

Loop 303 Outfall Channel

Reach A

Pre-Design Report

FCD Contract No. 2007C035

PCN 470.14.31

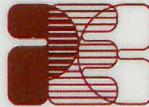
Assignment No. 1

Prepared for:



Flood Control District of Maricopa County

Prepared by:



Project Engineering Consultants, Ltd.
2310 W. Mission Lane, Suite 4
Phoenix, Arizona 85021

March 2009



A470.635

Loop 303 Outfall Channel

Reach A

Pre-Design Report

FCD Contract No. 2007C035

PCN 470.14.31

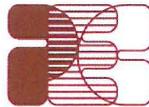
Assignment No. 1

Prepared for:



Flood Control District of Maricopa County

Prepared by:



Project Engineering Consultants, Ltd.
2310 W. Mission Lane, Suite 4
Phoenix, Arizona 85021

March 2009



Table of Contents

INTRODUCTION	3
LOCATION & FEATURES.....	4
HYDROLOGY	5
HYDRAULICS	5
CHANNEL FEATURES.....	6
DESIGN ALTERNATIVES AND HYDRAULIC MODELS.....	7
RECOMMENDED ALTERNATIVE.....	8
RECOMMENDATIONS FOR FUTURE CONSIDERATION.....	9

List of Figures

FIGURE 1 PROJECT WATERSHED MAP (FROM THE 2005 ADMPU REPORT).....	3
FIGURE 2 PROJECT VICINITY MAP (NTP).....	5

List of Tables

TABLE 1 SUMMARY OF THE STUDY FLOW RATES.....	5
--	---

Appendices

APPENDIX A: RAS MODELS FOR THE ALTERNATIVES
A.1: CAR ALTERNATIVE
A.2: DEEP CONVEYANCE ALTERNATIVE
A.3: RECOMMENDED ALTERNATIVE

APPENDIX B: MEETING MEMOS & OTHER DOCUMENTS
B.1: MEETING MINUTES (BWCDD)
B.2: MEETING MINUTES (GOODYEAR)
B.3: UPRR INFORMATION

APPENDIX C: UTILITY AND POTHOLE INFORMATION

APPENDIX D: PRE-DESIGN COST ESTIMATE

APPENDIX E: PLANS, PROFILES AND DETAILS



Introduction

Loop 303 Outfall Channel is a planned regional drainage facility closely aligned to Cotton Lane in western Maricopa County. Channel Reach A is the channel segment from the Broadway Road to Gila River. Project Engineering Consultants, Ltd., under contract to the Flood Control District of Maricopa County (District) conducted the Loop 303 Outfall Channel Reach A Pre-design project. The project included centerline surveying, alternative development at three critical channel crossings, hydraulic modeling of the channel alternatives, pre-design plans, and cost estimate. This report provides documentation of the project. The project received notice to proceed in August of 2008.

In a previous DISTRICT project, the Loop 303 Outfall Channel Candidate Assessment Report (CAR), PEC updated the hydrologic models and developed a new recommended alternative channel using the existing and proposed conditions for the drainage area south of the Interstate 10 (I-10). The basis for the CAR was the 2005 White Tank Mountain Area Drainage Plan Update (ADMPU). A new hydrologic update is currently under development for the same ADMPU area and the results will impact this Loop 303 Reach A Pre-design. The CAR recommended drainage channel, from I-10 to Gila River, was designed to convey the 100-year peak flow under the proposed conditions with 1-ft free board and under the existing conditions with bank-full. This design was a preliminary normal depth model. The Reach A Pre-design went into more detailed design (alignments, cross section configurations, structures, utility conflicts, etc.) for the segment between Broadway Road and Gila River. Figure 1 is the watershed map for the White Tanks ADMPU and its location compared to Phoenix, AZ.

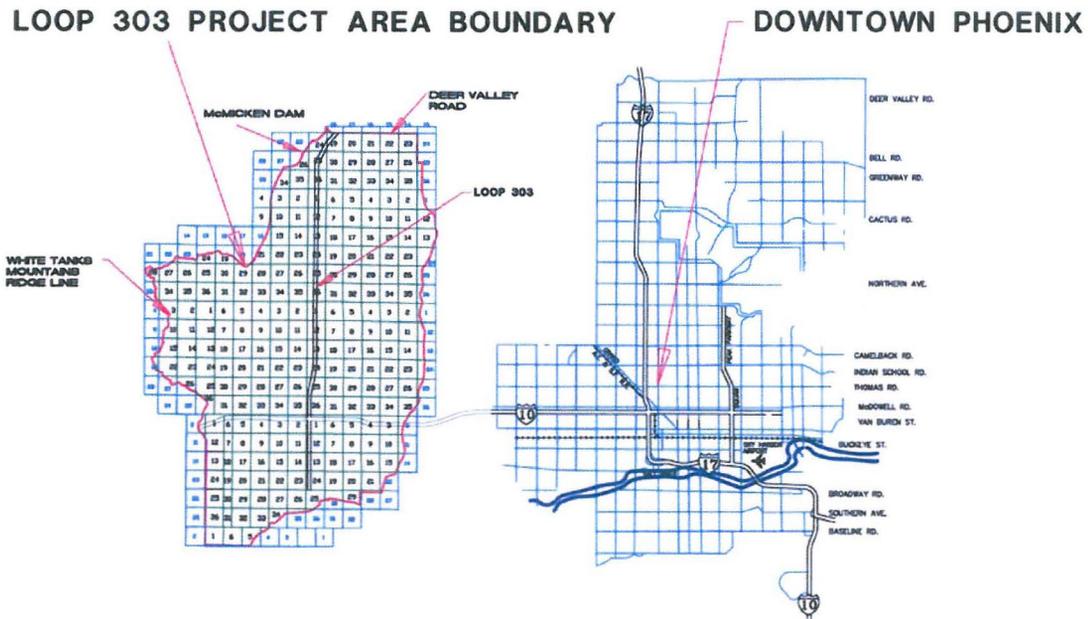


Figure 1 Project Watershed Map (from the 2005 ADMPU report)

