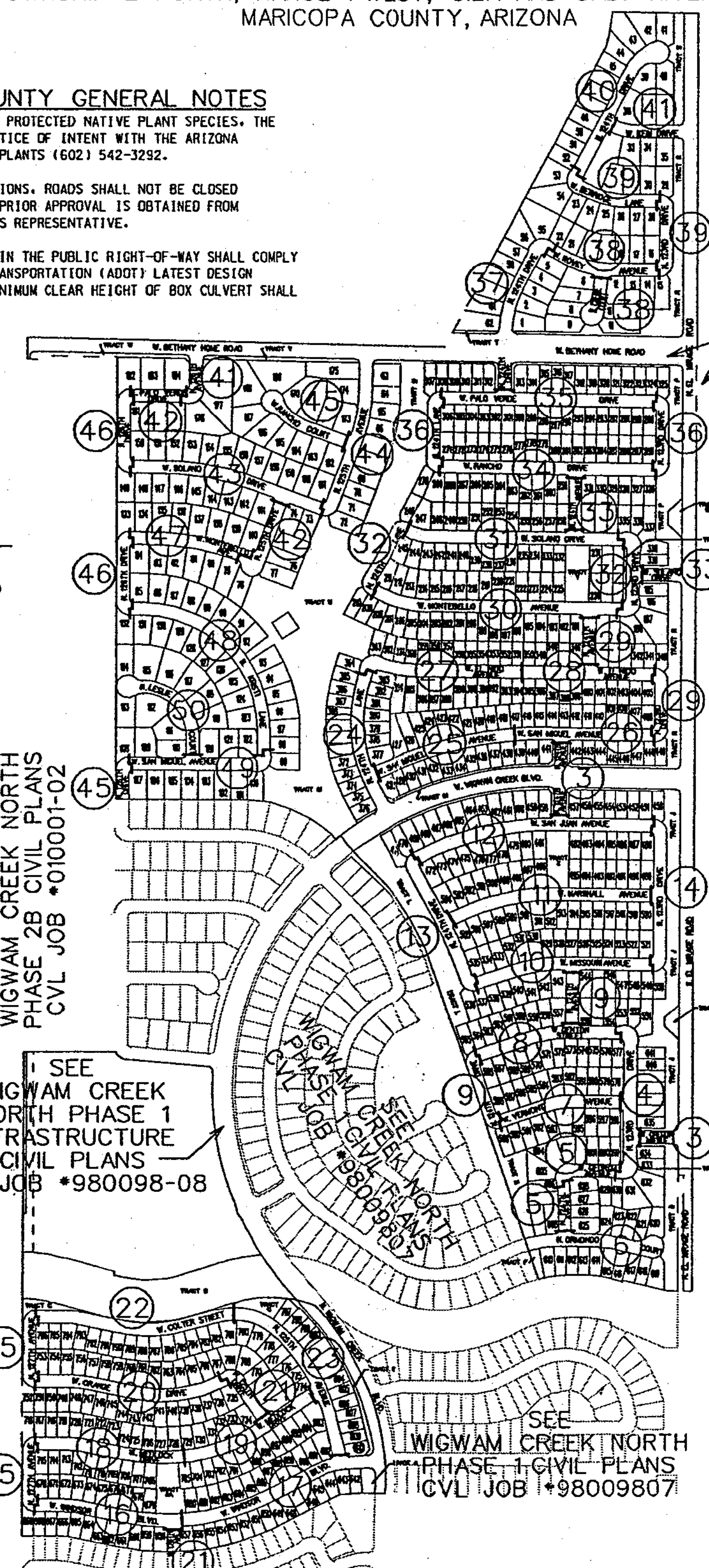
14. ALL BOX CULVERTS CONSTRUCTED IN THE PUBLIC RIGHT-OF-WAY SHALL COMPLY WITH THE ARIZONA DEPARTMENT OF TRANSPORTATION (ADOT) LATEST DESIGN SPECIFICATIONS AND STANDARDS. MINIMUM CLEAR HEIGHT OF BOX CULVERT SHALL BE 4 FEET.

ZONING:

PAD RESIDENTIAL

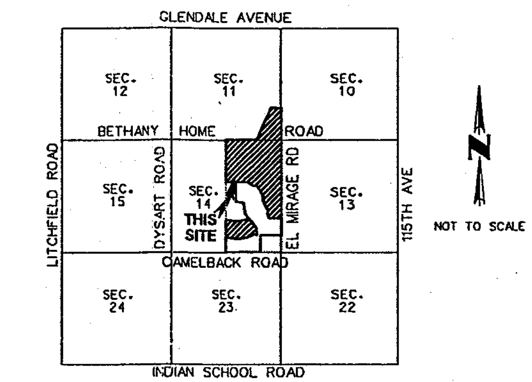
UTILITIES:

SEWER:	LPSCO
WATER:	LPSCO
FIRE:	RURAL METRO
GAS:	SOUTH WEST
ELECTRIC:	A.P.S.
TELEPHONE:	QWEST
CABLE TV:	COX CABLE



LEGEND:

TC	TOP OF CURB
G	GUTTER
P	PAVEMENT
E.P.	EDGE OF PAVEMENT
B.V.C.	BEGIN VERTICAL CURVE
P.I.	POINT OF INTERSECTION
E.V.C.	END VERTICAL CURVE
SW	SIDEWALK
C	CONCRETE
NG	NATURAL GROUND
B/C	BACK OF CURB
R/W	RIGHT OF WAY
S/W ESM'T	SIDEWALK EASEMENT
LE ESM'T	LANDSCAPE ESM'T
P.U.E.	PUBLIC UTILITY EASEMENT
R.W.	RETAINING WALL
L.F.	LINEAL FOOT
G.B.	GRADE BREAK
T.N.	TOP OF WATER VALVE
INV.	ELEVATION AT PIPE
M.H.	MANHOLE
M̲	MONUMENT LINE
P.C.	POINT OF CURVE
P.T.	POINT OF TANGENCY
P.R.C.	POINT OF REVERSE CURVE
▲	GRADE BREAK
X	PROP. STOP SIGN
●	SURVEY MONUMENT
	PROP. STREET LIGHT
	PROP. FIRE HYDRANT
	PROP WATERLINE & VALVE
	EXIST. FIRE HYDRANT
	EXIST. WATERLINE & VALVE
	PROP. SEWERLINE & MANHOLE
	EXIST. SEWERLINE & MANHOLE
	PROP. CATCH BASIN
	PROP. STORM DRAIN & MANHOLE
	EXIST. CATCH BASIN
	EXIST. STORM DRAIN & MANHOLE
(3)	PLAN SHEET NOS.



VICINITY MAP

DEVELOPER

CHI CONSTRUCTION COMPANY
7001 N. SCOTTSDALE RD., SUITE *2050
SCOTTSDALE, ARIZONA 85253
PHONE: (480) 483-0006
FAX: (480) 992-2577
CONTACT: BRETT HOPPER

ENGINEER

COE & VAN LOO
4550 N. 12TH STREET
PHOENIX, AZ. 85014
(602) 264-6831
(602) 264-0928 (FAX)

BENCHMARK

MARICOPA COUNTY DEPT. OF TRANSPORTATION - 1/2" IRON PIPE IN POTHOLE @ BETHANY HOME RD & EL MIRAGE RD ELEVATION 1036.44 MARICOPA COUNTY DATUM

SHEET INDEX

1..........................COVER SHEET
2..........................GENERAL NOTES AND DETAILS
3-50....................PAVING & STORM DRAIN PLANS
51-54..................A.D.O.T STANDARD DRAWINGS
55-56..................STORM DRAIN DETAILS & QUANTITIES

AS-BUILT CERTIFICATION

I HEREBY CERTIFY THAT THE "RECORD DRAWING" MEASUREMENTS AND SURVEY MONUMENTS AS SHOWN HEREON WERE MADE UNDER MY SUPERVISION OR AS NOTED AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

REGISTERED LAND SURVEYOR ____________ DATE ______

REGISTRATION NUMBER ____________ CVL PHONE: (602) 264-6831

MCDOT APPROVAL

BY LETTER
COUNTY ENGINEER ____________ DATE ______

Call two working days before you dig. CALL FOR THE BLUE STAKES 602-263-1100 1-800-STAKE-IT OUTSIDE MARICOPA COUNTY

WIGWAM CREEK NORTH PHASE 2

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED	GWV
DRAWN	MP,DH,RR,JH
CHECKED	GWV/DJH
DATE	4-2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 33065 CHRISTOPHER A. WOODROW ARIZONA, U.S.A.

CVL

SHEET 1 OF 56

CVL PROJECT NO.: 000046-03

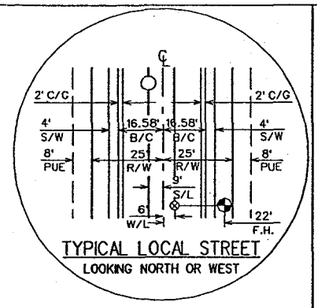
.../980098/land/phase2/pa01c01.dgn May. 03, 2002 14:01:40

PAVING NOTES:

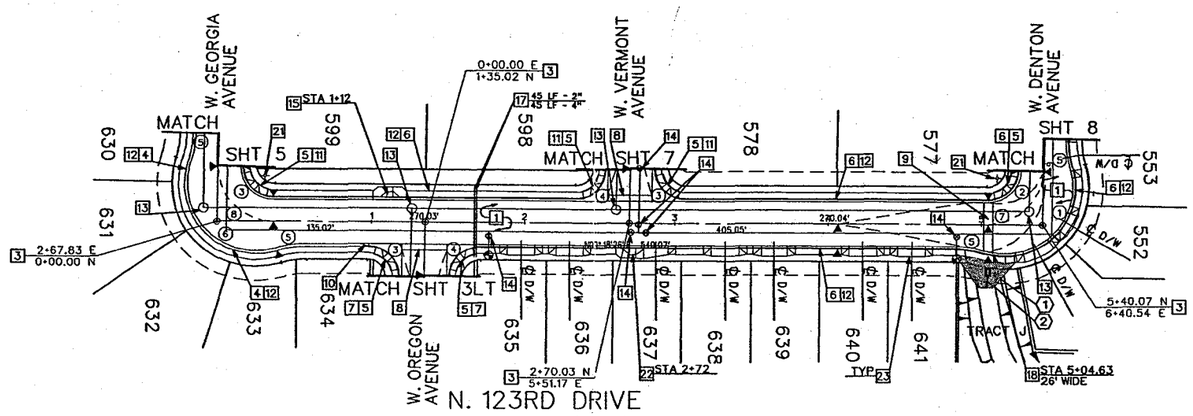
1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE A)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE B)
4. INSTALL ROLL CURB & GUTTER-M.A.G. STD. DET. 220 (TYPE C)
5. INSTALL SIDEWALK RAMP-M.C.D.O.T STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL 4" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
8. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
9. INSTALL 6' VALLEY GUTTER & APRON-M.A.G. STD. DET. 240 (MODIFIED)
10. INSTALL 5' CURB TRANSITION FROM VERTICAL TO ROLL CURB-M.A.G. STD. DET. 221
11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
12. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
13. MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422
14. WATER VALVE/CLEANOUT ADJUSTMENT- M.A.G. STD. DET. 270
15. INSTALL SIDEWALK RAMP PER M.C.D.O.T. STD. DET. 2032-B
16. INSTALL THICKENED EDGE OF PAVEMENT PER M.A.G. STD. DET. 201, TYPE 'B'
17. INSTALL SCH. 40 PVC SLEEVE - SEE PLANS FOR SIZE & LENGTH
18. DEPRESS CURB, GUTTER AND SIDEWALK PER DETAIL SHT2 (WIDTH GIVEN)
19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-B
20. REMOVE BARRICADE
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. CONSTRUCT MODIFIED SIDEWALK RAMP MCDOT STD. DET. 2032-B AND D/W MCDOT STD. DET. 2033 PER DETAIL ON SHT 2
23. INSTALL DRIVEWAY ENTRANCE PER MCDOT STD. DET. 2033 SEE TYPICAL DRIVE LOCATION DETAIL ON SHT 2 FOR OFFSET AND SIZE.
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS=12" D -6' (UNLESS OTHERWISE NOTED)
25. INSTALL CONC. SCUPPER PER M.A.G. STD. DET. 206.2 WITH OPENING WIDTH AS INDICATED ON PLAN. (SEE SHT 2 FOR RIP-RAP DETAIL)
26. REMOVE TEMPORARY A.C. TURNAROUND.
27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2
28. CONSTRUCT 2-6'X4' C.B.C. WITH INLET/OUTLET HEADWALLS & WINGWALLS PER A.D.O.T. STD. DET. B-02.20 & 08.10 SEE DET SHTS. 51, 52, 53 & 54
29. INSTALL 4-36"X60' RCRCP CL.. V UNDER 2' OF COVER AND INLET/OUTLET HEADWALLS PER MAG 501-1 WITH TRASH RACK PER MAG 502-2
30. SAWCUT 2' MIN. TO A NEAT CLEAN EDGE AND REMOVE. MATCH TO EXISTING.
31. REMOVE EXISTING BARRICADE

BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0046.58'	123°46'47"	0100.63'	0087.20'
2	0019.92'	089°05'49"	0030.98'	0019.61'
3	0019.42'	090°54'10"	0030.81'	0019.73'
4	0019.42'	089°05'49"	0030.20'	0019.12'
5	0063.42'	017°20'29"	0019.20'	0009.67'
6	0046.58'	125°35'09"	0102.10'	0090.61'
7	0036.00'	089°05'49"	0055.98'	0035.44'
8	0036.00'	90°54'10"	0057.12'	0036.57'



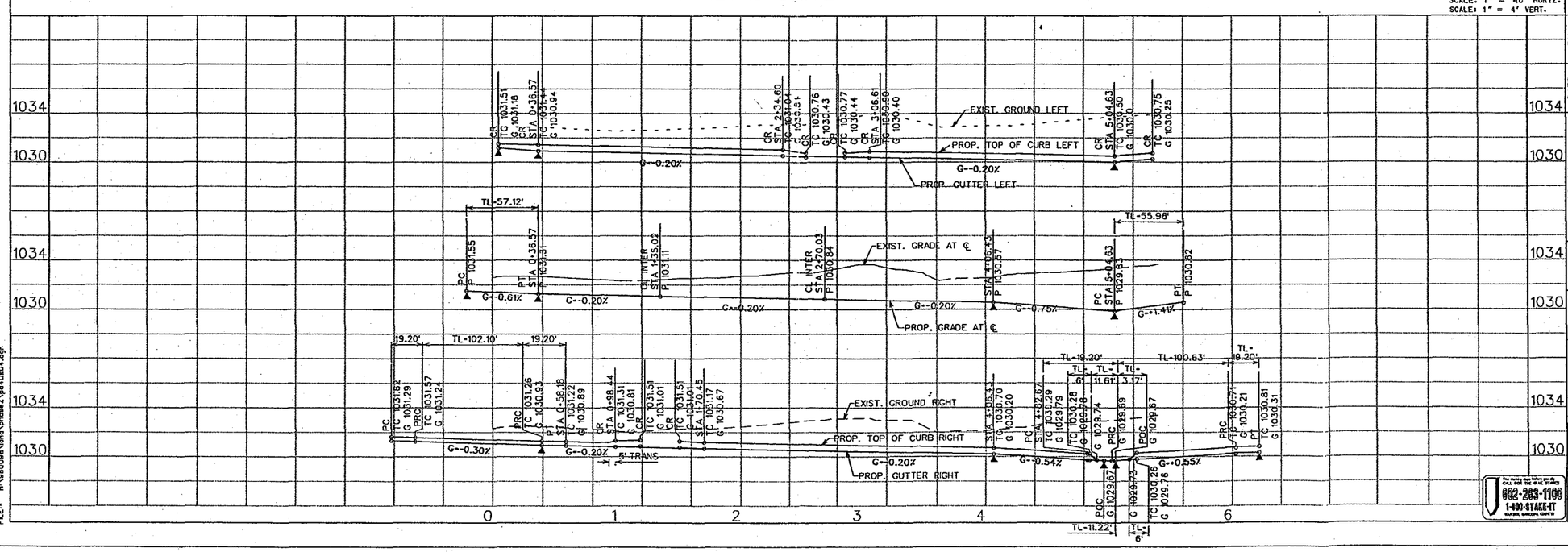
TYPICAL LOCAL STREET
LOOKING NORTH OR WEST



CONSTRUCTION NOTES
STORM DRAIN SYSTEM

1. STA 5+04.63, 33.16' RT., CONST. CATCH BASIN • PER M.A.G. STD. DET. 537, TYPE 'C', DOUBLE (SEE DET. SHT. 56) V=3.2', TOP GRATE=29.50, INV.=26.30
2. INSTALL 9 LF, 8" P.V.C. @ S=0.0117/' INV. IN=26.30, INV. OUT=26.20

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.



WIGWAM CREEK NORTH PHASE 2

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED CWV
DRAWN MP,DH,RR,JH
CHECKED CWV/DJH
DATE 4-2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 33065 CHRISTOPHER A. WOODROW ARIZONA U.S.A.

CVL

BLUE STAKE, INC. CALL FOR THE NEAR SERVICE
602-263-1100
602-263-1100
1-800-STAKE-IT
ELSEWHERE WITHIN STATE

SHEET 4 OF 56

CVL PROJECT NO.: 000046-03

DATE= May. 01, 2002
TIME= 09:31:03
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.../980098/land/phase2/pa40s04.dgn May. 03, 2002 14:13:45

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
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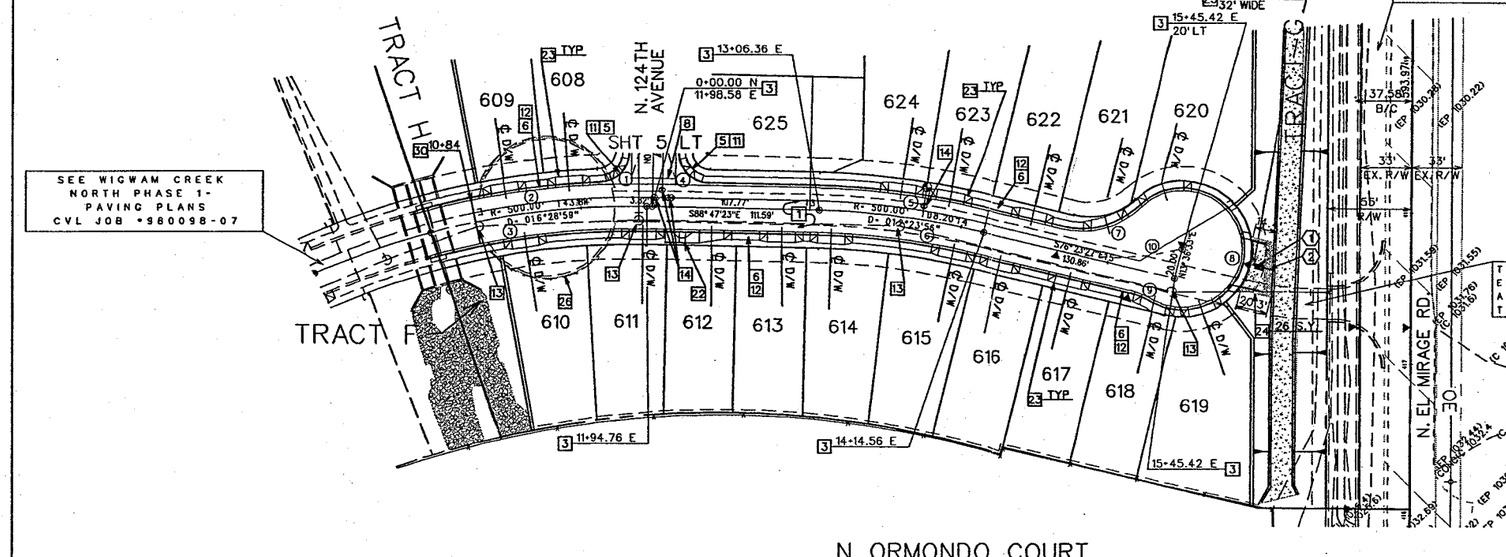
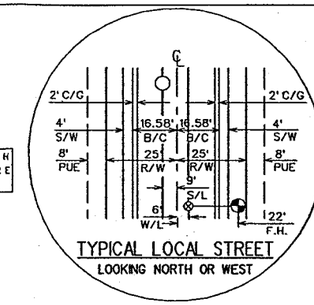
25. INSTALL CONC. SCUPPER PER M.A.G. STD. DET. 206.2 WITH OPENING WIDTH AS INDICATED ON PLAN. (SEE SHT 2 FOR RIP-RAP DETAIL)
26. REMOVE TEMPORARY A.C. TURNAROUND.
27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2
28. CONSTRUCT 2-6'X4' C.B.C. WITH INLET/OUTLET HEADWALLS & WINGWALLS PER A.D.O.T. STD. DET. B-02.20 & 08.10 SEE DET SHTS. 51, 52, 53 & 54
29. INSTALL 4-36"X66' RGRCP CL... V UNDER 2' OF COVER AND INLET/OUTLET HEADWALLS PER MAG 501-1 WITH TRASH RACK PER MAG 502-2
30. SAWCUT 2' MIN. TO A NEAT CLEAN EDGE AND REMOVE. MATCH TO EXISTING.
31. REMOVE EXISTING BARRICADE





BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0019.42'	086°33'28"	0029.34'	0018.29'
2	0516.58'	013°08'54"	0118.55'	0059.54'
3	0483.42'	016°22'04"	0138.10'	0069.52'
4	0019.42'	090°00'00"	0030.50'	0019.42'
5	0516.58'	012°23'56"	0111.79'	0056.11'
6	0483.42'	012°23'56"	0104.61'	0052.51'
7	0053.42'	057°51'54"	0053.95'	0029.53'
8	0040.58'	254°38'23"	0180.39'	-0053.2'
9	0053.42'	016°46'29"	0015.64'	0007.86'
10	0168.40'	028°12'29"	0082.91'	0042.31'

CONSTRUCTION NOTES
STORM DRAIN SYSTEM

1. STA 15+98.80, 20.37' L.T., CONST. CATCH BASIN * PER M.A.G. STD. DET. 537, TYPE 'G', DOUBLE (SEE DET. S-IT. 56) V-3.95', TO? GRATE-28.85, INV.-24.90
2. INSTALL 8 L.F. 8" P.V.C. @ S-0.0125'/' INV. IN-24.93, INV. OUT-24.80

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.

WIGWAM CREEK NORTH PHASE 2

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED GWV
DRAWN MP,DH,RR,JH
CHECKED GWV/DJH
DATE 4-2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 33065 CHRISTOPHER A. WOODROW ARIZONA, U.S.A.

CVL

SHEET 6 OF 56

CVL PROJECT NO.: 000046-03

602-263-1100
1-800-STAKE-IT

DATE:- May. 01, 2002
TIME:- 09:32:05
FILE:- n:\980098\land\phase2\pa40s06.dgn

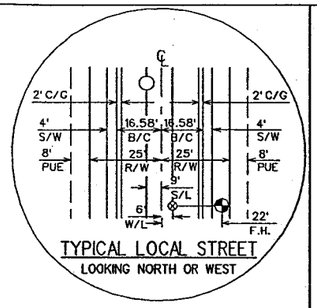
.../980098/land/phase2/pa40s06.dgn May. 03, 2002 14:14:23

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE A)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE B)
4. INSTALL ROLL CURB & GUTTER-M.A.G. STD. DET. 220 (TYPE C)
5. INSTALL SIDEWALK RAMP-M.C.D.O.T STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL 4" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
8. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
9. INSTALL 6' VALLEY GUTTER & APRON-M.A.G. STD. DET. 240 (MODIFIED)
10. INSTALL 5' CURB TRANSITION FROM VERTICAL TO ROLL CURB-M.A.G. STD. DET. 221
11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
12. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
13. MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422
14. WATER VALVE/CLEANOUT ADJUSTMENT- M.A.G. STD. DET. 270
15. INSTALL SIDEWALK RAMP PER M.C.D.O.T. STD. DET. 2032-B
16. INSTALL THICKENED EDGE OF PAVEMENT PER M.A.G. STD. DET. 201, TYPE 'B'
17. INSTALL SCH. 40 PVC SLEEVE - SEE PLANS FOR SIZE & LENGTH
18. DEPRESS CURB, GUTTER AND SIDEWALK PER DETAIL SHT2 (WIDTH GIVEN)
19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-B
20. REMOVE BARRICADE
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. CONSTRUCT MODIFIED SIDEWALK RAMP MCDOT STD. DET. 2032-B AND D/W MCDOT STD. DET. 2033 PER DETAIL ON SHT 2
23. INSTALL DRIVEWAY ENTRANCE PER MCDOT STD. DET. 2033 SEE TYPICAL DRIVE LOCATION DETAIL ON SHT 2 FOR OFFSET AND SIZE.
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS=12"$_{50}$D +6" (UNLESS OTHERWISE NOTED)
25. INSTALL CONC. SCUPPER PER M.A.G. STD. DET. 206.2 WITH OPENING WIDTH AS INDICATED ON PLAN. (SEE SHT 2 FOR RIP-RAP DETAIL)
26. REMOVE TEMPORARY A.C. TURNAROUND.
27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2
28. CONSTRUCT 2-6'X4' C.B.C. WITH INLET/OUTLET HEADWALLS & WINGWALLS PER A.D.O.T. STD. DET. B-02.20 & 08.10 SEE DET SHTS. 51, 52, 53 & 54
29. INSTALL 4-36"X66' RGRCP CL. V UNDER 2' OF COVER AND INLET/OUTLET HEADWALLS PER MAG 501-1 WITH TRASH RACK PER MAG 502-2
30. SAWCUT 2' MIN. TO A NEAT CLEAN EDGE AND REMOVE. MATCH TO EXISTING.
31. REMOVE EXISTING BARRICADE

BC CURVE DATA

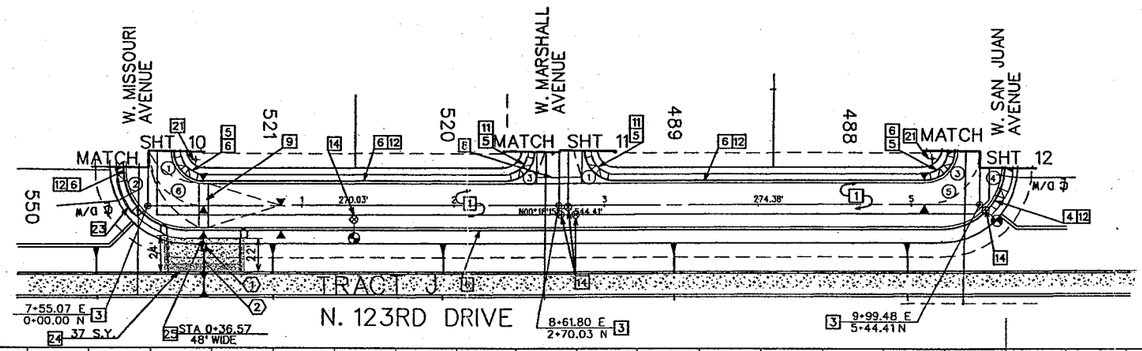
NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0019.42'	090°54'21"	0030.81'	0019.73'
2	0041.58'	090°54'21"	0065.97'	0042.24'
3	0019.42'	089°05'38"	0030.20'	0019.12'
4	0041.58'	089°05'38"	0064.66'	0040.93'
5	0036.00'	089°05'38"	0055.98'	0035.44'
6	0036.00'	090°54'21"	0057.12'	0036.57'

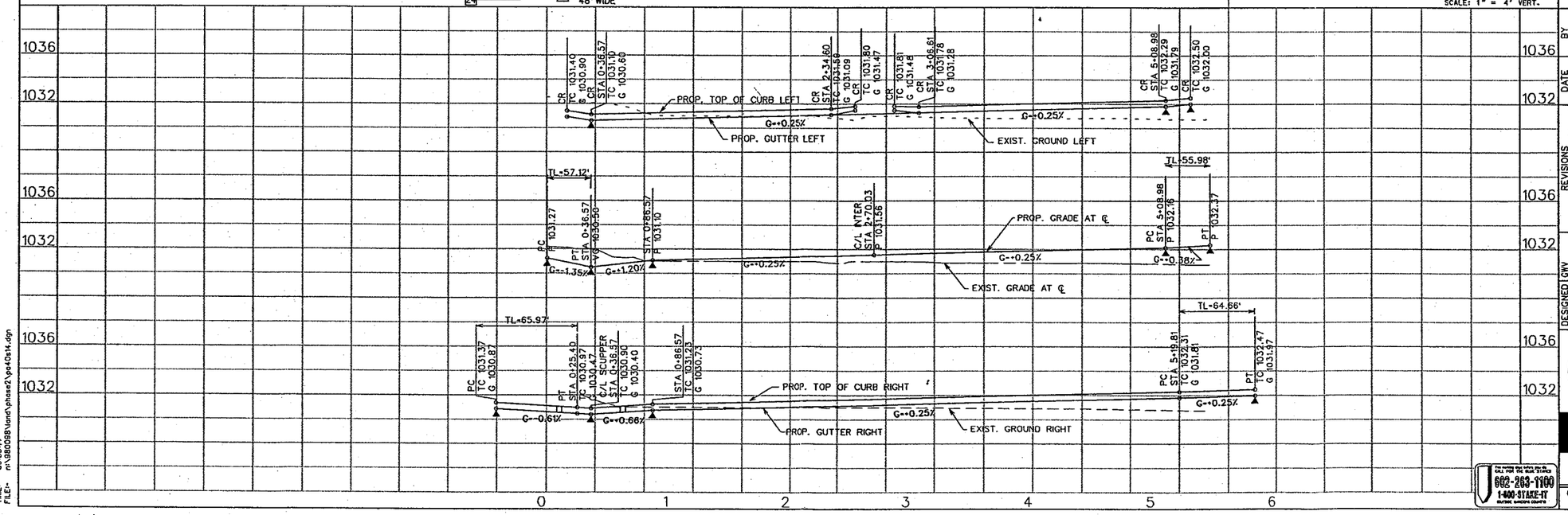


TYPICAL LOCAL STREET
LOOKING NORTH OR WEST

CONSTRUCTION NOTES
STORM DRAIN SYSTEM

1. STA 0+36.57, 29.25' RT., CONST. CATCH BASIN * PER M.A.G. STD. DET. 537, TYPE 'G', DOUBLE (SEE DET. SHT. 56) V=3.5', TOP GRATE=30.20, INV.=26.70
2. INSTALL 16 LF, 8" P.V.C. @ S=0.0063'/' INV. IN=26.70, INV. OUT=26.60





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4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED GWV
DRAWN MP,DH,RR,JH
CHECKED GWV/DJH
DATE 4-2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 33065 CHRISTOPHER A. WOODROW Date Signed ARIZONA U.S.A.

CVL

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602-263-1100
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

SHEET 14 OF 56

CVL PROJECT NO.: 000046-03

DATE:- May. 01, 2002
TIME:- 09:34:14
FILE:- n:\980098\land\phase2\pa40s14.dgn

.../980098/land/phase2/pa40s14.dgn May. 03, 2002 14:13:01

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE A)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE B)
4. INSTALL ROLL CURB & GUTTER-M.A.G. STD. DET. 220 (TYPE C)
5. INSTALL SIDEWALK RAMP-M.C.D.O.T STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL 4" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
8. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
9. INSTALL 6' VALLEY GUTTER & APRON-M.A.G. STD. DET. 240 (MODIFIED)
10. INSTALL 5' CURB TRANSITION FROM VERTICAL TO ROLL CURB-M.A.G. STD. DET. 221
11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
12. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
13. MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422
14. WATER VALVE/CLEANOUT ADJUSTMENT- M.A.G. STD. DET. 270
15. INSTALL SIDEWALK RAMP PER M.C.D.O.T. STD. DET. 2032-B
16. INSTALL THICKENED EDGE OF PAVEMENT PER M.A.G. STD. DET. 201, TYPE 'B'
17. INSTALL SCH. 40 PVC SLEEVE - SEE PLANS FOR SIZE & LENGTH
18. DEPRESS CURB, GUTTER AND SIDEWALK PER DETAIL SHT2 (WIDTH GIVEN)
19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-B
20. REMOVE BARRICADE
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. CONSTRUCT MODIFIED SIDEWALK RAMP MCDOT STD. DET. 2032-B AND D/W MCDOT STD DET. 2033 PER DETAIL ON SHT 2
23. INSTALL DRIVEWAY ENTRANCE PER MCDOT STD. DET. 2033 SEE TYPICAL DRIVE LOCATION DETAIL ON SHT 2 FOR OFFSET AND SIZE.
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS=12"$_{50}$D +6" (UNLESS OTHERWISE NOTED)
25. INSTALL CONC. SCUPPER PER M.A.G. STD. DET. 206.2 WITH OPENING WIDTH AS INDICATED ON PLAN. (SEE SHT 2 FOR RIP-RAP DETAIL)
26. REMOVE TEMPORARY A.C. TURNAROUND.
27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2
28. CONSTRUCT 2-8'X4' C.B.C. WITH INLET/OUTLET HEADWALLS & WINGWALLS PER A.D.O.T. STD. DET. B-02.20 & 08.10 SEE DET SHTS. 51, 52, 53 & 54
29. INSTALL 4-36"X66' RCRCP CL. V UNDER 2' OF COVER AND INLET/OUTLET HEADWALLS PER MAG 501-1 WITH TRASH RACK PER MAG 502-2
30. SAWCUT 2' MIN. TO A NEAT CLEAN EDGE AND REMOVE. MATCH TO EXISTING.
31. REMOVE EXISTING BARRICADE

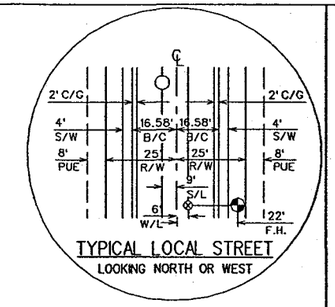
CONSTRUCTION NOTES
STORM DRAIN SYSTEM

(1) STA 0+36.57, 29.25' RT., CONST. CATCH BASIN * PER M.A.G. STD. DET. 537, TYPE 'G', DOUBLE (SEE DET. SHT. 56) V=2.2', TOP GRATE=31.40, INV.=29.20

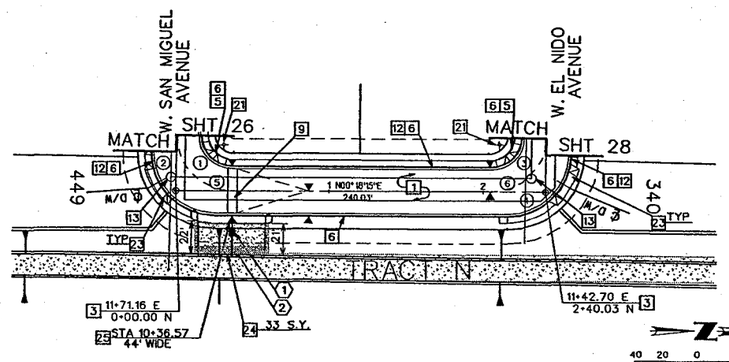
(2) INSTALL 15 LF, 8" P.V.C. @ S=0.0047'/' INV. IN=29.20, INV. OUT=29.13

BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0019.42'	090°54'21"	0030.81'	0019.73'
2	0041.58'	090°54'21"	0065.97'	0042.24'
3	0019.42'	089°05'38"	0030.20'	0019.12'
4	0041.58'	089°05'38"	0064.66'	0040.93'
5	0036.00'	090°54'21"	0057.12'	0036.57'
6	0036.00'	089°05'38"	0055.98'	0035.44'

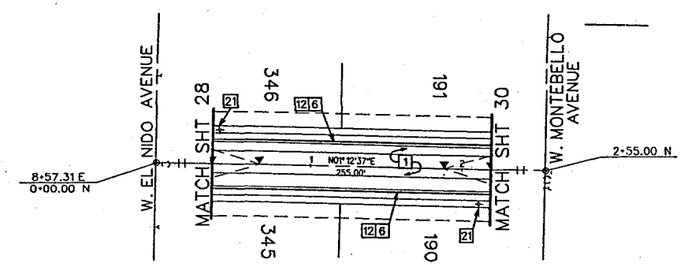


TYPICAL LOCAL STREET
LOOKING NORTH OR WEST



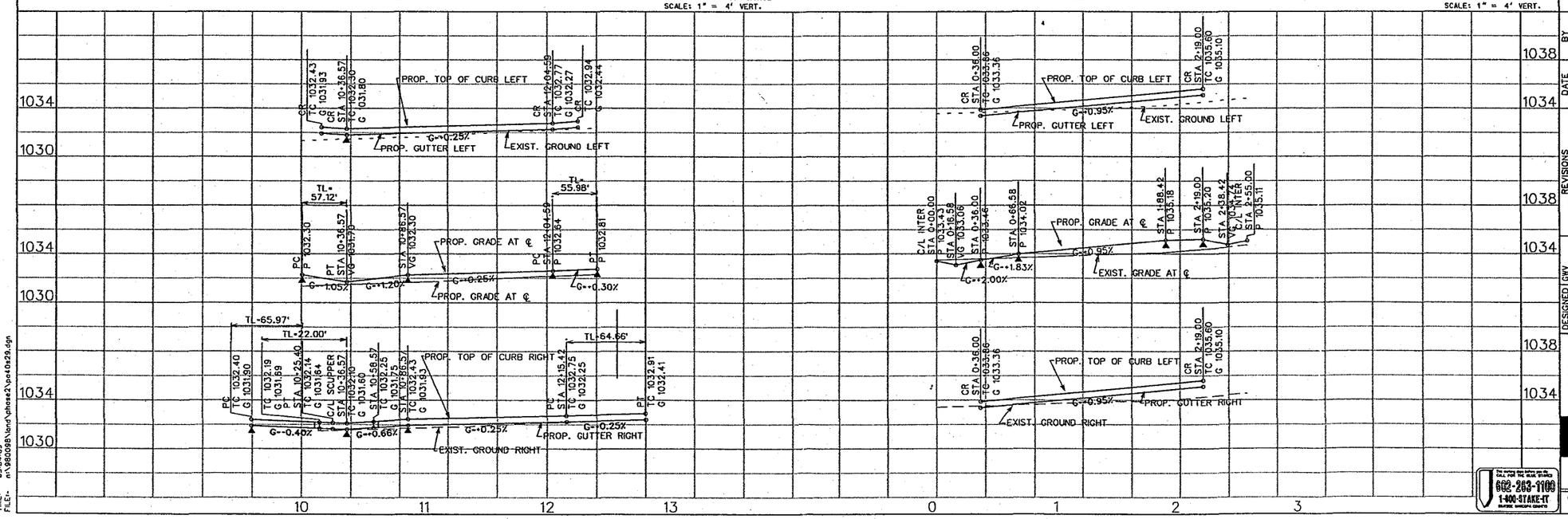
N. 123RD DRIVE

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.