Location & Features

The location of this project is within the Sections 26 and 35 of T1N R2W (Figure 2). The proposed UPRR Basin is located at the immediate upstream (north) of the railroad and south of Broadway Road on the east side of Citrus Road. The outfall channel passes through both Unincorporated Maricopa County and the Town of Goodyear. The proposed railroad basin is located in an FEMA Floodplain, on a parcel currently owned by the District. With the future construction of the basin, the floodplain will be contained, and it is anticipated that the basin will also help to mitigate adjacent floodplains. Floodplains also exist at the immediate north of the Buckeye Irrigation District (BID) Canal and about 600 ft south of the BID Canal (the Gila River Floodplain).

At the north end of the project, the channel crosses Broadway Road (Sta 90+00). This roadway is currently a rural section two-lane roadway but is anticipated to eventually become an urban multi-lane road as local planned developments proceed.

The Channel at Sta. 80+00 crosses the Union Pacific Railroad and several utilities located within the railroad easement. These utilities include a petroleum pipeline, a natural gas pipeline, and a fiber optics cable pulled into an abandoned petroleum line.

The channel crosses the Maricopa County Highway (MC 85) at Sta. 59+00. There is a natural gas line also in the vicinity of MC 85 as well as some local irrigation canals.

Near Sta. 48+00 the channel encounters the 96" waterline operated by the Palo Verde Nuclear Generating Station (PVNGS) and then immediately enters the Buckeye Irrigation and Drainage District Canal right-of-way. This canal is the main feeder canal for the BID.

For the final southern segment, Sta. 36+00 to Sta. 13+00, the channel becomes coincident with a BID wasteway that is used to discharge excess flows from the BID system to the Gila River.

There are other local irrigation features that the channel will impact. Many of these features can be re-routed and re-connected as necessary to keep them operational. Tailwater ditches will likely be directed into the BID irrigation system or the outfall channel. There are also overhead utilities that the channel will cross. At least one APS overhead electric high voltage line is crossed near Sta. 37+00.

Figure 2 is a graphic showing the location of the channel studied for this pre-design project.

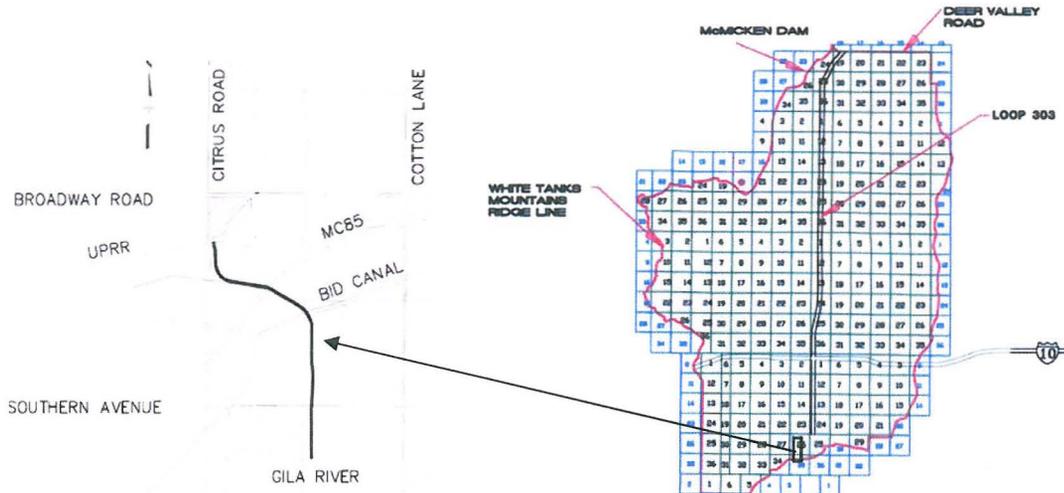


Figure 2 Project Vicinity Map

Hydrology

The study area was hydrologically modeled in the 2005 ADMPU. PEC updated the ADMPU models for existing and proposed conditions south of I-10 in the 2007 CAR (Table 1). This pre-design is based on the CAR models (100-year, 24-hour).

Table 1 Summary of the Study Flow Rates

	Flow to UPRR Basin	Flow out UPRR Basin
Existing Conditions	1500	600
Proposed Conditions	640	193
Notes: The flow rates are slightly different than the CAR flow rates based on discussions with the District and early input from the results of the on-going re-study of the White Tanks ADMP hydrologic model. Also the flow rates may vary slightly between the various models developed for different alternatives in this study.		