N. 124TH AVENUE

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.



DATE- May. 01, 2002
TIME- 09:34:09
FILE- n:\980098\land\phase2\pa40s29.dgn

WIGWAM CREEK NORTH PHASE 2

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4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED GWV
DRAWN MP,DH,RR,JH
CHECKED GWV/DJH
DATE 4-2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 33085 CHRISTOPHER A. WOODROW Date Signed ARIZONA, U.S.A.

CVL

SHEET 29 OF 56

CVL PROJECT NO.: 000046-03

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1-800-STAKE-IT
(ARIZONA BLUE STAKE, INC.)

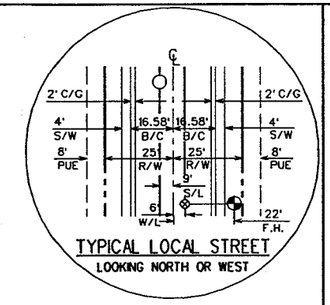
.../980098/land/phase2/pa40s29.dgn May. 03, 2002 14:12:20

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE A)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE B)
4. INSTALL ROLL CURB & GUTTER-M.A.G. STD. DET. 220 (TYPE C)
5. INSTALL SIDEWALK RAMP-M.C.D.O.T STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL 4" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
8. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
9. INSTALL 6' VALLEY GUTTER & APRON-M.A.G. STD. DET. 240 (MODIFIED)
10. INSTALL 5' CURB TRANSITION FROM VERTICAL TO ROLL CURB-M.A.G. STD. DET. 221
11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
12. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
13. MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422
14. WATER VALVE/CLEANOUT ADJUSTMENT- M.A.G. STD. DET. 270
15. INSTALL SIDEWALK RAMP PER M.C.D.O.T. STD. DET. 2032-B
16. INSTALL THICKENED EDGE OF PAVEMENT PER M.A.G. STD. DET. 201, TYPE 'B'
17. INSTALL SCH. 40 PVC SLEEVE - SEE PLANS FOR SIZE & LENGTH
18. DEPRESS CURB, GUTTER, AND SIDEWALK PER DETAIL SHT2 (WIDTH GIVEN)
19. INSTALL BARRICADE PER M.A.G. STD. DET. 150-8
20. REMOVE BARRICADE
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. DRIVEWAY-PEDESTRIAN COMBINATION (FOR USE AT "T" INTERSECTIONS PER CITY OF PHOENIX STD. DTL. P1244. SEE SETAIL SHT 57.
23. INSTALL DRIVEWAY ENTRANCE PER MCDOT STD. DET. 2033 SEE TYPICAL DRIVE LOCATION DETAIL ON SHT 2 FOR OFFSET AND SIZE.
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS-12"$_{MD}$ +6" (UNLESS OTHERWISE NOTED)
25. INSTALL CONC. SCUPPER: PER M.A.G. STD. DET. 206.2 WITH OPENING WIDTH AS INDICATED ON PLAN. (SEE SHT 2 FOR RIP-RAP DETAIL)
26. REMOVE TEMPORARY A.C. TURNAROUND.
27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2
28. CONSTRUCT 2-6'X4' C.B.C. WITH INLET/OUTLET HEADWALLS & WINGWALLS PER A.D.O.T. STD. DET. B-02.20 & 08.10 SEE DET SHTS. 51, 52, 53 & 54
29. INSTALL 7-24" x 66' RGRCP CL. V S=0.0023X
30. SAWCUT 2' MIN. TO A NEAT CLEAN EDGE AND REMOVE. MATCH TO EXISTING.
31. REMOVE EXISTING BARRICADE

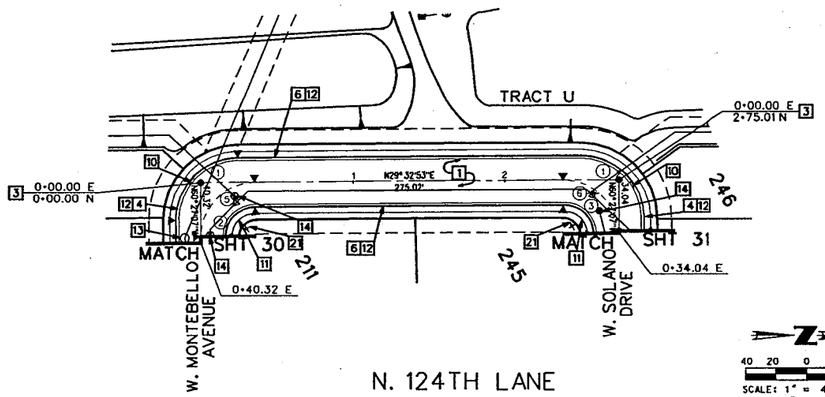
BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0041.58'	090°00'00"	0065.31'	0041.58'
2	0019.42'	090°00'00"	0030.50'	0019.42'
3	0019.42'	089°31'29"	0030.34'	0019.26'
4	0046.58'	124°40'58"	0101.36'	0088.88'
5	0036.00'	090°00'00"	0056.55'	0036.00'
6	0036.00'	089°31'29"	0056.25'	0035.70'
7	0063.42'	017°20'29"	0019.20'	0009.67'



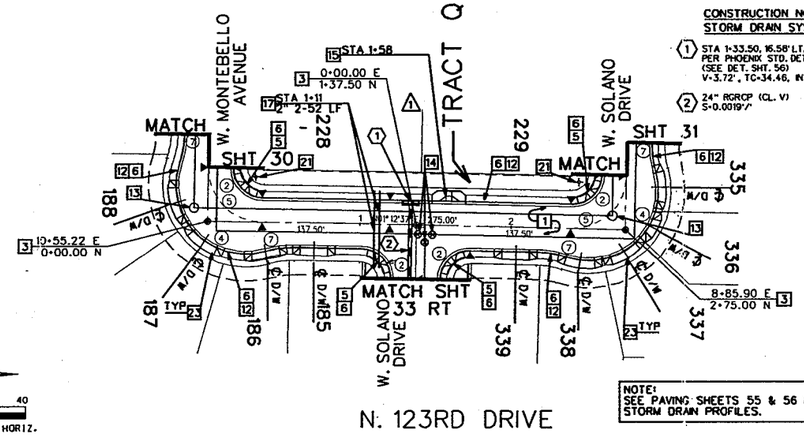
CONSTRUCTION NOTES
STORM DRAIN SYSTEM

1. STA 1+33.50, 16.58' LT. CONSTRUCT CATCH BASIN +2-2-3 PER PHOENIX STD. DET. P1570, M-1, TYPE 'N', TRIPLE (SEE DET. SHT. 56) V=3.72', TC=34.46, INV.=30.73
2. 24" RGRCP (CL. V) S=0.0019'/'



N. 124TH LANE

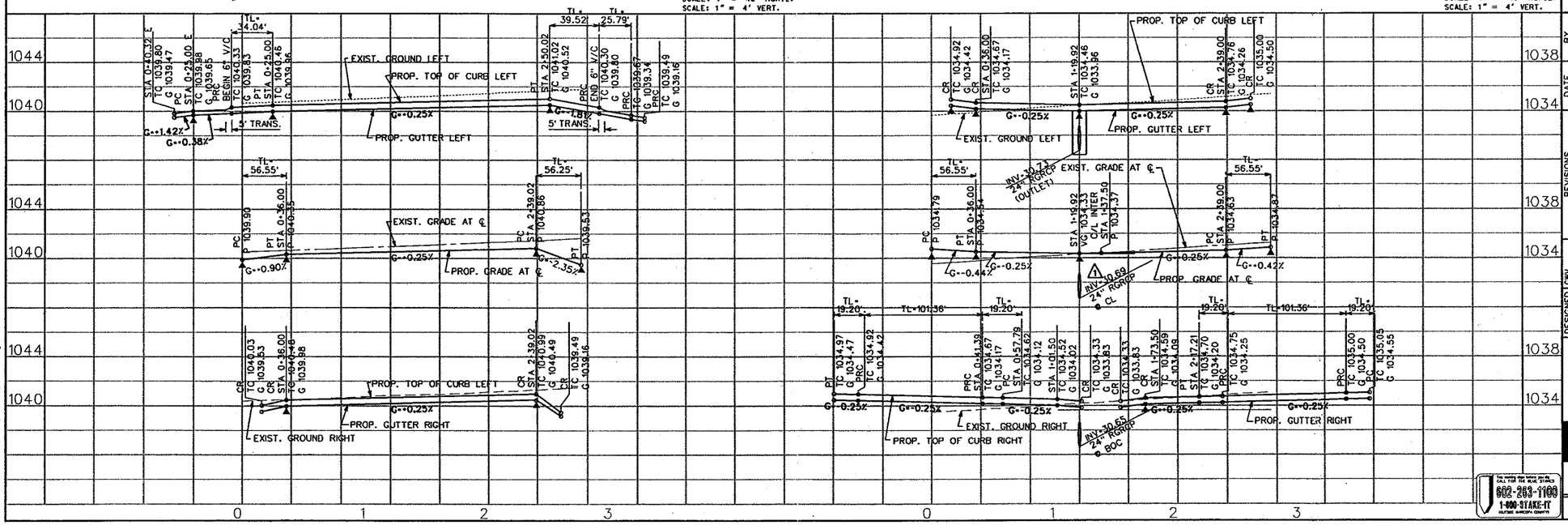
SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.



N. 123RD DRIVE

NOTE:
SEE PAVING SHEETS 55 & 56 FOR STORM DRAIN PROFILES.

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.



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PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY
ADDED NOTE 110 PLAN	5-22-02	RW
REMOVED S/W RAMP	7-30-02	JH
MODIFIED INVERT/ CATCH BASIN	5-9-03	JK

DESIGNED GWV
DRAWN MP/DH/RR/JH
CHECKED GWV/DJH
DATE 4-2001

PAVING AND STORM DRAIN PLANS

CVL

SHEET 32 OF 57

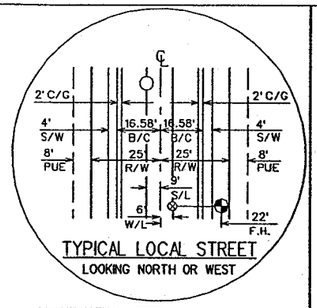
CVL PROJECT NO.: 980098-13

CALL FOR THE LOCATION OF UNDERGROUND UTILITIES
602-263-1100
602-289-1100
1-800-STAKE-IT

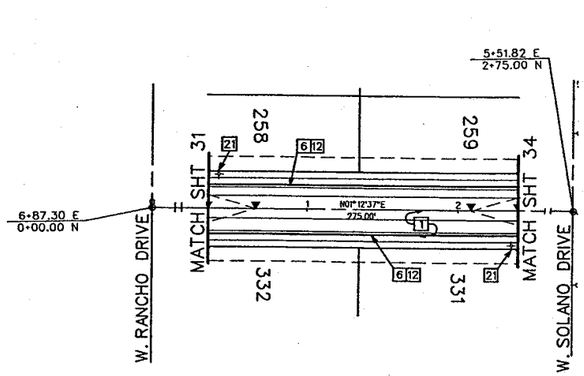
DATE:- May. 01, 2002
TIME:- 09:34:57
FILE:- m:\980098\land\phase2\pa40s32.dgn

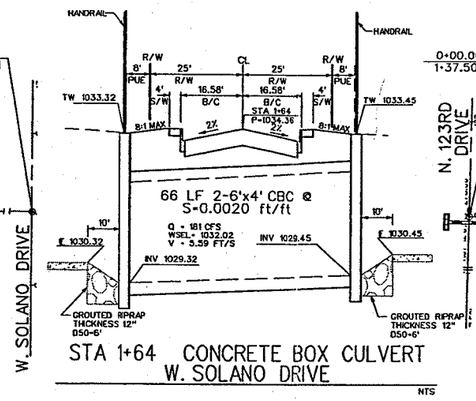
PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE A)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE B)
4. INSTALL ROLL CURB & GUTTER-M.A.G. STD. DET. 220 (TYPE C)
5. INSTALL SIDEWALK RAMP-M.C.D.O.T STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL 4" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
8. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
9. INSTALL 6' VALLEY GUTTER & APRON-M.A.G. STD. DET. 240 (MODIFIED)
10. INSTALL 5' CURB TRANSITION FROM VERTICAL TO ROLL CURB-M.A.G. STD. DET. 221
11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
12. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
13. MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422
14. WATER VALVE/CLEANOUT ADJUSTMENT- M.A.G. STD. DET. 270
15. INSTALL SIDEWALK RAMP PER M.C.D.O.T. STD. DET. 2032-B
16. INSTALL THICKENED EDGE OF PAVEMENT PER M.A.G. STD. DET. 201, TYPE 'B'
17. INSTALL SCH. 40 PVC SLEEVE - SEE PLANS FOR SIZE & LENGTH
18. DEPRESS CURB, GUTTER AND SIDEWALK PER DETAIL SHT2 (WIDTH GIVEN)
19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-B
20. REMOVE BARRICADE
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. CONSTRUCT MODIFIED SIDEWALK RAMP MCDOT STD. DET. 2032-B AND D/W MCDOT STD. DET. 2033 PER DETAIL ON SHT 2
23. INSTALL DRIVEWAY ENTRANCE PER MCDOT STD. DET. 2033 SEE TYPICAL DRIVE LOCATION DETAIL ON SHT 2 FOR OFFSET AND SIZE.
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS-12"$_{50}$D =6' (UNLESS OTHERWISE NOTED)
25. INSTALL CONC. SCUPPER PER M.A.G. STD. DET. 206.2 WITH OPENING WIDTH AS INDICATED ON PLAN. (SEE SHT 2 FOR RIP-RAP DETAIL)
26. REMOVE TEMPORARY A.C. TURNAROUND.
27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2
28. CONSTRUCT 2-8'X4' C.B.C. WITH INLET/OUTLET HEADWALLS & WINGWALLS PER A.D.O.T. STD. DET. B-02.20 & 08.10 SEE DET SHTS. 51, 52, 53 & 54
29. INSTALL 4-36"X66' RGRCP CL. V UNDER 2' OF COVER AND INLET/OUTLET HEADWALLS PER MAG 501-1 WITH TRASH RACK PER MAG 502-2
30. SAWCUT 2' MIN. TO A NEAT CLEAN EDGE AND REMOVE. MATCH TO EXISTING.
31. REMOVE EXISTING BARRICADE



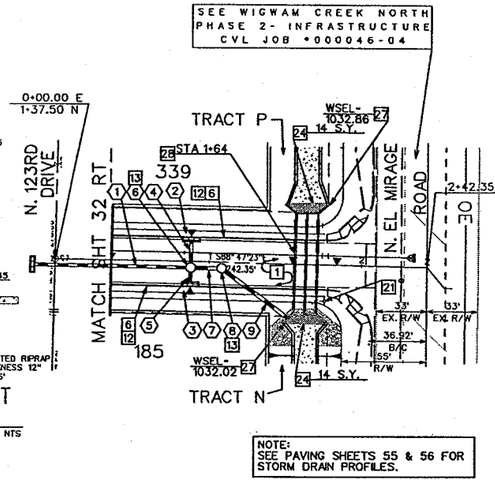
TYPICAL LOCAL STREET
LOOKING NORTH OR WEST





STA 1+64 CONCRETE BOX CULVERT
W. SOLANO DRIVE

NTS

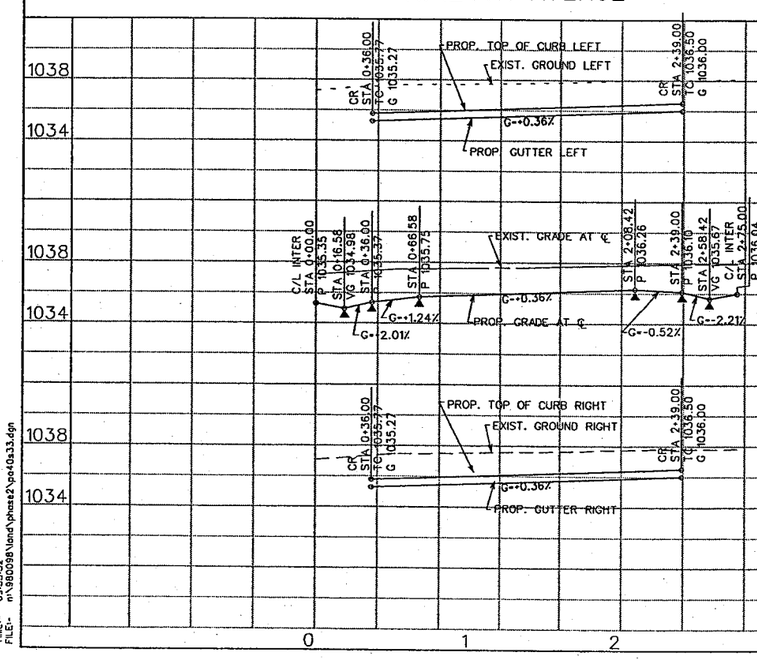


CONSTRUCTION NOTES
STORM DRAIN SYSTEM

1. INSTALL 192 LF 24" RGRCP (CL. V) S=0.0019'/'
2. STA 0+88.00, 16.58' LT., CONST. CATCH BASIN #2-2-1 PER PHOENIX STD. DET. P1570, TYPE 'N', TRIPLE (SEE DET. SHT. 56) V=4.0' TC=34.20, INV.=30.20
3. STA 0+88.00, 16.58' RT., CONST. CATCH BASIN #2-2-2 PER PHOENIX STD. DET. P1570, TYPE 'N', TRIPLE (SEE DET. SHT. 56) V=4.0' TC=34.20, INV.=30.20
4. INSTALL 21 LF 24" RGRCP (CL. V) S=0.0048'/'
5. INSTALL 13 LF 24" RGRCP (CL. V) S=0.0077'/'
6. STA 0+88.00, 4.0' RT CONSTRUCT STORM DRAIN MANHOLE PER M.A.G. STD. DET. 520 & 522 RIM 34.0 INV=30.10 N,S&W 24", INV=29.60 E 30"
7. INSTALL 20 LF 30" RGRCP (CL. V) S=0.0050'/'
8. STA 1+08.00, 4.0' RT CONSTRUCT STORM DRAIN MANHOLE PER M.A.G. STD. DET. 520 & 522 RIM 34.1 INV=29.50 W 30", INV=29.40 E 30"
9. INSTALL 50 LF 30" RGRCP (CL. V) S=0.0020'/' CONNECT TO BOX CULVERT WINGWALL INV=29.30

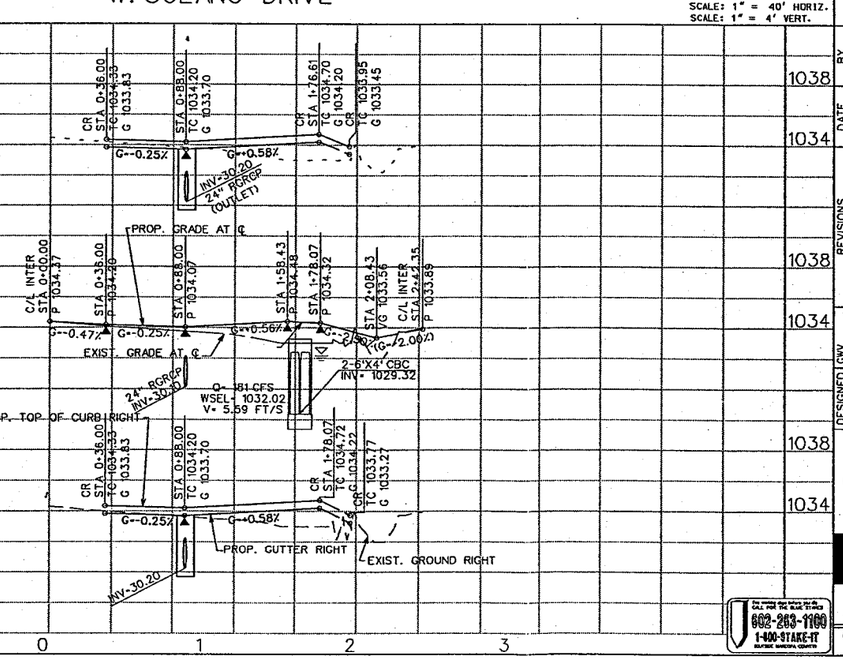
N. 124TH AVENUE

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.