As previously noted, the DISTRICT has an on-going study that will update the hydrologic models for the entire White Tanks ADMPU area. This new modeling will incorporate the development in the watershed that has occurred quite rapidly since the completion of the previous update in 2005.

Hydraulics

As a part of this pre-design project PEC developed a cursory hydraulic model for the outfall channel from Broadway Road to the Gila River based on a centerline survey of the current alignment of the outfall channel. The centerline survey was completed as a part

of this project to allow for development of a model. With this data, utility information, and pothole information multiple channel geometry data were used to develop HEC-RAS models to simulate alternatives for crossing the various features encountered by the channel as it extends to the Gila River. The general design standards utilized were similar to those used for the CAR. The channel should be able to convey the 100-year storm water runoff with at least 1-foot of freeboard under proposed conditions and convey the existing conditions flow at bank full. The existing conditions flow rate proved difficult to achieve. The UPRR and the PVNGS pipeline required very stringent requirements on the design for their crossings. The railroad required that the energy grade line should be at least two feet below the base of rail and the pipeline required two feet of clearance over the facility.

The boundary condition utilized for this project is the estimated 10-year water surface elevation in the Gila River. This equals a water surface elevation of 888.4 feet at this location. This was provided in data from the District. Both the 100-year and the 10-year flows in the Gila River inundate the proposed outfall channel to about Sta. 48+00 as backwater in the channel. The “no-tailwater” condition was also modeled for this project. The 100-year Gila River floodplain boundary crosses the proposed channel at Sta. 40+00.

Channel Features

Broadway Road Culverts

The Broadway Road Culverts in the CAR model, as were all the features in the CAR, were developed with very little actual geometry features. The channel used general slopes and normal depth calculations and the culverts were developed using the velocity from the normal depth channel calculations and an estimated culvert area. The Broadway Road Culvert in the CAR is shown as a 4-barrel 8’X5’ box culvert (this was based on the future conditions flow of 676 cfs). The culverts were not included in the Reach A hydraulic model since they would be at the extreme upstream and would have no effect on the study reach. However, the culvert size shown on the pre-design plans (7-barrel 8’x4’) is based on the flow rate and velocity of the existing condition RAS model just downstream of Broadway Road.

Railroad Basin

The critical design of this reach of the outfall channel is getting flows under the railroad, over the PVNGS pipeline, and under the BID Canal. The design of the railroad basin is not as critical to this. Therefore, for the purposes of the pre-design study, the Railroad basin is not modeled specifically and is set up as an off-line basin which functions similar to the CAR model, but with the intent to lower the flow rate in the outfall channel. To keep the flow rate in the downstream channel approximately 600 cfs, the model incorporated side channel spillway weirs to reduce to flow to the desired discharge.

UPRR Crossing

The railroad crossing presents several challenges to constructing a large storm water channel. The railroad is nominally elevated about 3 feet above existing grade and the right-of-way includes multiple utilities on both sides of the rails. Several communications

fiber optic lines and a liquid petroleum line share this vicinity making it a complicated crossing. In addition to these, the UPRR requires several conditions also be met with the crossing. Communications from the UPRR has revealed that they will not allow box culverts beneath the rail road. The railroad will only allow a smooth steel pipe culvert or a bridge. Smooth steel pipes would be jacked into place and built by UPRR. This could be in groups of up to 3 pipes. The other option would be a bridge. The bridge could be sized using up to three spans of 20 feet (or 30 feet) with a 20 inch (or 30 inch for the 30 foot spans) deep girders also designed and built by UPRR. UPRR standards also do not allow the energy grade line to be higher than 2-ft below the base of rail. With all of this, the channel cannot go deeper than about 5.5 feet deep at the railroad either, due to clearance criterion for the existing utilities within the railroad right-of-way.

It is an important point that, as with the CAR, the controlling design is the existing flow rate since the channel must be designed to contain the existing flows with no freeboard. Therefore if the controlling design is for the 193 cfs, or whatever the future conditions flow rate is determined to be, the size of the channel and facilities could be significantly decreased in some cases. The Railroad Basin design will have an important role in the outfall channel capacity design.

MC85 Crossing

In the CAR, a 2-barrel 5' by 5' culvert was proposed for the MC85 crossing. The outfall channel pre-design incorporates a 4-barrel 10'X3' box culvert due to a shallow channel and to try to keep the grade of MC85 at or close to the existing profile grade at this location.

PVNGS Pipeline and BID Crossing

The PVNGS pipeline and the BID Canal are major linear utilities that are parallel and closely adjacent to each other. The structure at this crossing must accommodate these two features at once. The canal is three to four feet deep (into natural ground) and the PVNGS pipeline has nearly six feet of cover. This leaves very little room to weave the outfall channel between them. The CAR proposed an inverted siphon beneath both the pipeline and the BID Canal. This reversed the original ADMPU proposed concept of an inverted siphon for the BID Canal. These features are critical to the design of the outfall channel.

Design Alternatives and Hydraulic Models

Many alternatives were investigated and hydraulic models developed during the course of this project. The following section discusses the major various alternatives evaluated for the features within the channels location.