W. SOLANO DRIVE

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.



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TIME- 08:45:52
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WIGWAM CREEK NORTH PHASE 2

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED	GWV
DRAWN	NP,DH,RR,JH
CHECKED	GWV/DJH
DATE	4-2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil)
CERTIFICATE NO. 33065
CHRISTOPHER A. WOODROW
Date Signed
ARIZONA U.S.A.

CVL

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OUTSIDE MARICOPA COUNTY

SHEET 33 OF 56

CVL PROJECT NO.: 000046-03

.../980098/land/phase2/pa40s33.dgn May. 03, 2002 14:11:40

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE A)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE B)
4. INSTALL ROLL CURB & GUTTER-M.A.G. STD. DET. 220 (TYPE C)
5. INSTALL SIDEWALK RAMP-M.C.D.O.T STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL 4" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
8. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
9. INSTALL 6' VALLEY GUTTER & APRON-M.A.G. STD. DET. 240 (MODIFIED)
10. INSTALL 5' CURB TRANSITION FROM VERTICAL TO ROLL CURB-M.A.G. STD. DET. 221
11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
12. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
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14. WATER VALVE/CLEANOUT ADJUSTMENT- M.A.G. STD. DET. 270
15. INSTALL SIDEWALK RAMP PER M.C.D.O.T. STD. DET. 2032-B
16. INSTALL THICKENED EDGE OF PAVEMENT PER M.A.G. STD. DET. 201, TYPE 'B'
17. INSTALL SCH. 40 PVC SLEEVE - SEE PLANS FOR SIZE & LENGTH
18. DEPRESS CURB, GUTTER AND SIDEWALK PER DETAIL SHT2 (WIDTH GIVEN)
19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-B
20. REMOVE BARRICADE
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. CONSTRUCT MODIFIED SIDEWALK RAMP MCDOT STD. DET. 2032-B AND D/W MCDOT STD. DET. 2033 PER DETAIL ON SHT 2
23. INSTALL DRIVEWAY ENTRANCE PER MCDOT STD. DET. 2033 SEE TYPICAL DRIVE LOCATION DETAIL ON SHT 2 FOR OFFSET AND SIZE.
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS-12" $_{W}$D +6' (UNLESS OTHERWISE NOTED)
25. INSTALL CONC. SCUPPER PER M.A.G. STD. DET. 206.2 WITH OPENING WIDTH AS INDICATED ON PLAN. (SEE SHT 2 FOR RIP-RAP DETAIL)
26. REMOVE TEMPORARY A.C. TURNAROUND.
27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2
28. CONSTRUCT 2-6'X4' C.B.C. WITH INLET/OUTLET HEADWALLS & WINGWALLS PER A.D.O.T. STD. DET. B-02.20 & 08.10 SEE DET SHTS. 51, 52, 53 & 54
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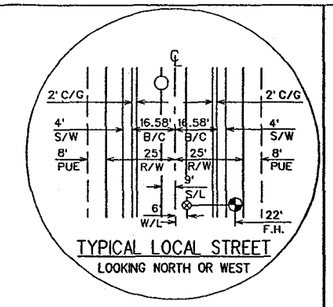
30. SAWCUT 2' MIN. TO A NEAT CLEAN EDGE AND REMOVE. MATCH TO EXISTING.
31. REMOVE EXISTING BARRICADE

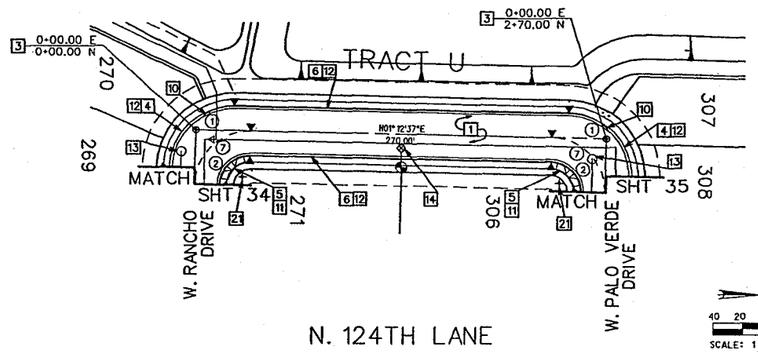
BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0041.58'	090°00'00"	0065.31'	0041.58'
2	0019.42'	090°00'00"	0030.50'	0019.42'
3	0019.42'	090°54'21"	0030.81'	0019.73'
4	0041.58'	090°54'21"	0065.97'	0042.24'
5	0019.42'	089°05'38"	0030.20'	0019.12'
6	0041.58'	089°05'38"	0064.66'	0040.93'
7	0036.00'	090°00'00"	0056.55'	0036.00'
8	0036.00'	090°54'21"	0057.12'	0036.57'
9	0036.00'	089°05'38"	0055.98'	0035.44'



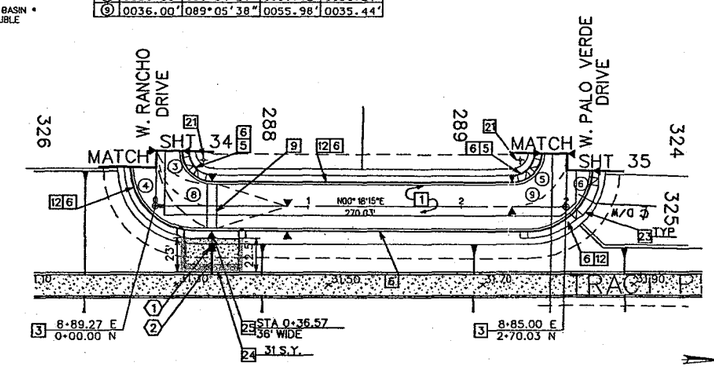
CONSTRUCTION NOTES
STORM DRAIN SYSTEM

1. STA 0+36.57, 29.25' RT., CONST. CATCH BASIN * PER M.A.G. STD. DET. 537, TYPE 'G', DOUBLE (SEE DET. SHT. 56) V=2.7', TOP GRATE=34.10, INV.=31.40
2. INSTALL 16 LF, 8" P.V.C. @ S=0.0063'/' INV. IN=31.40, INV. OUT=31.30



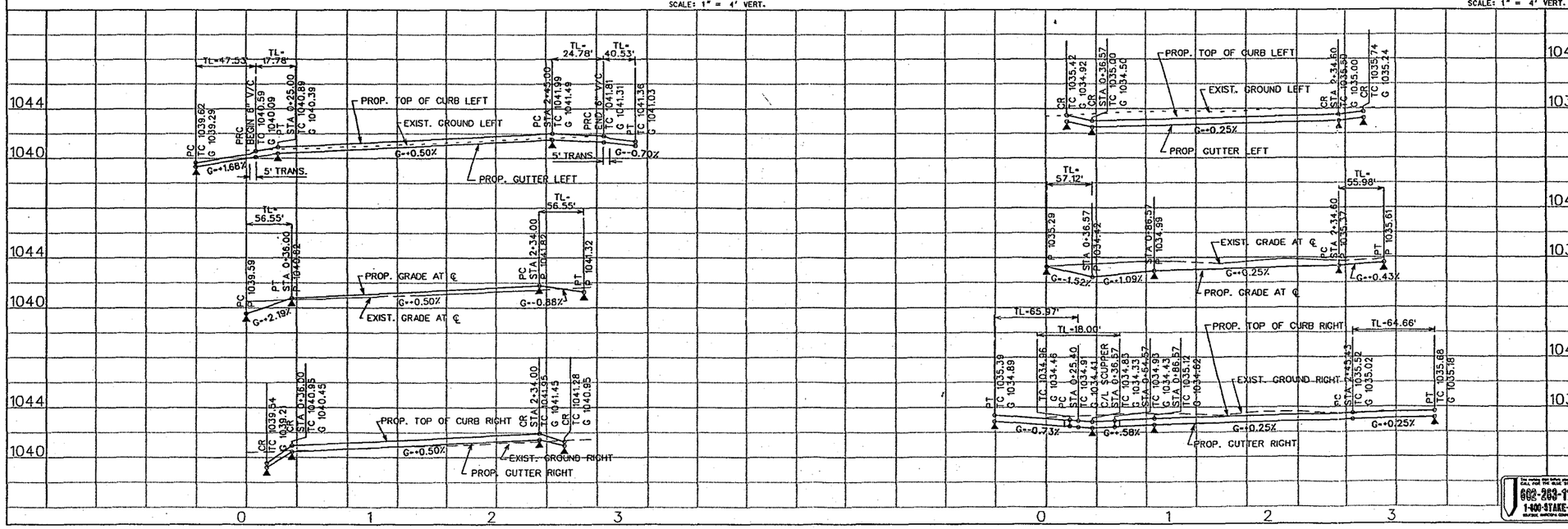
N. 124TH LANE

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.



N. 123RD DRIVE

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.



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WIGWAM CREEK NORTH PHASE 2

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4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

BY	DATE	REVISIONS

DESIGNED GWV
DRAWN MP DH RR JH
CHECKED GWV DJH
DATE 4-2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 33085 CHRISTOPHER A. WOODROW ARIZONA U.S.A.

CVL

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SHEET 36 OF 56

CVL PROJECT NO.: 000046-03

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE A)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE B)
4. INSTALL ROLL CURB & GUTTER-M.A.G. STD. DET. 220 (TYPE C)
5. INSTALL SIDEWALK RAMP-M.C.D.O.T STD. DET. 2031-B
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18. DEPRESS CURB, GUTTER AND SIDEWALK PER DETAIL SHT2 (WIDTH GIVEN)
19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-B
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22. CONSTRUCT MODIFIED SIDEWALK RAMP MCDOT STD. DET. 2032-B AND D/W MCDOT STD. DET. 2033 PER DETAIL ON SHT 2
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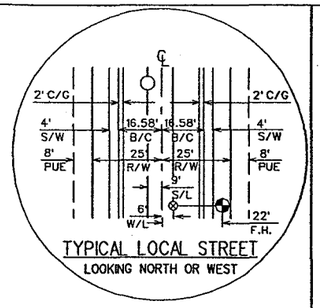
30. SAWCUT 2' MIN. TO A NEAT CLEAN EDGE AND REMOVE. MATCH TO EXISTING.
31. REMOVE EXISTING BARRICADE

BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0041.58'	090°00'00"	0065.31'	0041.58'
2	0019.42'	090°00'00"	0030.50'	0019.42'
3	0046.58'	124°40'58"	0101.36'	0088.88'
4	0036.00'	090°00'00"	0056.55'	0036.00'
5	0063.42'	017°20'29"	0019.20'	0009.67'
6	0283.42'	027°44'19"	0137.21'	0069.98'
7	0316.58'	027°44'19"	0153.27'	0078.17'



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STORM DRAIN SYSTEM

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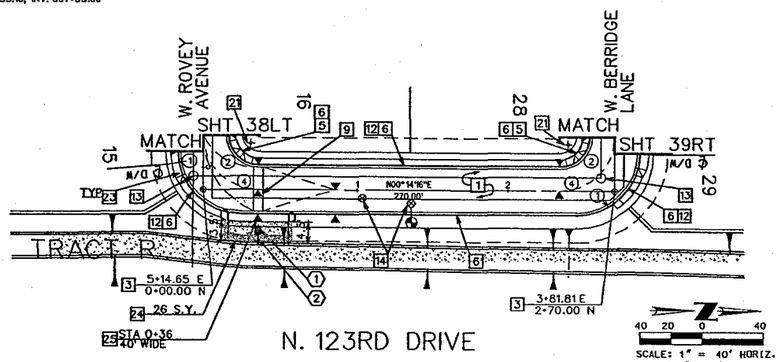
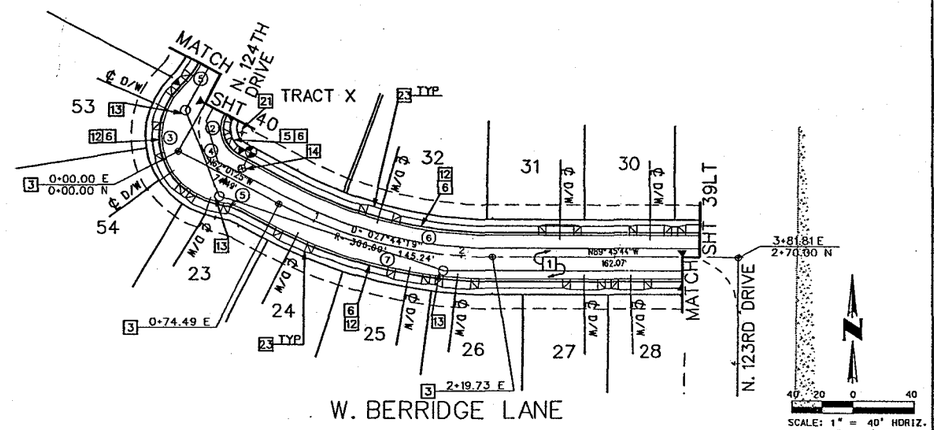
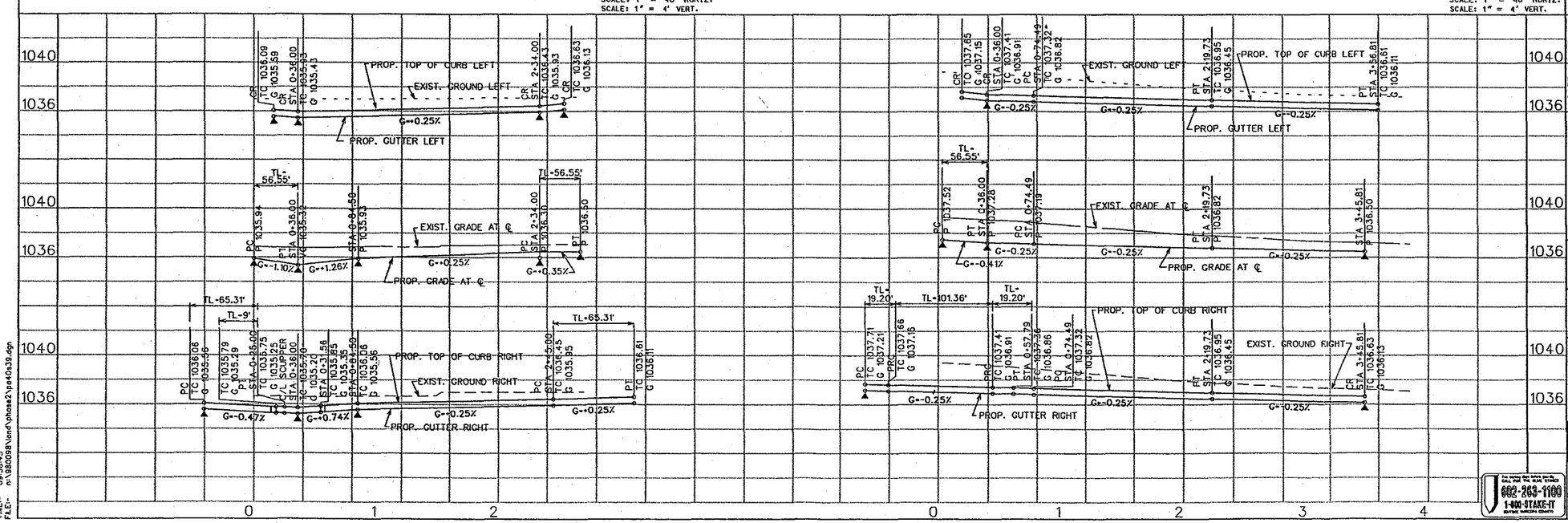
2. INSTALL 8 LF, 8" P.V.C. @ S=0.0125'/' INV. IN=33.10, INV. OUT=33.00







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PAVING AND STORM DRAIN PLANS

REVISIONS	DATE	BY

DESIGNED GWV
DRAWN WP,DH,RR,JH
CHECKED GWV/DJH
DATE 4-2001

Registered Professional Engineer (Civil) CERTIFICATE NO. 33065 CHRISTOPHER A. WOODROW ARIZONA U.S.A.

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SHEET 39 OF 56

CVL PROJECT NO.: 000046-03

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(STATEWIDE NUMBER)

DATE: May. 01, 2002
TIME: 09:56:41
FILE: n:\980098\land\phase2\pa40s39.dgn

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PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE A)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE B)
4. INSTALL ROLL CURB & GUTTER-M.A.G. STD. DET. 220 (TYPE C)
5. INSTALL SIDEWALK RAMP-M.C.D.O.T STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL 4" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
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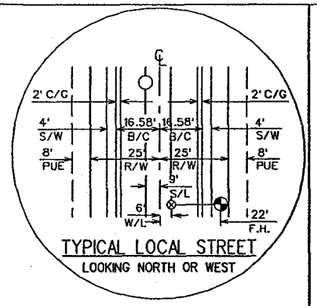
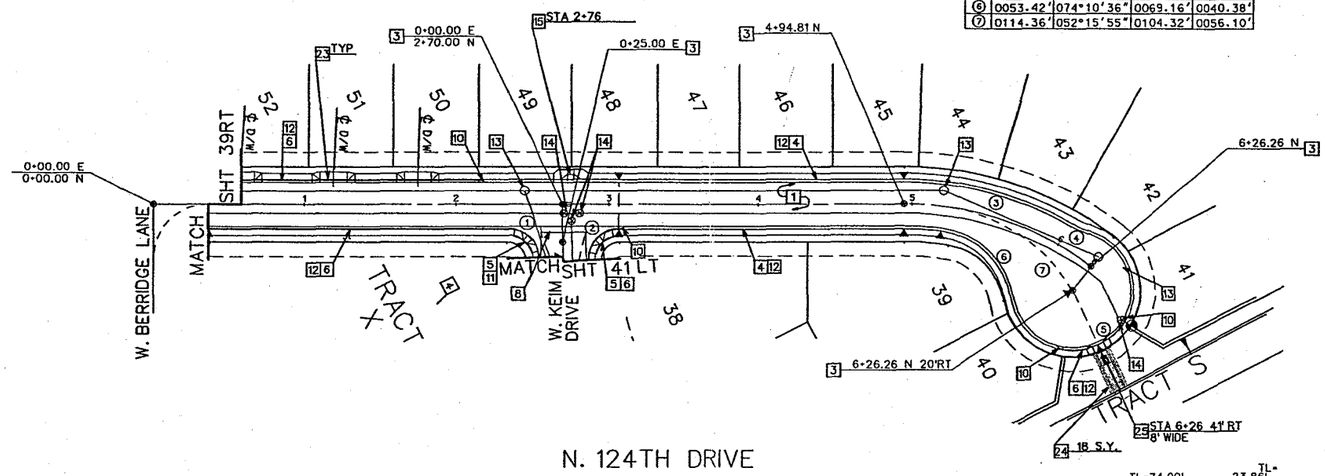
30. SAWCUT 2' MIN. TO A NEAT CLEAN EDGE AND REMOVE. MATCH TO EXISTING.
31. REMOVE EXISTING BARRICADE

BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0019.42'	087°38'02"	0029.70'	0018.63'
2	0019.42'	093°14'34"	0031.60'	0020.55'
3	0216.58'	030°36'11"	0115.68'	0059.26'
4	0053.42'	013°36'12"	0012.68'	0006.37'
5	0040.58'	244°40'28"	0173.29'	-0064.1'
6	0053.42'	074°10'36"	0069.16'	0040.38'
7	0114.36'	052°15'55"	0104.32'	0056.10'



TYPICAL LOCAL STREET
LOOKING NORTH OR WEST



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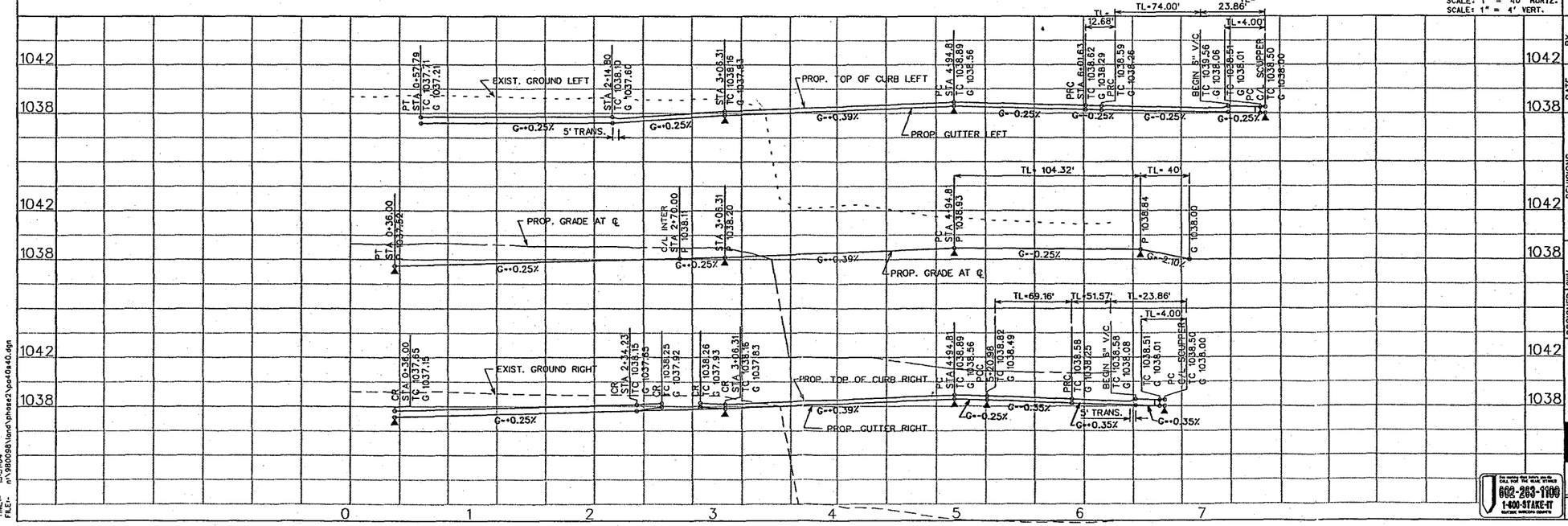
SCALE: 1" = 4' VERT.



WIGWAM CREEK NORTH PHASE 2

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

PAVING AND STORM DRAIN PLANS

REVISIONS	BY	DATE

DESIGNED GWV
DRAWN WP,DH,RR,JH
CHECKED GWV/DJH
DATE 1-2001

CVL

SHEET 40 OF 56

CVL PROJECT NO.: 000046-03

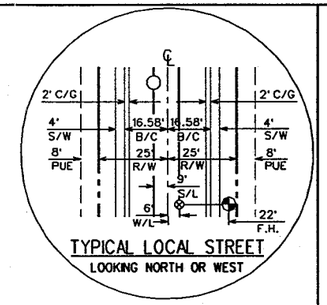
602-263-1100
1-800-STAKE-IT

DATE- Jul. 25, 2000
TIME- 13:04:04
FILE- n:\980098\land\phase2\pa40s40.dgn

.../980098/land/phase2/pa40s40.dgn May. 03, 2002 14:09:24

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE A)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE B)
4. INSTALL ROLL CURB & GUTTER-M.A.G. STD. DET. 220 (TYPE C)
5. INSTALL SIDEWALK RAMP-M.C.D.O.T STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL 4" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
8. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
9. INSTALL 6' VALLEY GUTTER & APRON-M.A.G. STD. DET. 240 (MODIFIED)
10. INSTALL 5' CURB TRANSITION FROM VERTICAL TO ROLL CURB-M.A.G. STD. DET. 221
11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
12. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
13. MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422
14. WATER VALVE/CLEANOUT ADJUSTMENT- M.A.G. STD. DET. 270
15. INSTALL SIDEWALK RAMP PER M.C.D.O.T. STD. DET. 2032-B
16. INSTALL THICKENED EDGE OF PAVEMENT PER M.A.G. STD. DET. 201, TYPE 'B'
17. INSTALL SCH. 40 PVC SLEEVE - SEE PLANS FOR SIZE & LENGTH
18. DEPRESS CURB, GUTTER AND SIDEWALK PER DETAIL SHT2 (WIDTH GIVEN)
19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-B
20. REMOVE BARRICADE
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. DRIVEWAY-PEDESTRIAN COMBINATION (FOR USE AT "T" INTERSECTIONS PER CITY OF PHOENIX STD. DTL. P1244. SEE SETAL SHT 57.
23. INSTALL DRIVEWAY ENTRANCE PER MCDOT STD. DET. 2033 SEE TYPICAL DRIVE LOCATION DETAIL ON SHT 2 FOR OFFSET AND SIZE.
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS=12"$_{50}$D +6" (UNLESS OTHERWISE NOTED)
25. INSTALL CONC. SCUPPER PER M.A.G. STD. DET. 206.2 WITH OPENING WIDTH AS INDICATED ON PLAN. (SEE SHT 2 FOR RIP-RAP DETAIL)
26. REMOVE TEMPORARY A.C. TURNAROUND.
27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2
28. CONSTRUCT 2-6'X4' C.B.C. WITH INLET/OUTLET HEADWALLS & WINGWALLS PER A.D.O.T. STD. DET. B-02.20 & 08.10 SEE DET SHTS. 51, 52, 53 & 54
29. INSTALL 7-24" x 66' RGRCP CL. V S=0.0023%
30. SAWCUT 2' MIN. TO A NEAT CLEAN EDGE AND REMOVE. MATCH TO EXISTING.
31. REMOVE EXISTING BARRICADE

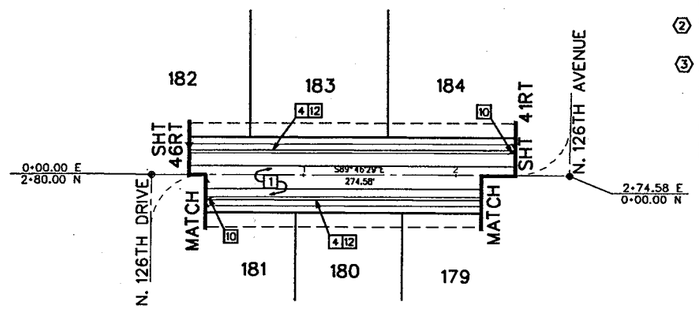


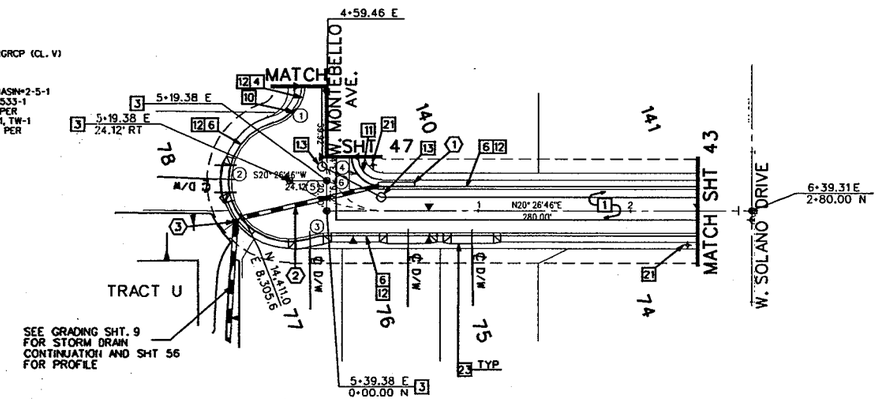
BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0024.42'	075°07'09"	0032.02'	0018.78'
2	0040.58'	181°43'24"	0128.71'	-2697.7'
3	0053.42'	016°46'29"	0015.64'	0007.88'
4	0019.42'	090°00'00"	0030.50'	0019.42'
5	0100.38'	036°47'54"	0064.47'	0033.39'
6	0036.00'	090°00'00"	0056.55'	0036.00'

1. STA 0+36.00, 16.5' RT CONSTRUCT CATCH BASIN=2-5-2 PER M.A.G. STD. DET. 533-1 TYPE 'D' AND GRATE PER M.A.G. STD. DET. 540-1, TW-1 AND C&G TRANSITION PER M.A.G. STD. DET. 532 (SEE DET. SHT. 56) L1=20' V=4.67' TC=40.12 INV. OUT=1035.5
2. INSTALL 92 LF 30" RGRCP (CL. V) S=0.0054'/'
3. STA 5+43.96, 56' RT CONSTRUCT CATCH BASIN=2-5-1 PER M.A.G. STD. DET. 533-1 TYPE 'D' AND GRATE PER M.A.G. STD. DET. 540-1, TW-1 AND C&G TRANSITION PER M.A.G. STD. DET. 532 (SEE DET. SHT. 56) L1=10' L2=10' V=5' TC=39.50 INV IN= 35.00 INV. OUT=34.50

NOTE:
SEE PAVING SHEETS 55 & 56 FOR STORM DRAIN PROFILES.

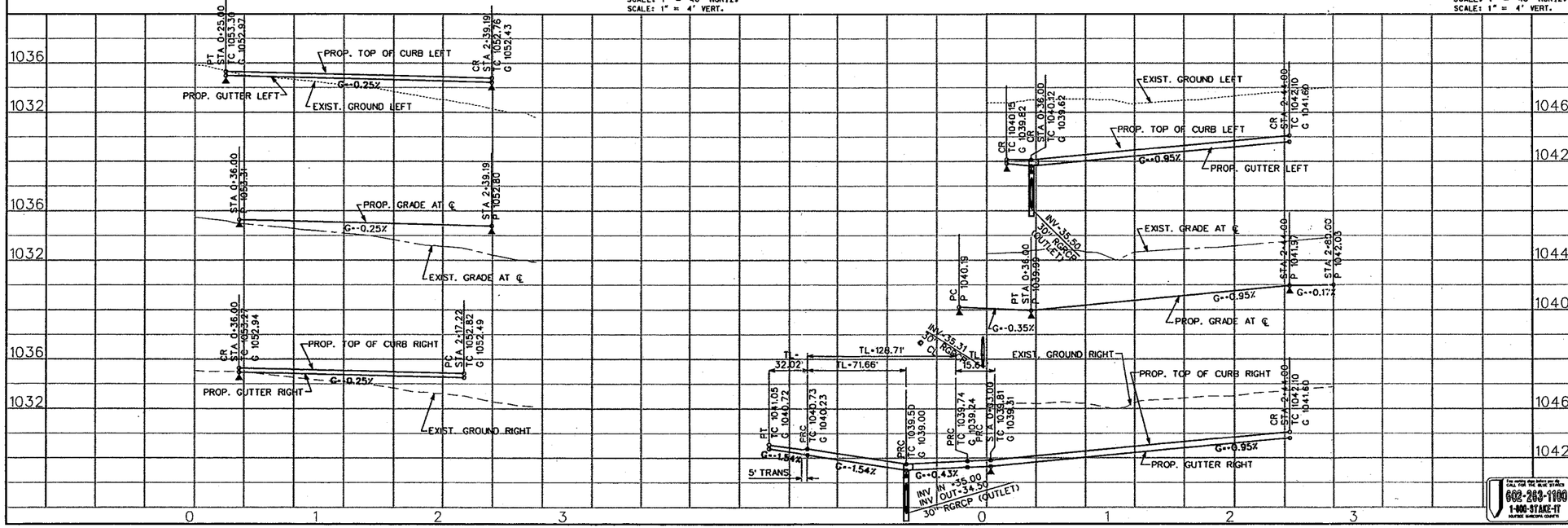




SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.

W. PALO VERDE DRIVE

N. 125TH DRIVE



SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.

DATE:- Jul. 31, 2000
TIME:- 11:05:18
FILE:- m:\980098\land\phase2\pa40s42.dgn

WIGWAM CREEK NORTH PHASE 2

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS		DATE	BY
ADDED TYP TO NOTE 23		5-22-02	RM
ADDED CATCH BASINS & S.D.		7-30-02	JH
REMOVED S/W RAMP		7-30-02	JH

DESIGNED	GWV
DRAWN	MP,DH,RR,JH
CHECKED	GWV/DJH
DATE	4-2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 37325 RYAN WEED ARIZONA U.S.A.

CVL

For entire day before you dig CALL FOR THE BLUE STAKES 602-263-1100 1-800-STAKE-IT MARICOPA COUNTY

SHEET 42 OF 57

CVL PROJECT NO.: 980098-13

.../980098/land/phase2/pa40s42.dgn Aug. 18, 2003 14:03:11

PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE A)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE B)
4. INSTALL ROLL CURB & GUTTER-M.A.G. STD. DET. 220 (TYPE C)
5. INSTALL SIDEWALK RAMP-M.C.D.O.T STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL 4" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
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10. INSTALL 5' CURB TRANSITION FROM VERTICAL TO ROLL CURB-M.A.G. STD. DET. 221
11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
12. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
13. MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422
14. WATER VALVE/CLEANOUT ADJUSTMENT- M.A.G. STD. DET. 270
15. INSTALL SIDEWALK RAMP PER M.C.D.O.T. STD. DET. 2032-B
16. INSTALL THICKENED EDGE OF PAVEMENT PER M.A.G. STD. DET. 201, TYPE "B"
17. INSTALL SCH. 40 PVC SLEEVE - SEE PLANS FOR SIZE & LENGTH
18. DEPRESS CURB, GUTTER AND SIDEWALK PER DETAIL SHT2 (WIDTH GIVEN)
19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-B
20. REMOVE BARRICADE
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. DRIVEWAY-PEDESTRIAN COMBINATION (FOR USE AT "T" INTERSECTIONS PER CITY OF PHOENIX STD. DTL. P1244. SEE SETAIL SHT 57.
23. INSTALL DRIVEWAY ENTRANCE PER MCDOT STD. DET. 2033 SEE TYPICAL DRIVE LOCATION DETAIL ON SHT 2 FOR OFFSET AND SIZE.
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS-12"$_{50}$D +6" (UNLESS OTHERWISE NOTED)
25. INSTALL CONC. SCUPPER PER M.A.G. STD. DET. 206.2 WITH OPENING WIDTH AS INDICATED ON PLAN. (SEE SHT 2 FOR RIP-RAP DETAIL)
26. REMOVE TEMPORARY A.C. TURNAROUND.
27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2
28. CONSTRUCT 2-6'X4' C.B.C. WITH INLET/OUTLET HEADWALLS & WINGWALLS PER A.D.O.T. STD. DET. B-02.20 & 08.10 SEE DET SHTS. 51, 52, 53 & 54
29. INSTALL 7-24" x 66' RGRCP CL. V S=0.0023%
30. SAWCUT 2' MIN. TO A NEAT CLEAN EDGE AND REMOVE. MATCH TO EXISTING.
31. REMOVE EXISTING BARRICADE

CONSTRUCTION NOTES

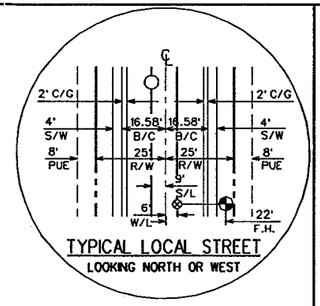
STORM DRAIN SYSTEM

1. STA 8+18.08 E, 13.5' RT CONSTRUCT CATCH BASIN-2-4-1 PER M.A.G. STD. DET. 533-1 TYPE "D" AND GRATE PER M.A.G. STD. DET 540-1, TW-1 AND C&G TRANSITION PER M.A.G. STD. DET. 532 (SEE DET. SHT. 56) L1=17' V=6.59' TC=39.89 INV IN 33.30 INV. OUT 32.20
2. INSTALL 49 LF 36" RGRCP (CL. III) S=0.0020'/'
3. STA 0+36.00 E, 16.58' LT CONSTRUCT CATCH BASIN-2-4-2 PER M.A.G. STD. DET. 533-1 TYPE "D" AND GRATE PER M.A.G. STD. DET. 540-1, TW-1 AND C&G TRANSITION PER M.A.G. STD. DET. 532 (SEE DET. SHT. 56) L1=17' V=6.64' TC=40.04 INV 33.40

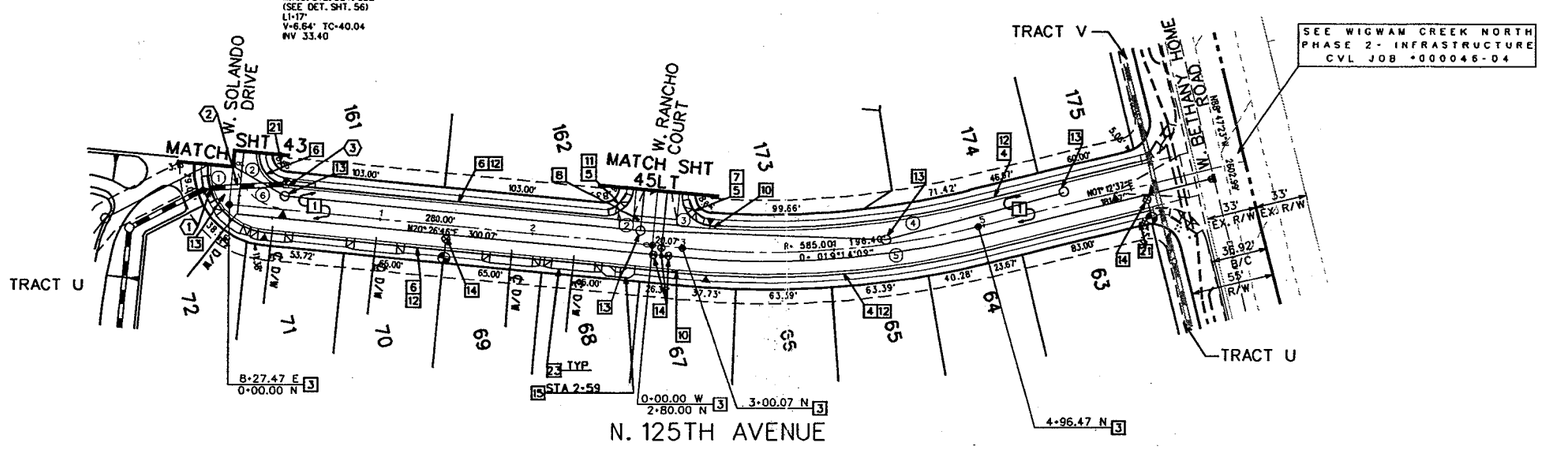
NOTE:
SEE PAVING SHEETS 55 & 56 FOR STORM DRAIN PROFILES.