CAR Alternative

This alternative uses the features recommended by the CAR in 2007, but is modified slightly due to more sophisticated modeling using HEC-RAS. The CAR alternative channel includes a 45 foot bottom width, 6:1 side slopes, and is typically 5 to 8 feet deep. The channel crosses the railroad in a 4-barrel 10'x6' box culvert and MC85 using a 3-barrel 10' by 6' box culvert. The channel crosses the PVNGS pipeline and the BID Canal

in an inverted siphon. The inverted siphon consists of a 6-barrel 6'x4' box culvert. The proposed channel is typically 5 feet deep from the railroad to the Gila River; but dives to nearly 20 feet deep where the inverted siphon crosses the BID and PVNGS pipeline.

Hydraulic models have shown that a manifold of 7-barrels of 42" circular culverts have the capacity to pass 600 cfs coming from the basin outfall. However the channel cannot go deeper than 5.5 feet deep at the railroad, due to clearance criterion for the existing utilities within the railroad right-of-way and the energy grade line still has to be maintained 2 feet below the base of rail elevation.

Deep Conveyance Alternative

This proposed channel is similar to the CAR channel until it reaches the PVNGS pipeline and BID Canal. At this point the channel incorporates a large drop to cross these features. The crossing is accomplished by using a 6-barrel 6' by 4' box culvert to drop the channel requiring a very deep channel conveyance in the channel to the Gila River. The channel is also very flat; a problem for sedimentation both from the outfall channel, and from the Gila River backwater.

Recommended Alternative

In general, the recommended outfall channel is 4-ft deep with 45-ft bottom width and 6 to 1 side slope. The structures will be as follows.

Railroad Crossing - Given the local conditions and the outflow rate, the three 30-foot span bridge works the best. This configuration allows the 600 cfs outflow from the basin to pass keeps the energy grade line below the required base of rail minus two feet. The opening below the bridge deck is about 1.96 feet. It is a shallow opening because of the existing utilities (20" petroleum line, 5" and 13" fiber optic lines in the UPRR right of way).

MC85 Crossing - This crossing is dictated by the requirements at the railroad and the PVNG crossing and the slope required to meet these restrictions. That slope sets the invert at the roadway crossing. The crossing is modeled by using a 4-barrel 10'x 3' box culvert. The three foot box is used to keep the profile grade at the roadway as close to existing as possible. If the profile can be elevated, then a taller box could be considered

PVNGS Pipeline and BID Canal Crossing – This crossing is as complicated as the railroad crossing. The 96" PVNGS pipeline is not installed very deep and is adjacent to the BID Canal. Its size and the critical nature of its purpose make it less likely to relocate than most waterlines. The concept for this crossing for the outfall channel is to pass over the pipeline and under the BID canal. The proximity of the two facilities requires one rather large structure in this location. The outfall channel invert crosses with two feet of cover and will require a concrete cap to protect the pipeline. Shortly after crossing the pipeline, the channel will begin to drop approximately eight feet. This is currently modeled in a stair-step fashion in the model. This drop is done at the entrance to a 6-barrel 6'x4' box culvert to cross the BID canal. This provides about three feet of

clearance from the invert of the canal. The BID typically requires four feet, but may be open to less as discussed in a meeting with the BID General Manager (see meeting memo in Appendix B.1). The BID Canal will be lined across the limits of the construction, plus 100 feet each side of the crossing, to ensure the integrity of the canal banks. The outfall channel continues to the Gila River from this point with a shallow, but positive slope. Its overall depth is nearly 15 feet as it exits the BID crossing, but shallows quickly as it proceeds toward the river.

BID Wasteway – The outfall channel enters a BID easement for a wasteway at Sta. 37+00. The outfall channel and wasteway will combine to discharge to the Gila River. A culvert and lined section of the channel is shown at this location to provide erosion protection for both facilities.

Cost Estimate – Based on information developed in this pre-design effort, the estimated cost for Reach A of the Loop 303 Outfall Channel is approximately \$8.6M. The CAR estimate for the entire outfall channel is \$43.8M; however land costs have been reduced from \$250K per acre to \$100K per acre. The cost for the pre-design includes a 20% contingency and the landscape and aesthetics costs from the CAR study completed last year. This cost also does not include the Railroad Basin Cost, nor the cost of right-of-way for the basin since it has been purchased by the District already and further design development was not included in this study.

Recommendations for Future Consideration

Next steps for the Loop 303 Outfall Channel Reach A are as follows:

- The channel is typically designed for the existing flow at the bank full capacity. This leaves little room for channel movement and alternative designs at critical locations. The future flow is nearly 67 percent less and will be a much less costly facility to purchase right-of-way and construct.
- The channel should be re-evaluated following the completion of the on-going ADMPU updated. The general belief is that the flow rates will be smaller and the channel will be able to be reduced in its design requirements.
- Further refinements will be facilitated by obtaining topographic mapping of the area. This study utilized a centerline survey with a few areas of topo mapping. But true cut/fill lines would provide a better evaluation of the channel right-of-way requirements.
- Continued efforts to include the project stakeholders will benefit the channel design as it proceeds to the design stages. The City of Goodyear, ADOT, and the Buckeye Water Conservation and Drainage District will all be major players in the development of this outfall channel. Intergovernmental Agreement requirements should be discussed with these agencies. The design team for the future 801 freeway has expressed interest in also using the BID wasteway to discharge drainage. A combined facility is probably a good idea, but will require proactive coordination with all participating agencies.