BC CURVE DATA

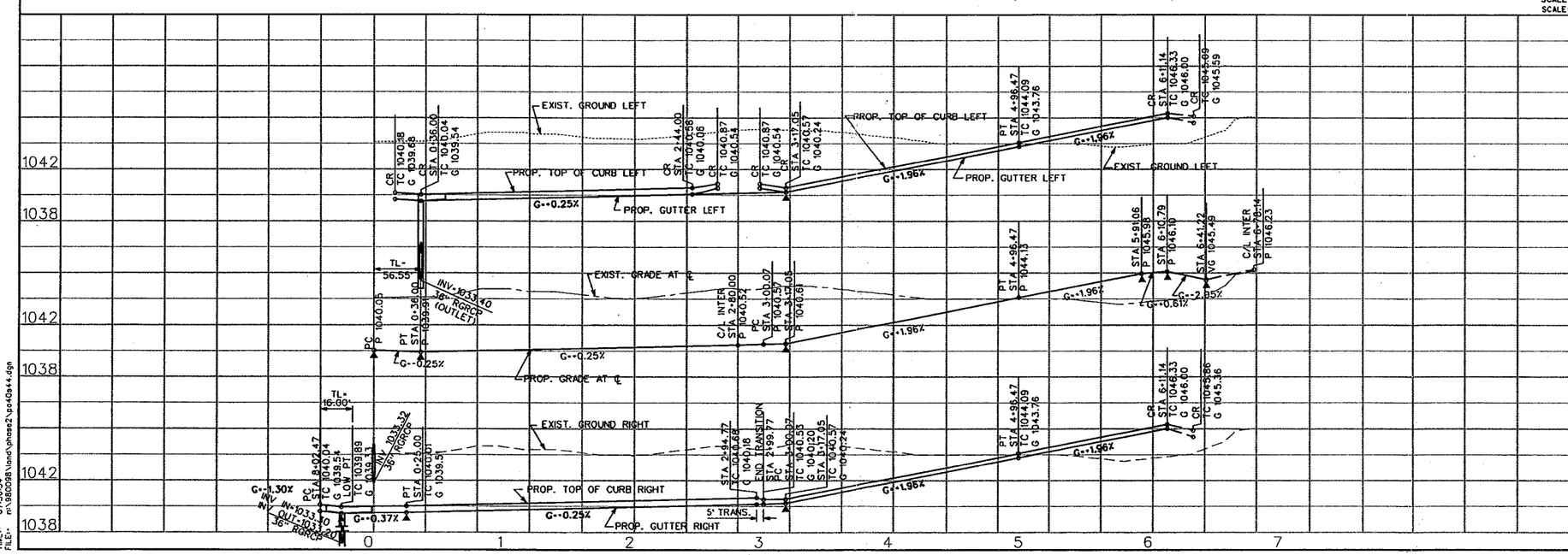
NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0041.58'	090°00'00"	0065.31'	0041.58'
2	0019.42'	090°00'00"	0030.50'	0019.42'
3	0019.42'	091°39'45"	0031.07'	0019.99'
4	0568.42'	017°34'23"	0174.34'	0087.86'
5	0601.58'	019°14'09"	0201.97'	0101.94'
6	0036.00'	090°00'00"	0056.55'	0036.00'



TYPICAL LOCAL STREET
LOOKING NORTH OR WEST



SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.



DATE:- Dec. 12, 2001
TIME:- 07:56:54
FILE:- m:\980098\land\phase2\pa40s44.dgn

WIGWAM CREEK NORTH PHASE 2

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY
ADDED CATCH BASIN & S.D.	6-17-02	JH
MOVED S/W RAMP	7-30-02	JH

DESIGNED	GWV	
DRAWN	NP,DH,RR,JH	
CHECKED	GWV/DJH	
DATE	4-2001	

PAVING AND STORM DRAIN PLANS

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO. 37325
RYAN WEED
ARIZONA, U.S.A.

CVL

SHEET 44 OF 57

CVL PROJECT NO.: 980098-13

CALL FOR THE BLUE STAKES
602-263-1100
602-263-1100
1-800-STAKE-IT
(ARIZONA WARDEN COMPTY)

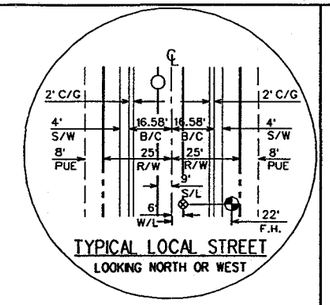
.../980098/land/phase2/pa40s44.dgn Aug. 18, 2003 14:03:17

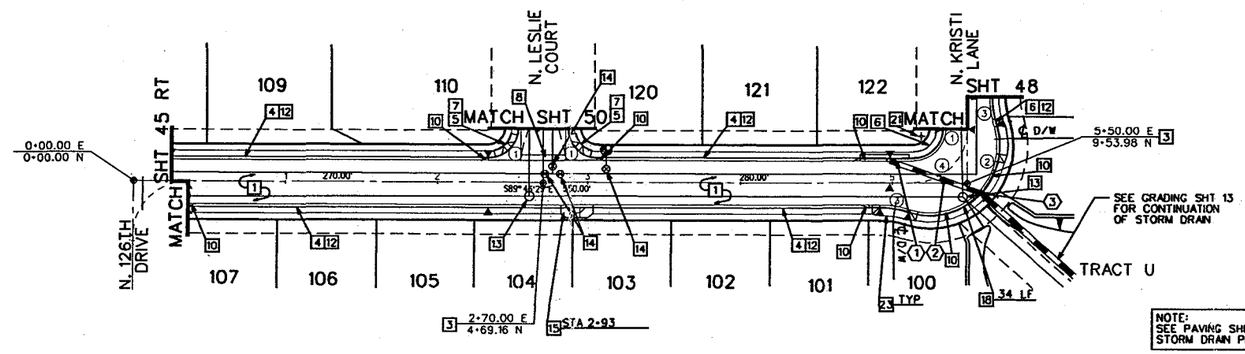
PAVING NOTES:

1. INSTALL A.C. PAVEMENT & BASE COURSE PER TYPICAL SECTIONS ON SHT. 2
2. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE A)
3. INSTALL BRASS CAP-M.A.G. STD. DET. 120-1 (TYPE B)
4. INSTALL ROLL CURB & GUTTER-M.A.G. STD. DET. 220 (TYPE C)
5. INSTALL SIDEWALK RAMP-M.C.D.O.T STD. DET. 2031-B
6. INSTALL 6" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
7. INSTALL 4" VERTICAL CURB-M.A.G. STD. DET. 220 (TYPE A)
8. INSTALL 4' VALLEY GUTTER & APRONS-M.A.G. STD. DET. 240
9. INSTALL 6' VALLEY GUTTER & APRON-M.A.G. STD. DET. 240 (MODIFIED)
10. INSTALL 5' CURB TRANSITION FROM VERTICAL TO ROLL CURB-M.A.G. STD. DET. 221
11. INSTALL 6"-4" VERTICAL CURB TRANSITION THRU RETURN
12. INSTALL SIDEWALK-M.A.G. STD. DET. 230. (WIDTH PER TYP SECTIONS)
13. MANHOLE FRAME & COVER ADJUSTMENT-M.A.G. STD. DET. 422
14. WATER VALVE/CLEANOUT ADJUSTMENT- M.A.G. STD. DET. 270
15. INSTALL SIDEWALK RAMP PER M.C.D.O.T. STD. DET. 2032-B
16. INSTALL THICKENED EDGE OF PAVEMENT PER M.A.G. STD. DET. 201, TYPE 'B'
17. INSTALL SCH. 40 PVC SLEEVE - SEE PLANS FOR SIZE & LENGTH
18. DEPRESS CURB, GUTTER AND SIDEWALK PER DETAIL SHT2 (WIDTH GIVEN)
19. INSTALL BARRICADE PER M.A.G. STD. DET. 130-B
20. REMOVE BARRICADE
21. INSTALL STREET SIGN BASE-M.C.D.O.T. STD. DET. 2054
22. DRIVEWAY-PEDESTRIAN COMBINATION (FOR USE AT "T" INTERSECTIONS PER CITY OF PHOENIX STD. DTL. PI244. SEE SETAIL SHT 57.
23. INSTALL DRIVEWAY ENTRANCE PER MCDOT STD. DET. 2033 SEE TYPICAL DRIVE LOCATION DETAIL ON SHT 2 FOR OFFSET AND SIZE.
24. INSTALL GROUTED RIP-RAP, MIN. THICKNESS=12"$_{50}$D -6' (UNLESS OTHERWISE NOTED)
25. INSTALL CONC. SCUPPER PER M.A.G. STD. DET. 206.2 WITH OPENING WIDTH AS INDICATED ON PLAN. (SEE SHT 2 FOR RIP-RAP DETAIL)
26. REMOVE TEMPORARY A.C. TURNAROUND.
27. INSTALL HANDRAIL ON HEADWALL SEE DET. SHT. 2
28. CONSTRUCT 2-6'X4' C.B.C. WITH INLET/OUTLET HEADWALLS & WINGWALLS PER A.D.O.T. STD. DET. B-02.20 & 08.10 SEE DET SHTS. 51, 52, 53 & 54
29. INSTALL 7-24" x 66' RGRCP CL. V S=0.0023x
30. SAWCUT 2' MIN. TO A NEAT CLEAN EDGE AND REMOVE. MATCH TO EXISTING.
31. REMOVE EXISTING BARRICADE

BC CURVE DATA

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	0019.42'	090°00'00"	0030.50'	0019.42'
2	0046.58'	124°40'58"	0101.36'	0088.88'
3	0063.42'	017°20'29"	0019.20'	0009.67'
4	0036.00'	090°00'00"	0056.55'	0036.00'





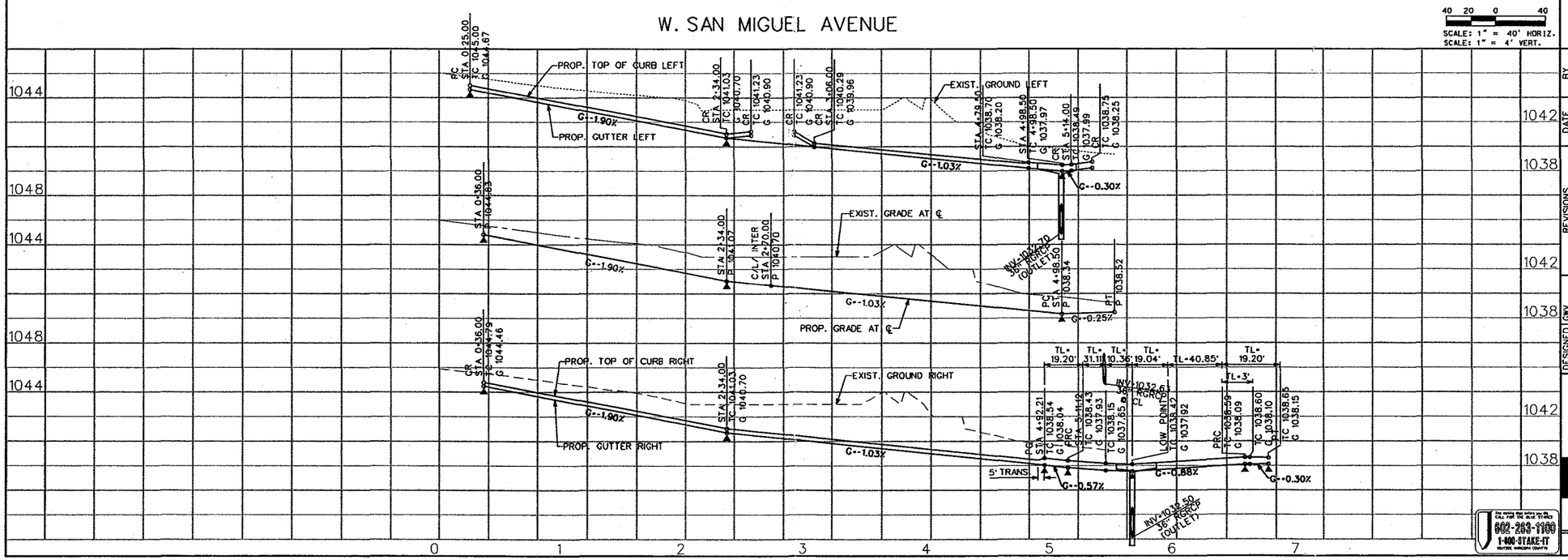
1. STA 4+98.50, 16.5' LT
CONSTRUCT CATCH BASIN*2-6-2
PER M.A.G. STD. DET. 533-1
TYPE 'D' AND GRATE PER
M.A.G. STD. DET. 540-1, TW-1
AND C&G TRANSITION PER
M.A.G. STD. DET. 532
(SEE DET. SHT. 56)
L1=10', L2=17'
V=5.77' TC=38.47
INV. OUT=32.70
MODIFIED CATCH BASIN BOX
(SUMP TO ACCOMIDATE 36" PIPE)

2. INSTALL 57 LF 36" RGRCP (CL. IV)
S=0.0018'/'

3. STA 5+58.18, 6.5' RT
CONSTRUCT CATCH BASIN*2-6-1
PER M.A.G. STD. DET. 533-1
TYPE 'D' AND GRATE PER
M.A.G. STD. DET. 540-1, TW-1
AND C&G TRANSITION PER
M.A.G. STD. DET. 532
(SEE DET. SHT. 56)
L1=10', L2=17'
V=5.68' TC=38.28
INV IN =32.60
INV. OUT=32.50

NOTE:
SEE PAVING SHEETS 55 & 56 FOR STORM DRAIN PROFILES.

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.



DATE:- Jul 31, 2000
TIME:- 13:06:12
FILE:- n:\980098\land\phase2\pa40s49.dgn

REVISIONS		
DATE	BY	
7-30-02	JH	REMOVED S/W RAMP

DESIGNED	GWV
DRAWN	NP,DH,RR,JH
CHECKED	GWV/DJH
DATE	4-2001

WIGWAM CREEK NORTH PHASE 2

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

PAVING AND STORM DRAIN PLANS

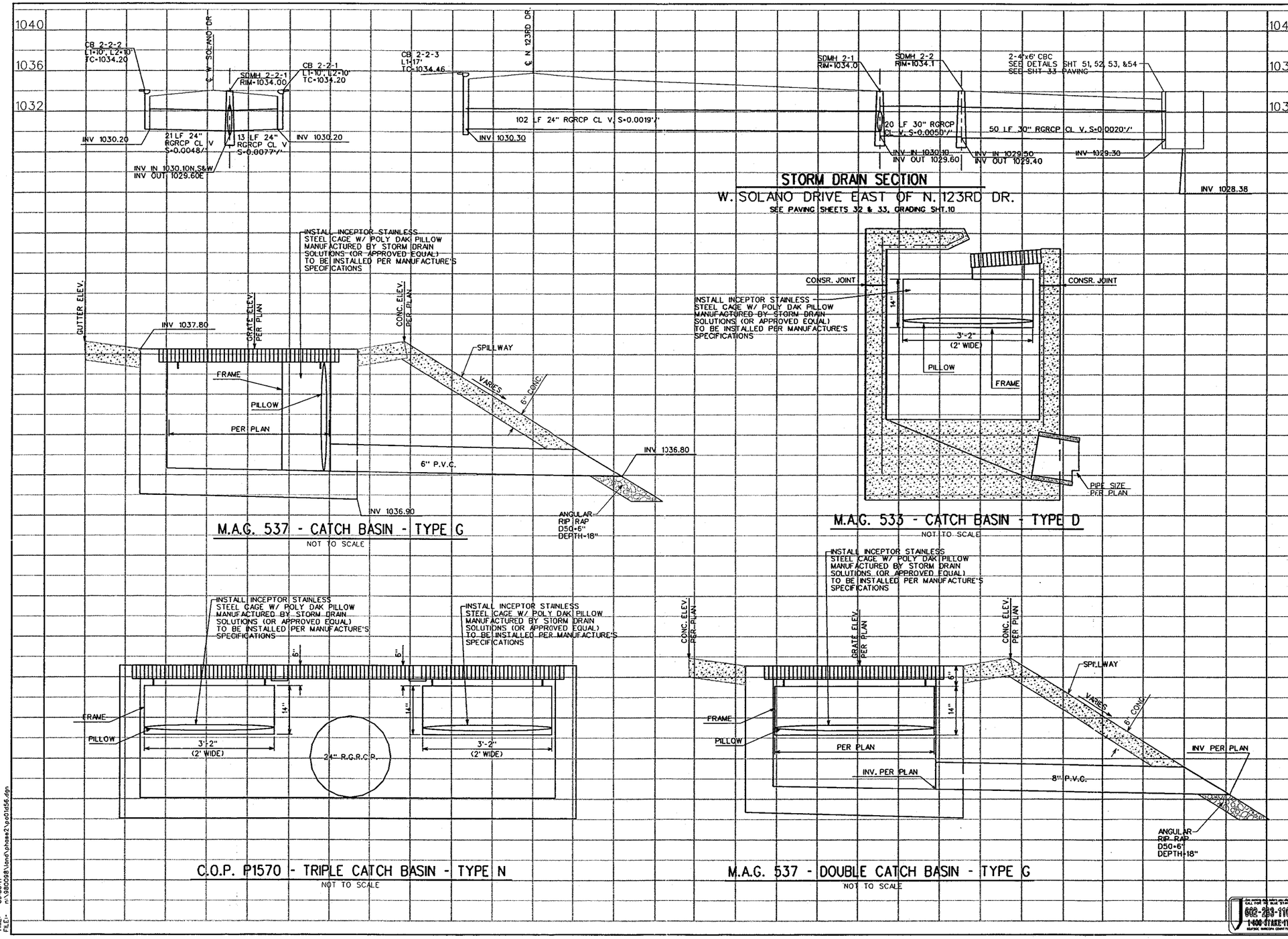
Registered Professional Engineer (Civil)
CERTIFICATE NO. 37325
RYAN WEED
Date Signed 7-30-02
ARIZONA U.S.A.

CVL

SHEET 49 OF 57

CVL PROJECT NO.: 980098-13

The water has been shut off. CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
(NATIONWIDE EXPRESS CENTER)



WIGWAM CREEK NORTH PHASE 2

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED GWV
DRAWN MP.DH.RR.JH
CHECKED GWV/DJH
DATE 4-2001

PAVING AND STORM DRAIN PLANS

Registered Professional Engineer (Civil) CERTIFICATE NO. 37325 RYAN WEDD DATE SIGNED 5-16-03 ARIZONA U.S.A.