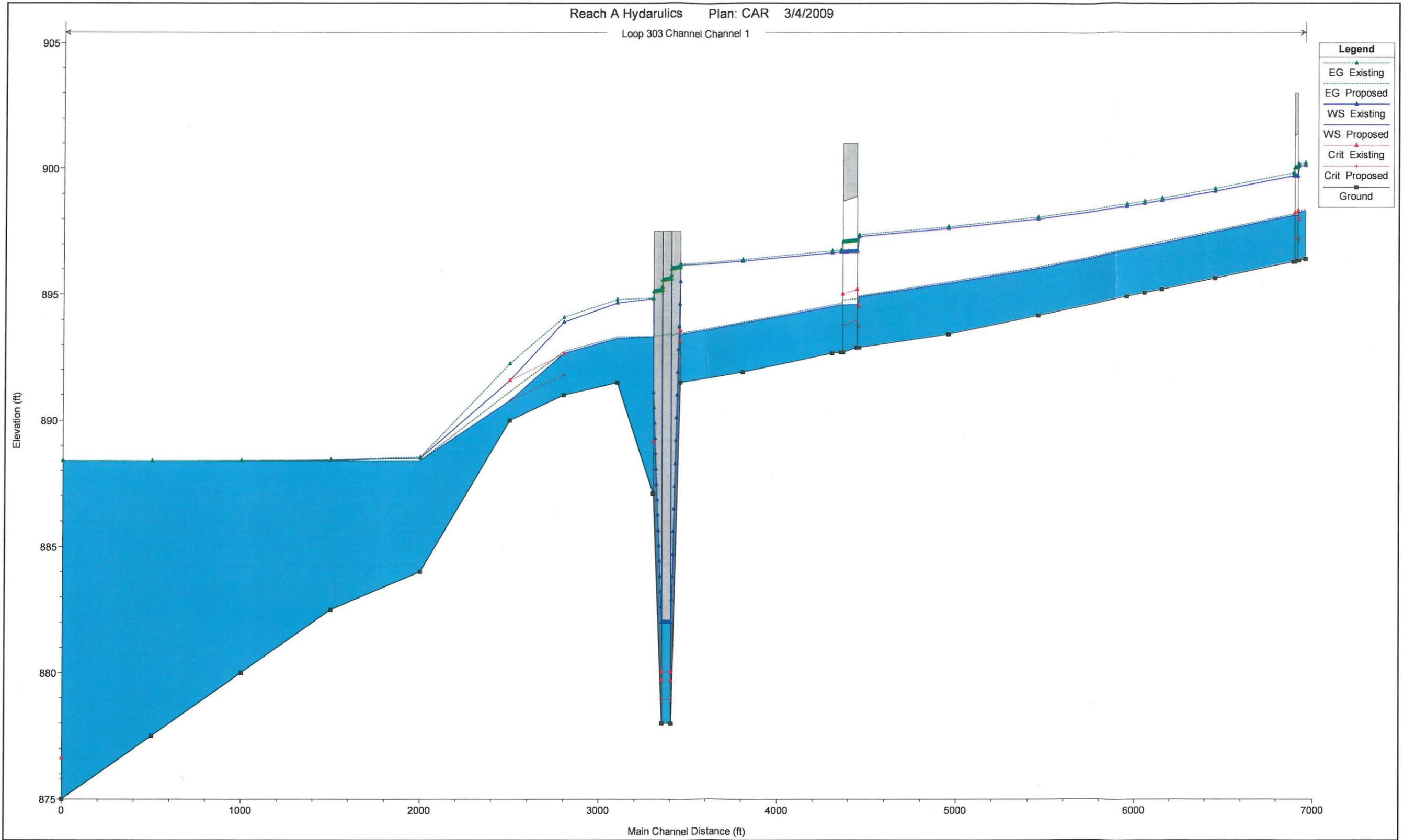
- AZPDES Permit investigations should be a consideration with the next steps for this project as it moves forward. Coordinating Best Management Practices with all agencies that discharge to the system should be discussed during stakeholder meetings.
- The Railroad Basin is also a future consideration. This study focused more on the channel and how it could be located to drain to the Gila River. As discussed in the narrative above, the basin will likely have to be used to ensure that the flows in the outfall channel are small enough for the channel to provide the conveyance through the existing utilities.

Appendix A

RAS models for the Alternatives

Reach A Hydraulics Plan: CAR 3/4/2009

Loop 303 Channel Channel 1



- Legend**
- EG Existing
 - EG Proposed
 - WS Existing
 - WS Proposed
 - Crit Existing
 - Crit Proposed
 - Ground