CVL

SHEET 56 OF 57

CVL PROJECT NO.: 980098-13

CALL TWO WORK DAYS BEFORE YOU DIG 602-263-1100 1-800-STAKE-IT (ARIZONA BLUE STAKE, INC.)

DATE= May. 01, 2002
TIME= 09:30:07
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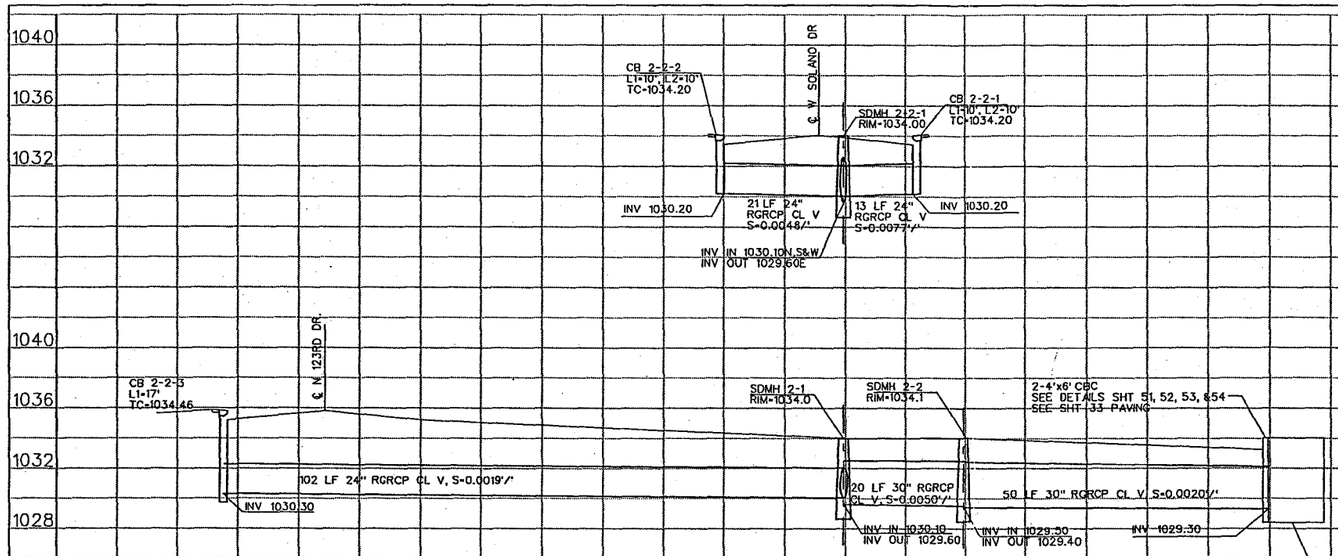
.../980098/land/phase2/pa01d56.dgn Aug. 18, 2003 14:02:57



STORM DRAIN SECTION

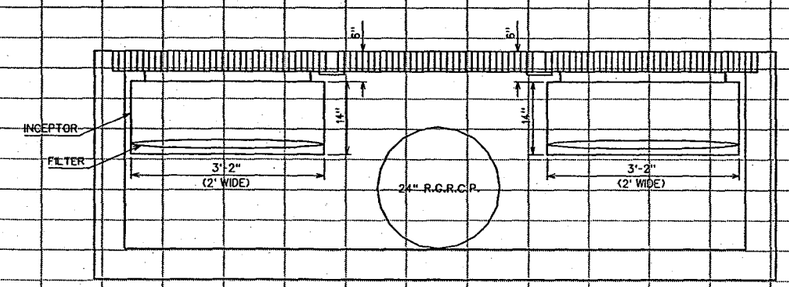
W. SOLANO DRIVE EAST OF N. 123RD DR.

SEE PAVING SHEETS 32 & 33, GRADING SHT.10

THE QUANTITIES SHOWN ARE AN ESTIMATE ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL QUANTITIES BEFORE BIDDING.

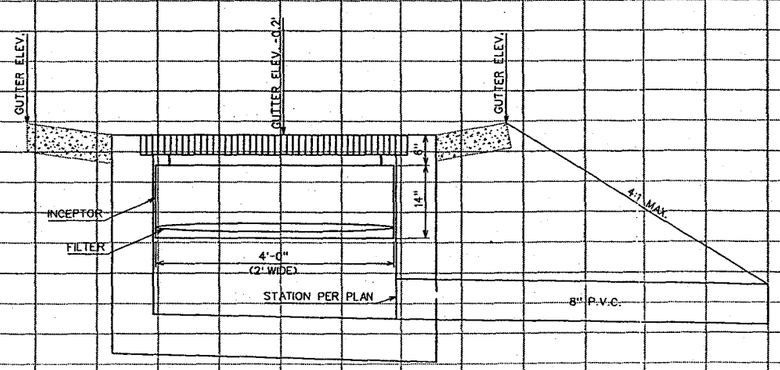
ESTIMATED QUANTITIES

DESCRIPTION	UNITS	QUANTITY
STORM DRAIN QUANTITIES		
STORM DRAIN MANHOLE PER M.A.G. STD. DET 520	EA	6
CATCH BASIN PER M.A.G. STD. DET 533-1, (L=10') SGL.	EA	4
CATCH BASIN PER M.A.G. STD. DET 533-1, (L=10') DBL	EA	5
CATCH BASIN PER M.A.G. STD. DET 533-1, (L=17') SGL.	EA	1
CATCH BASIN PER M.A.G. STD. DET 533-1, (L=17') DBL	EA	2
CATCH BASIN PER M.A.G. STD. DET 533-1 (L=20') SGL.	EA	1
42" RGRCP CL IV	LF	301
36" RGRCP CL IV	LF	285
36" RGRCP CL III	LF	49
30" RGRCP CL V	LF	92
30" RGRCP CL V	LF	133
24" RGRCP CL V	LF	669
12" PVC	LF	36
4" PVC	LF	132
6'X 4'C.B.C. PER A.D.O.T. STD. DET B-02.20 & 08.10	LF	264
36" X 66" RGRCP CL. IV	LF	280
HEADWALL 'U' TYPE	EA	1
LOOSE RIP-RAP MIN. THICKNESS=12", D 50-6'	SY	1,162
GUNNITE CONCRETE CHANNEL	SY	8,226



C.O.P. P1570 - TRIPLE CATCH BASIN - TYPE N

NOT TO SCALE



M.A.G. 537 - DOUBLE CATCH BASIN - TYPE G

NOT TO SCALE

CALL FOR THE WHOLE BUSINESS DAY
602-263-1100
1-800-STAKE-IT
STATEWIDE-MARICOPA COUNTY

WIGWAM CREEK NORTH PHASE 2

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED GWV
DRAWN MP DH HR JH
CHECKED GWV/DJH
DATE 4-2001

PAVING AND STORM DRAIN PLANS

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
33060
CHRISTOPHER A. WOODROW
ARIZONA U.S.A.

CVL

SHEET 57 OF 56

CVL PROJECT NO.: 000046-03

DATE:- May. 01, 2002
TIME:- 09:30:07
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.../980098/land/phase2/pa01d56.dgn May. 03, 2002 11:16:54

Stormdrain Solutions an RDI Company
333 Beaumont Road
Devon, PA 19333
Tel: 1-877-OUR-PIPE
WWW.STORMDRAINS.COM

Introduction

Stormdrain Solutions an RDI Company is located in Pennsylvania and provides an array of products and services associated with BMPs to mitigate storm water pollution. We have developed products that address non-point source pollution pertaining to stormwater runoff, harbor hydrocarbon contamination, bildge water pollution and hydrant flushing. Stormdrain Solutions can also provide services associated with installation, maintenance, and disposal of the aforementioned products.

Product Description

Our premier product, the Inceptor, suspends from any existing storm grate or curb inlet and coalesces oils, grease, paints, PCBs and when attached to sediment, heavy metals like lead, copper, zinc, mercury, chromium VI among others. The Inceptor frame is made out of #304 stainless steel and will last a lifetime. The frame is designed to shed debris, such as leaves, paper and cigarette butts which negates clogging. It's two-point suspension system creates a hinge-like tipping effect in case of inordinately high rushes of runoff. This guarantees that our device will not be the cause of basin back-ups. The two-point system utilizes two #316 stainless steel wire ties that attach to the rib of a storm grate and will not impact tires or snow plows. From the wire ties attach a S/S chain that connect to the S/S frame. The entire installation process takes less than 5 minutes per basin. Our patented PolyDak pillow that slides inside the S/S frame is a melt-spun thermo-plastic synthetic fiber that will not leach nor impede the flow of water. The PolyDak pillow needs only to be replaced annually. We also manufacture the Inceptor to fit any basin dimension with little to no impact on pricing.

Six Points of Interest:

- **Cost** – The annual cost associated with a 2' x 4' Inceptor is $89.00. This covers the annual requirements of maintaining one basin with our patented PolyDak filter pillow. The initial cost for the S/S frame, which will last a lifetime, to house the PolyDak filter is $1100.00 and is a one time expense.

- **Installation** – The Inceptor installation process is quick and simple. The process entails elevating the existing stormdrain grate, permanately attaching the suspension hardware to the grate, then connecting the hardware to the Inceptor frame. Once this is completed, insertion of the PolyDak filter pillow is required before lowering the grate back to the basin.

- **Maintenance** – The Inceptor only requires annual replacement of the patented PolyDak filter pillow. Since the Inceptor is permanately suspended from the existing grate, replacement is achieved by elevating the stormdrain grate, removing the existing PolyDak pillow, and sliding a new pillow in its place.

- **Adaptability** – We can manufacture the Inceptor to fit any basin dimension.

- **Durability** – The Inceptor is constructed of #304 stainless steel which will last a lifetime. The suspension hardware is constructed of #316 stainless steel and will not affect tires or snow plows.

- **Effectiveness** – The keystone to the Inceptor is the melt spun thermoplastic synthetic PolyDak filter pillow. The patented pillow significantly coalesces contaminants and will not leach. The design of the Inceptor is geared towards a cleaner release without disturbing the hydrology of the basin. Our product will shed debris, yet coalesce hydrocarbons, PCBs, PCPs and an array of heavy metals.

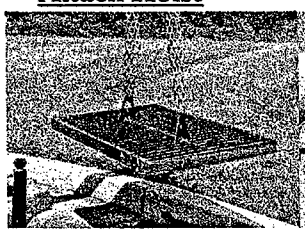
Cost Proposal:
Stormdrain Solutions will provide products and services associated with mitigation of stormwater pollution runoff.

One 2'x4' Inceptor.....$1,100.00 - - - - - (Frame lasts a lifetime)
One 2'x2' Inceptor.....$625.00 - - - - - - (Frame lasts a lifetime)
One 2'x4' PolyDak filter pillow.....$89.00 - - - - - - - (Annual replacement)
One 2'x2' PolyDak filter pillow.....$69.00 - - - - - - - (Annual replacement)

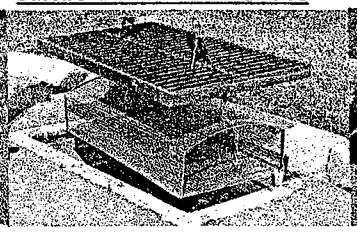
*Inceptors and PolyDak pillows can be manufactured to fit any basin or curb inlet dimension and pricing for custom sizes fall in and around listed pricing structure.

Installation Details:

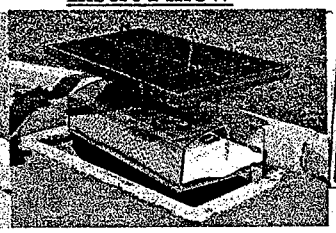
Attach Hoist



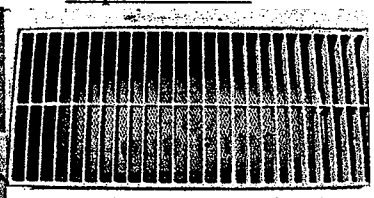
Attach Frame to Grate



Insert Pillow



Replace Grate



Installation and maintenance takes less than five minutes per basin.

Qualifying Experience:

Stormdrain Solutions has succesfully remedied many environmental issues pertaining to stormwater pollution. We have enabled many of our clients to continue their business expertise without focusing on environmental issues outside of there day to day operations. Such clients are:

The Port of San Diego - Steve Austin – (619) 686-6251
Mount Holly Municipal Utilities Authority - Theresa Rogan (609) 267-0015
Church of the Savior - Radnor, PA - Donation
Burlington County Soil & Conservation District - Donald Yarus (609) 276-7410

Personnel:

CEO: Robert Sharpless – Robert@Stormdrains.com

Director of Operations: David Curnane – DavidCurnane@Stormdrains.com

Product Engineer – Michael Sharpless MikeS@Stormdrains.com

MOUNT HOLLY, NEW JERSEY SIX MONTH FIELD ANALYSIS

Pollutants	INFLUENT	EFFLUENT
Acetone	22.2 ug/L	9.95 ug/L
Ammonia Nitrogen	1.5 ug/L	0.2 ug/L
Chemical Oxygen Demand	666 ug/L	114 ug/L
Chromium	49.3 ug/L	23.3 ug/L
Copper	101 ug/L	36 ug/L
Lead	27.3 ug/L	1.94 ug/L
Oil & Grease (1)	21.3 mg/L	ND mg/L
Solids - Total Dissolved	154 ug/L	88 ug/L
Solids - Total Suspended(2)	2244 mg/L	169 mg/L

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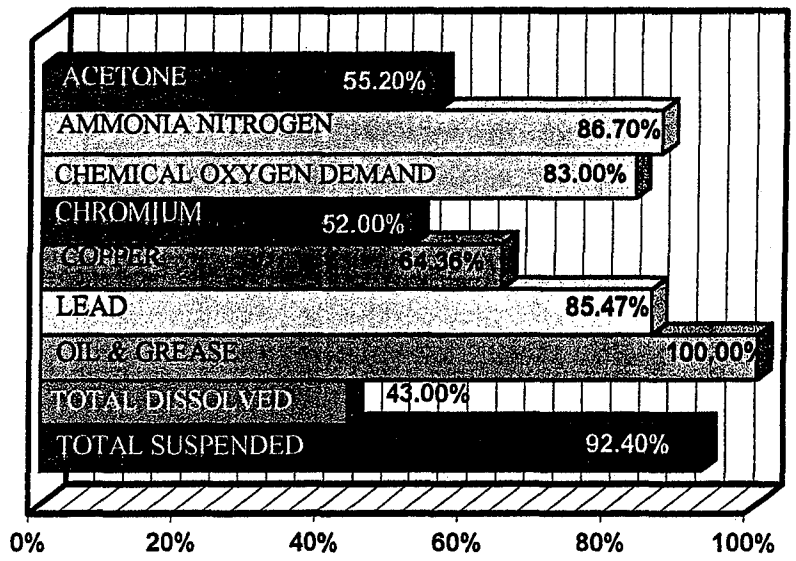


Mount Holly Municipal Utilities Authority
New Jersey Certification Number: 03348
37 Washington Street PO Box 486
Mount Holly, NJ 08060

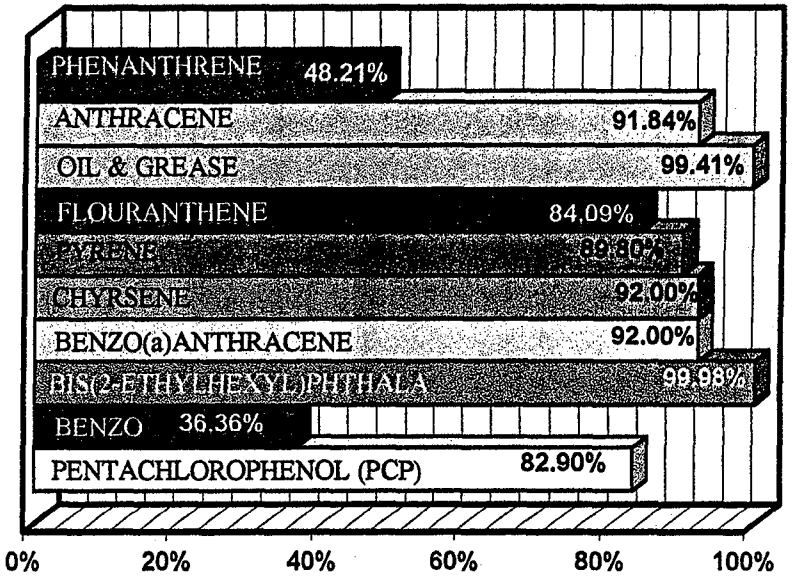
Certificate of Analysis
Report Date: 7/24/01
Client: Robert Hulit
Project Name: Stormdrain Monitoring
Project Number: Streams

Sample Collected By: MHMUA
Sample Description: Inceptor Influent/Effluent
Date Collected: 6/12/01
Time Collected: 10:00
Date Received: 6/12/01
MHMUA Laboratory Number: 11842

SALVAGE YARD SIX MONTH FIELD ANALYSIS

Pollutants	INFLUENT	EFFLUENT
Phenanthrene	4.1 ug/L	0.7 ug/L
Anthracene	1.1 ug/L	0.7 ug/L
Oil & Grease	86730 mg/L	10 mg/L
Fluoranthene	10 ug/L	0.8 ug/L
Pyrene	10 ug/L	0.8 ug/L
Chyrsene	5.9 ug/L	0.6 ug/L
Benzo(a)Anthracene	4.4 ug/L	0.7 ug/L
Bis(2-Ethylhexyl)phthala	118 ug/L	0.7 ug/L
Benzo(b)fluoranthene	9.8 ug/L	0.8 ug/L
Pentachlorophenol (PCP)	5.6 ug/L	2.9 ug/L

PERCENTAGE REMOVED



ATLANTIC COAST Laboratories, Incorporated
630 Churchmans Road
Newark, DE 19702
302-266-9121

Certified By: Warren Van Arsdall

Order #: 0105A12

Date: 5/29/01

Work ID: Continental Auto Parts Inceptor

Date Received: 5/21/01

Date Completed: 5/29/01

Total Petroleum Hydrocarbons

SW-846 Method 3550; EPA Method 418.1 (Sonication, Infrared)

Extraction, Base/Neutral and Acid Extractable Organics

Wastewater: EPA Method 625 (Liq-Liq, Sep Funnel)

Solids: SW 846 Method 3550 (Sonication)

RCRA TCLP Leachates & Groundwater

SW 846 Method 3510 (Liq-Liq, Sep Funnel)

Drinking Water: EPA Method 525 (Solid Phase Extraction

BURLINGTON COUNTY SOIL & CONSERVATION DISTRICT
SIX MONTH FIELD ANALYSIS

Pollutants	INFLUENT	EFFLUENT
Copper, ICP	29.5 mg/L	0.24 mg/L
Lead, ICP	27.3 mg/L	1.94 mg/L
Oil & Grease	778 mg/L	10 mg/L
Zinc, ICP	168 mg/L	0.24 mg/L

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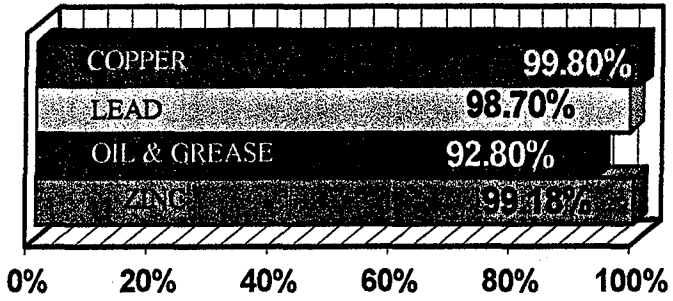