HEC-RAS Plan: car River: Loop 303 Channel Reach: Channel 1

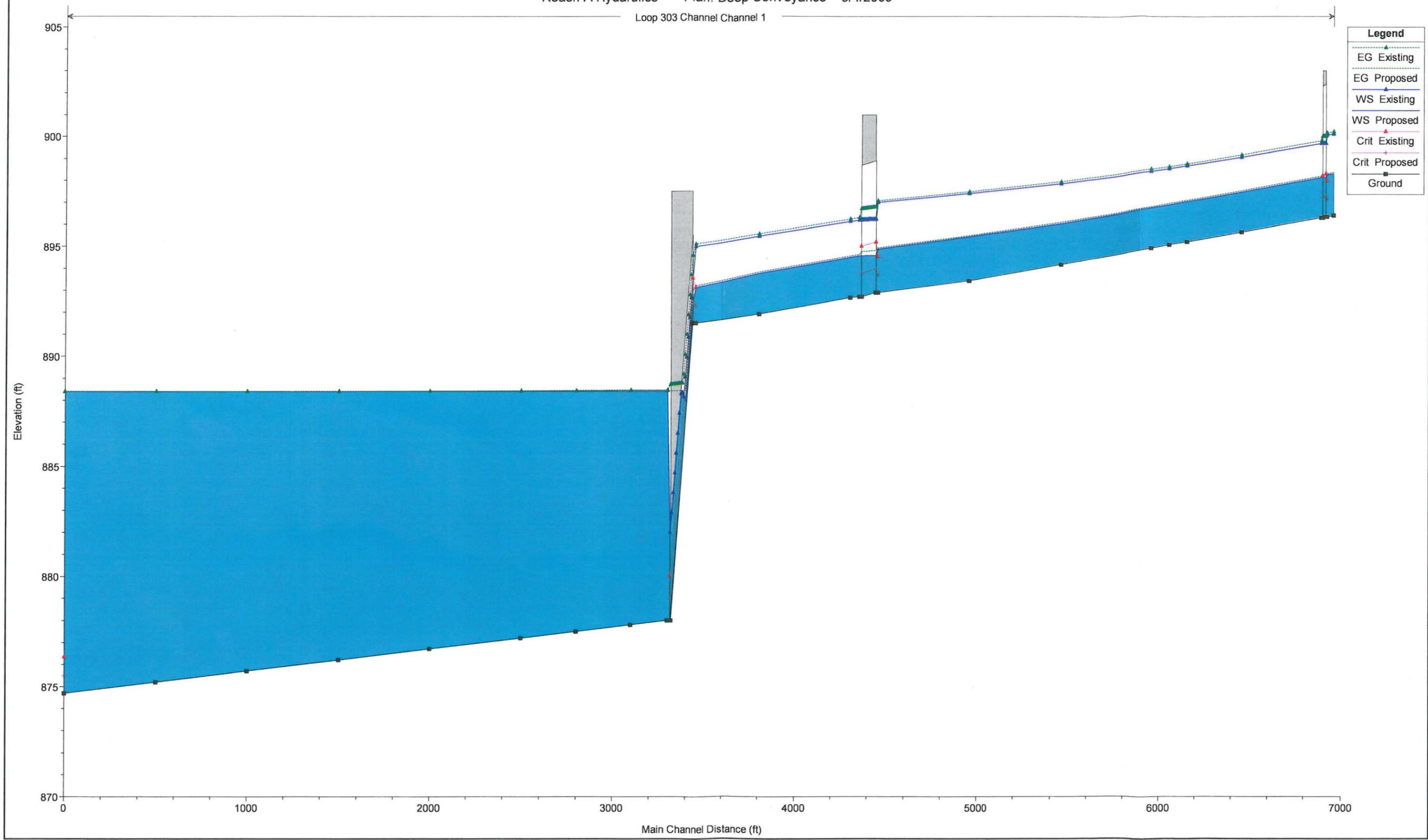
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Channel 1	8000	Proposed	193.00	896.40	898.28		898.33	0.001343	1.83	105.21	66.93	0.26
Channel 1	8000	Existing	600.00	896.40	900.11		900.20	0.001096	2.43	246.89	88.24	0.26
Channel 1	7965	Proposed	193.00	896.34	898.23	897.14	898.29	0.001344	1.86	103.91	64.88	0.26
Channel 1	7965	Existing	600.00	896.34	900.06	897.98	900.16	0.001128	2.50	240.22	84.11	0.26
Channel 1	7950		Culvert									
Channel 1	7935	Proposed	193.00	896.30	898.10		898.16	0.001534	1.91	101.22	67.17	0.27
Channel 1	7935	Existing	600.00	896.30	899.68		899.79	0.001514	2.70	222.22	86.50	0.30
Channel 1	7500	Proposed	193.00	895.65	897.45		897.50	0.001474	1.84	105.03	71.56	0.27
Channel 1	7500	Existing	600.00	895.65	899.08		899.18	0.001316	2.49	241.05	95.55	0.28
Channel 1	7200	Proposed	193.00	895.20	897.02		897.07	0.001436	1.82	105.82	71.49	0.26
Channel 1	7200	Existing	600.00	895.20	898.70		898.79	0.001220	2.43	247.15	96.09	0.27
Channel 1	7100	Proposed	193.00	895.07	896.87		896.92	0.001465	1.83	105.61	72.24	0.27
Channel 1	7100	Existing	600.00	895.07	898.59		898.67	0.001181	2.38	251.64	98.15	0.26
Channel 1	7000	Proposed	193.00	894.92	896.73		896.78	0.001457	1.83	105.65	72.01	0.27
Channel 1	7000	Existing	600.00	894.92	898.47		898.56	0.001144	2.36	254.06	98.11	0.26
Channel 1	6500	Proposed	193.00	894.17	896.02		896.07	0.001368	1.80	107.20	71.20	0.26
Channel 1	6500	Existing	600.00	894.17	897.97		898.05	0.000903	2.19	273.77	98.99	0.23
Channel 1	6000	Proposed	193.00	893.42	895.42		895.47	0.001039	1.66	116.36	71.08	0.23
Channel 1	6000	Existing	600.00	893.42	897.60		897.66	0.000658	1.99	301.63	99.37	0.20
Channel 1	5650	Proposed	193.00	892.89	894.88	893.69	894.92	0.001142	1.77	109.28	65.11	0.24
Channel 1	5650	Existing	600.00	892.89	897.28	894.54	897.34	0.000620	2.04	294.83	89.43	0.20
Channel 1	5600		Culvert									
Channel 1	5550	Proposed	193.00	892.70	894.58		894.63	0.001360	1.85	104.55	66.52	0.26
Channel 1	5550	Existing	600.00	892.70	896.68		896.75	0.000846	2.22	269.78	90.65	0.23