ATLANTIC COAST Laboratories, Incorporated
630 Churchmans Road
Newark, DE 19702
302-266-9121

Order #: 00-03-965
Date: 12/19/00 16:57
Work ID: Drain Inceptor
Date Received: 3/29/00
Date Completed: 4/11/00
Client Code: Roberts
Certified By: Warren Van Arsdall

Total Petroleum Hydrocarbons
SW-846 Method 3550; EPA Method 418.1 (Sonication, Infrared)
Extraction, Base/Neutral and Acid Extractable Organics
Wastewater EPA Method 625 (Liq-Liq, Sep Funnel)
Solids SW 846 Method 3550 (Sonication)
RCRA TCLP Leachates & Groundwater
SW 846 Method 3510 (Liq-Liq, Sep Funnel)
Drinking Water EPA Method 525 (Solid Phase Extraction

ATLANTIC COAST Laboratories, Incorporated
630 Churchmans Road
Newark, DE 19702
302-266-9121
Fax: 302-266-8720

Report Of Analysis

Stormdrain Solutions
333 Beaumont Road
Devon, PA 19333
Tel: 1-877-687-7473
Fax: 610-687-6327
Invoice Number: 83105

Order #: 00-03-965
Date: 12/19/00 16:57
Work ID: Drain Inceptor
Date Received: 3/29/00
Date Completed: 4/11/00
Client Code: Roberts

Certified By: Warren Van Arsdall

Bench Test Results By Sample

Sample 01A
(External Dacron Scrim)
Collected: 03/23/00

Test Description	Influent	Effluent	Units
Copper, ICP	18.7	0.25	mg/Kg
Lead, ICP	19.0	1.99	mg/Kg
Petroleum Hydrocarbons	778	10	mg/Kg
Zinc, ICP	124	0.25	mg/Kg

Sample 02A
(Internal Melt-Spun Thermoplastic Synthetic Fiber)
Collected: 3/23/00

Test Description	Influent	Effluent	Units
Copper, ICP	29.5	0.24	mg/Kg
Lead, ICP	27.3	1.94	mg/Kg
Petroleum Hydrocarbons	18630	10	mg/Kg
Zinc, ICP	168	0.24	mg/Kg

Total Petroleum Hydrocarbons
SW-846 Method 3550; EPA Method 418.1 (Sonication, Infrared)

Extraction, Base/Neutral and Acid Extractable Organics
Wastewater EPA Method 625 (Liq-Liq, Sep Funnel)
Solids SW 846 Method 3550 (Sonication)
RCRA TCLP Leachates & Groundwater
SW 846 Method 3510 (Liq-Liq, Sep Funnel)
Drinking Water EPA Method 525 (Solid Phase Extraction)

ATLANTIC COAST Laboratories, Incorporated
630 Churchmans Road
Newark, DE 19702
302-266-9121
Fax: 302-266-8720

Report Of Analysis

Stormdrain Solutions
333 Beaumont Road
Devon, PA 19333
Tel: 1-877-687-7473
Fax: 610-687-6327

Order #: 0105A12
Date: 5/29/01
Work ID: Continental Auto Parts Inceptor
Date Received: 5/21/01
Date Completed: 5/29/01
Client Code: Roberts

Certified By: Warren Van Arsdall

Contaminants Coalesced Results By Sample

Sample 01A
(Internal Melt-Spun Thermoplastic Synthetic Fiber with External Dacron Scrim)
Collected: 3/27/01

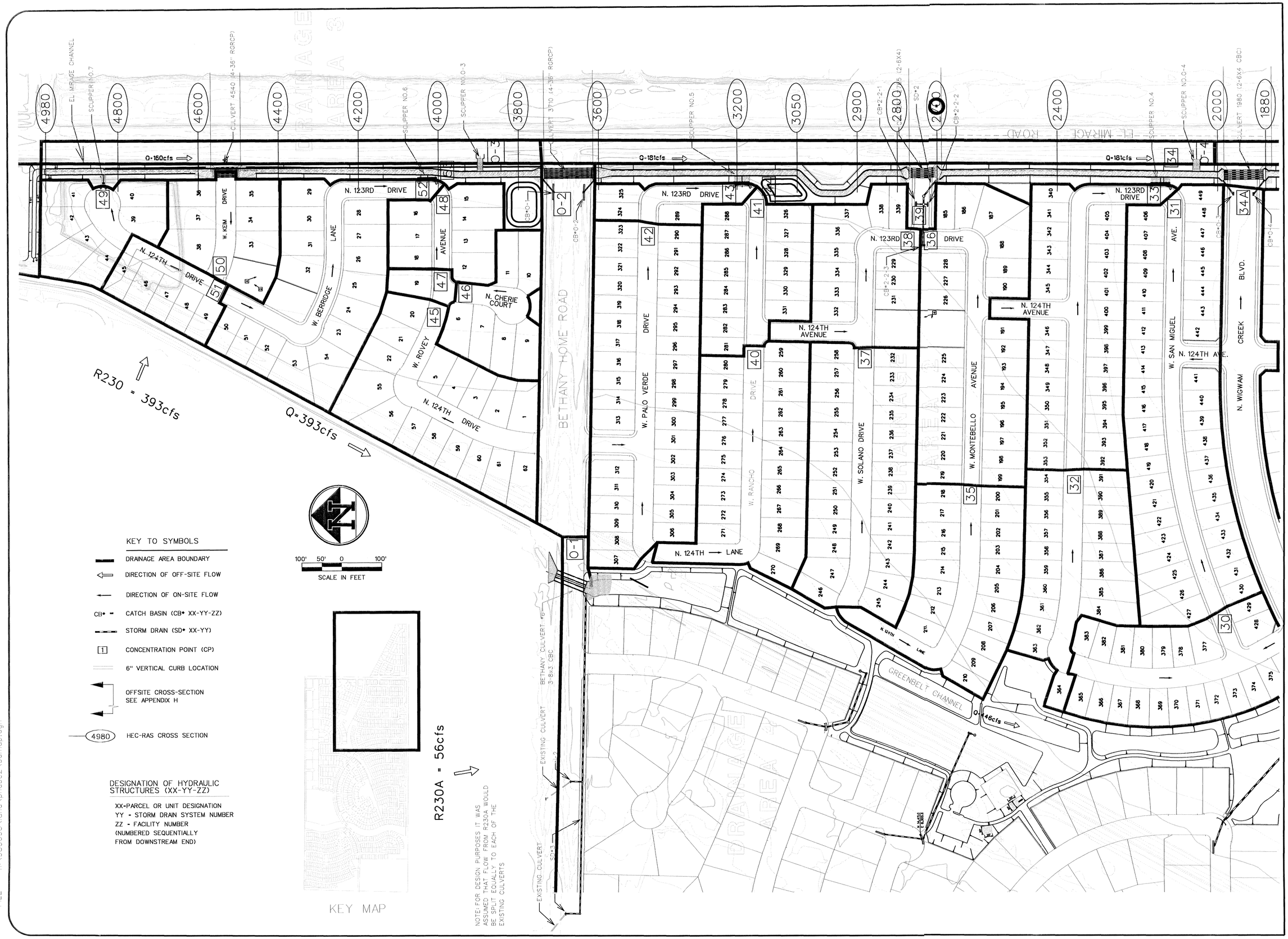
Test Description	Influent	Effluent	Units
Phenanthrene	4.1	0.70	mg/Kg
Anthracene	1.1	0.70	mg/Kg
Fluoranthene	10	0.60	mg/Kg
Pyrene	10	0.80	mg/Kg
Chyrsene	5.9	0.60	mg/Kg
Benzo(a)Anthracene	4.4	0.70	mg/Kg
Bis(2-Ethylhexyl)phthala	118	0.70	mg/Kg
Benzo(b)fluoranthene	9.8	0.80	mg/Kg
Pentachlorophenol (PCP)	5.6	2.9	mg/Kg
Petroleum Hydrocarbons	86730	10	mg/Kg

Total Petroleum Hydrocarbons
SW-846 Method 3550; EPA Method 418.1 (Sonication, Infrared)

Extraction, Base/Neutral and Acid Extractable Organics
Wastewater EPA Method 625 (Liq-Liq, Sep Funnel)
Solids SW 846 Method 3550 (Sonication)
RCRA TCLP Leachates & Groundwater
SW 846 Method 3510 (Liq-Liq, Sep Funnel)
Drinking Water EPA Method 525 (Solid Phase Extraction)

PLATE

CVL



WIGWAM CREEK PHASE 2

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

DRAINAGE MAP

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

JOB NO.
000046-03

PLATE 1

DATE:- May. 14, 2001
TIME:- 08:51:06
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WIGWAM CREEK PHASE 2

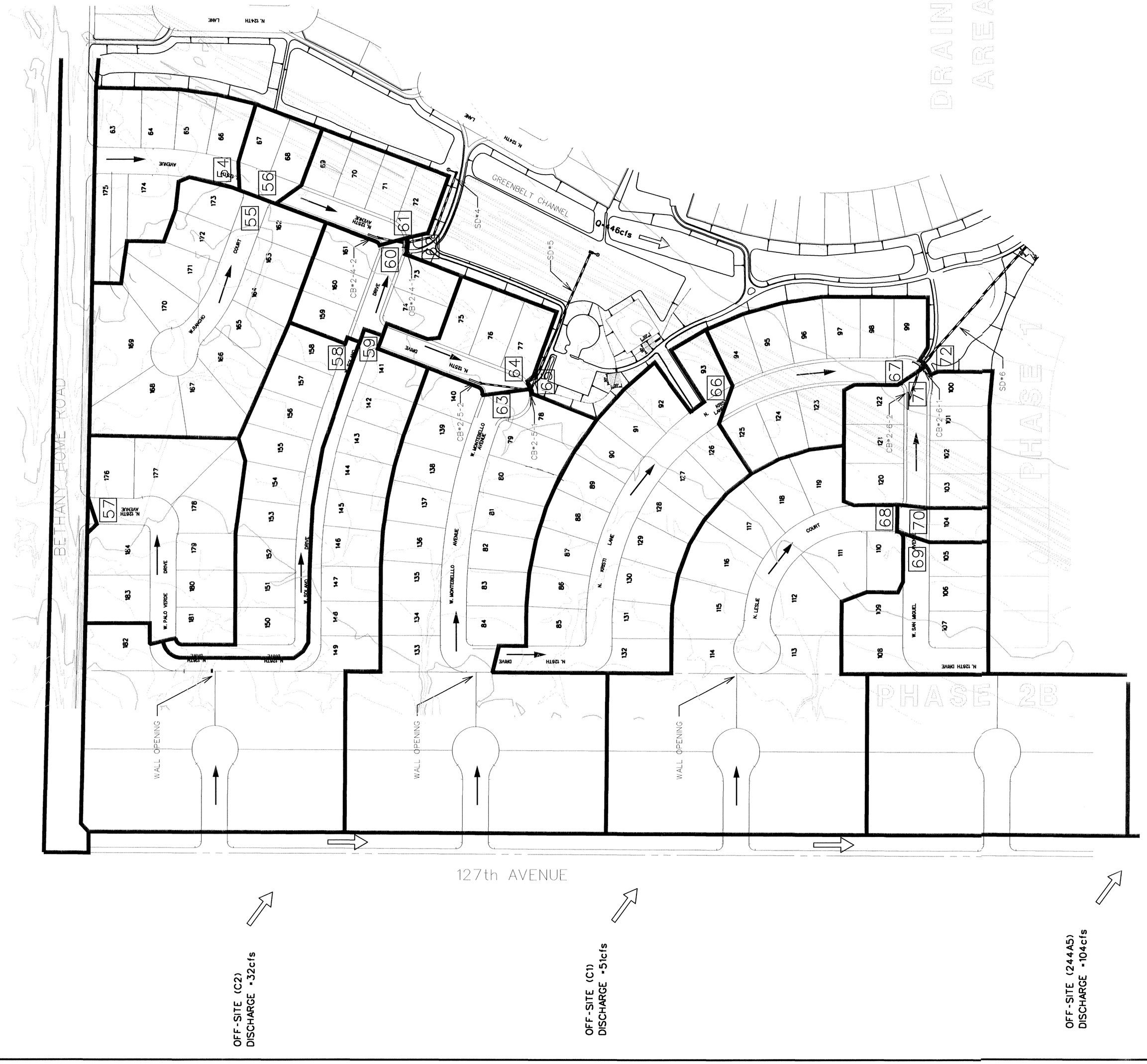
COE & VAN LOO
PLANNING•ENGINEERING•LANDSCAPE ARCHITECTURE

DRAINAGE MAP

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

JOB NO.
000046-03

PLATE 2

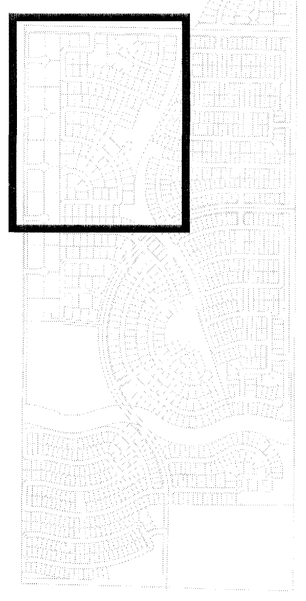


KEY TO SYMBOLS

- DRAINAGE AREA BOUNDARY
- DIRECTION OF OFF-SITE FLOW
- DIRECTION OF ON-SITE FLOW
- CB*= CATCH BASIN (CB* XX-YY-ZZ)
- STORM DRAIN (SD* XX-YY)
- 1 CONCENTRATION POINT (CP)
- 6" VERTICAL CURB LOCATION
- 7" VERTICAL CURB LOCATION
- R-2 RETENTION BASIN IDENTIFICATION

DESIGNATION OF HYDRAULIC STRUCTURES (XX-YY-ZZ)

XX-PARCEL OR UNIT DESIGNATION
YY - STORM DRAIN SYSTEM NUMBER
ZZ - FACILITY NUMBER
(NUMBERED SEQUENTIALLY FROM DOWNSTREAM END)



KEY MAP

100' 50' 0 100'
SCALE IN FEET

WIGWAM CREEK PHASE 2

COE & VAN LOO
PLANNING•ENGINEERING•LANDSCAPE ARCHITECTURE

DRAINAGE MAP

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

JOB NO. 000046-03

PLATE 3

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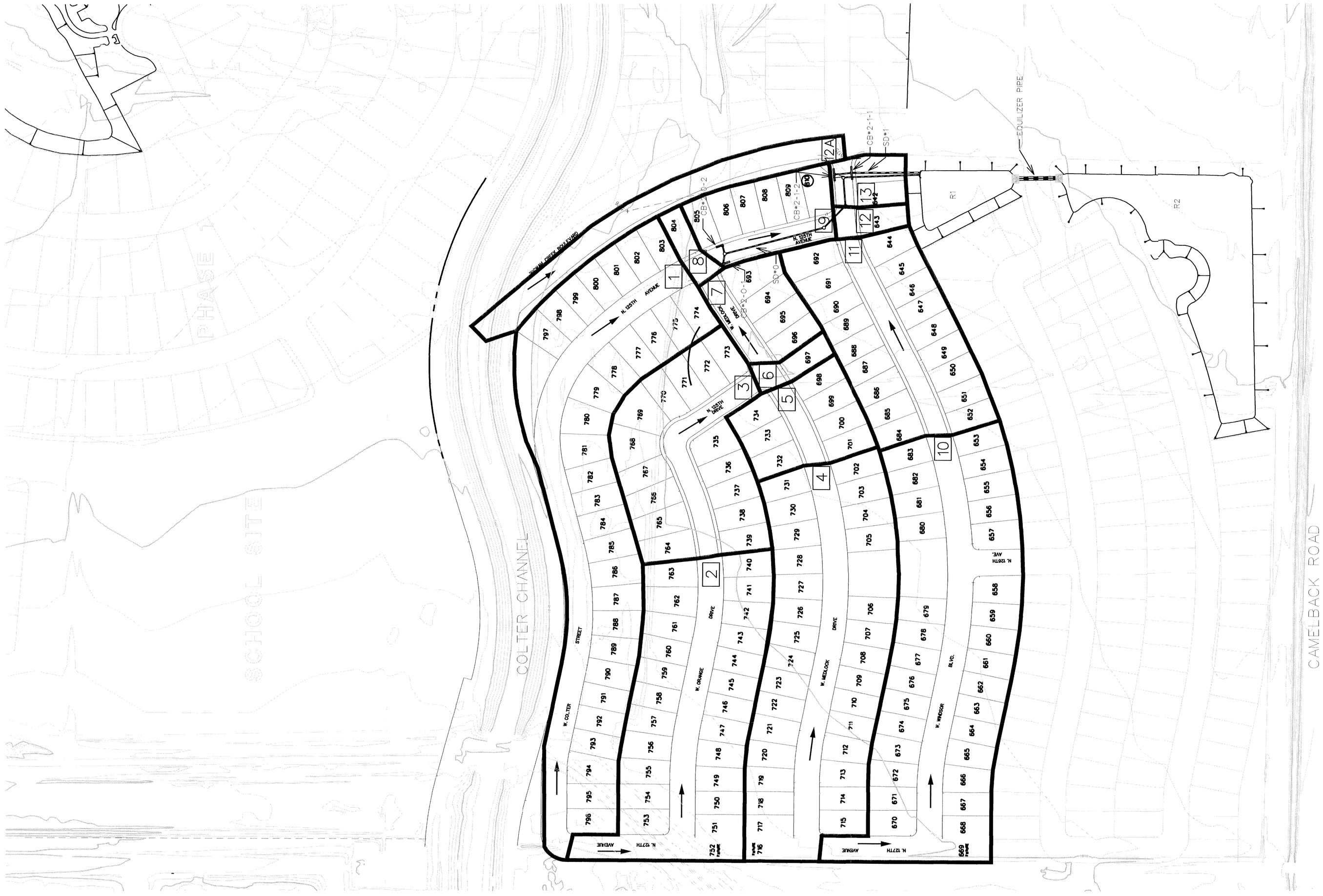

KEY TO SYMBOLS

- DRAINAGE AREA BOUNDARY
- DIRECTION OF OFF-SITE FLOW
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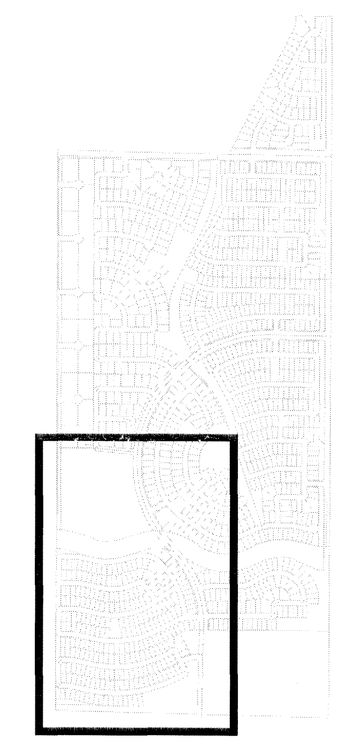
FROM DOWNSTREAM END)



KEY MAP

100' 50' 0 100'
SCALE IN FEET

WIGWAM CREEK PHASE 2

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

DRAINAGE MAP

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

JOB NO.
000046-03

PLATE 4

DATE: Nov 15,2001
PLOT: 9:25AM
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