Channel 1	5500	Proposed	193.00	892.67	894.50		894.56	0.001446	1.87	103.42	67.80	0.27
Channel 1	5500	Existing	600.00	892.67	896.64		896.71	0.000821	2.17	276.51	94.34	0.22
Channel 1	5000	Proposed	193.00	891.92	893.84		893.89	0.001233	1.77	108.78	68.26	0.25
Channel 1	5000	Existing	600.00	891.92	896.31		896.37	0.000564	1.91	314.55	98.20	0.19
Channel 1	4650	Proposed	193.00	891.50	893.39	892.30	893.44	0.001322	1.83	105.55	66.69	0.26
Channel 1	4650	Existing	600.00	891.50	896.14	893.14	896.19	0.000471	1.81	332.04	98.21	0.17
Channel 1	4625		Culvert									
Channel 1	4600	Proposed	193.00	878.00	893.41	878.82	893.41	0.000001	0.17	1120.02	100.33	0.01
Channel 1	4600	Existing	600.00	878.00	895.73	879.72	895.73	0.000005	0.44	1362.25	108.65	0.02
Channel 1	4575		Culvert									
Channel 1	4550	Proposed	193.00	878.00	893.37	878.82	893.37	0.000001	0.17	1115.33	100.16	0.01
Channel 1	4550	Existing	600.00	878.00	895.28	879.72	895.28	0.000006	0.46	1313.35	107.02	0.02
Channel 1	4525		Culvert									
Channel 1	4500	Proposed	193.00	887.10	893.32		893.32	0.000021	0.48	404.12	84.94	0.04
Channel 1	4500	Existing	600.00	887.10	894.82		894.84	0.000091	1.11	539.24	94.61	0.08
Channel 1	4300	Proposed	193.00	891.50	893.24		893.30	0.001762	2.01	96.02	65.31	0.29
Channel 1	4300	Existing	600.00	891.50	894.64		894.78	0.002029	3.02	198.90	81.64	0.34
Channel 1	4000	Proposed	193.00	891.00	892.65	891.80	892.72	0.002123	2.14	90.04	63.96	0.32
Channel 1	4000	Existing	600.00	891.00	893.90	892.64	894.08	0.002732	3.35	178.89	78.30	0.39
Channel 1	3500	Proposed	193.00	890.00	890.79	890.79	891.14	0.026570	4.76	40.55	58.11	1.00
Channel 1	3500	Existing	600.00	890.00	891.59	891.59	892.24	0.021753	6.49	92.41	71.45	1.01
Channel 1	3000	Proposed	193.00	884.00	888.40		888.41	0.000044	0.53	366.24	115.00	0.05
Channel 1	3000	Existing	600.00	884.00	888.50		888.54	0.000380	1.59	377.90	115.00	0.15
Channel 1	2500	Proposed	193.00	882.50	888.39		888.40	0.000012	0.36	541.22	115.00	0.03
Channel 1	2500	Existing	600.00	882.50	888.42		888.44	0.000117	1.10	544.43	115.00	0.09

HEC-RAS Plan: car River: Loop 303 Channel Reach: Channel 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Channel 1	2000	Proposed	193.00	880.00	888.39		888.39	0.000003	0.24	814.49	115.00	0.02
Channel 1	2000	Existing	600.00	880.00	888.40		888.41	0.000032	0.74	815.62	115.00	0.05
Channel 1	1500	Proposed	193.00	877.50	888.39		888.39	0.000001	0.18	1059.89	115.00	0.01
Channel 1	1500	Existing	600.00	877.50	888.39		888.40	0.000014	0.57	1060.25	115.00	0.03
Channel 1	1000	Proposed	193.00	875.00	888.39	875.80	888.39	0.000001	0.15	1319.35	115.00	0.01
Channel 1	1000	Existing	600.00	875.00	888.39	876.64	888.39	0.000007	0.45	1319.35	115.00	0.02

Reach A Hydarulics Plan: Deep Conveyance 3/4/2009

Loop 303 Channel Channel 1



Legend

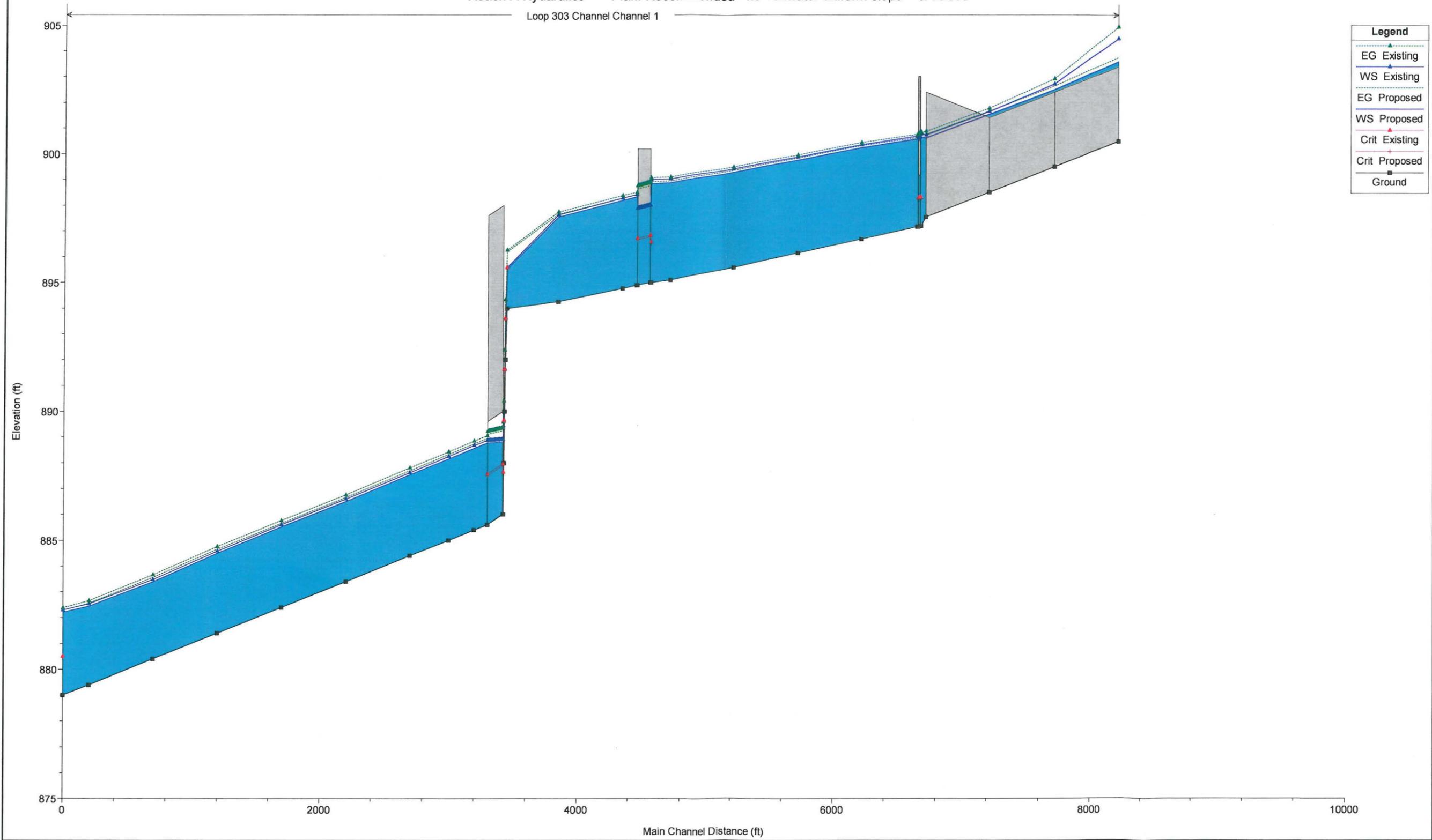
- EG Existing (dashed line with green triangles)
- EG Proposed (dotted line with blue triangles)
- WS Existing (solid blue line with blue triangles)
- WS Proposed (solid blue line with blue triangles)
- Crit Existing (dashed line with red triangles)
- Crit Proposed (dotted line with red triangles)
- Ground (solid black line with black squares)

HEC-RAS Plan: deep River: Loop 303 Channel Reach: Channel 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Channel 1	8000	Proposed	193.00	896.40	898.28		898.33	0.001343	1.83	105.21	66.93	0.26
Channel 1	8000	Existing	600.00	896.40	900.09		900.19	0.001109	2.44	245.89	88.10	0.26
Channel 1	7965	Proposed	193.00	896.34	898.23	897.14	898.29	0.001344	1.86	103.91	64.88	0.26
Channel 1	7965	Existing	600.00	896.34	900.05	897.98	900.15	0.001142	2.51	239.22	83.99	0.26
Channel 1	7950		Culvert									
Channel 1	7935	Proposed	193.00	896.30	898.10		898.16	0.001534	1.91	101.22	67.17	0.27
Channel 1	7935	Existing	600.00	896.30	899.66		899.78	0.001541	2.72	220.87	86.31	0.30
Channel 1	7500	Proposed	193.00	895.65	897.45		897.50	0.001474	1.84	105.03	71.56	0.27
Channel 1	7500	Existing	600.00	895.65	899.04		899.14	0.001369	2.52	237.69	95.03	0.28
Channel 1	7200	Proposed	193.00	895.20	897.02		897.07	0.001436	1.82	105.82	71.49	0.26
Channel 1	7200	Existing	600.00	895.20	898.65		898.74	0.001297	2.48	241.80	95.28	0.27
Channel 1	7100	Proposed	193.00	895.07	896.87		896.92	0.001465	1.83	105.60	72.24	0.27
Channel 1	7100	Existing	600.00	895.07	898.52		898.61	0.001269	2.45	245.35	97.18	0.27
Channel 1	7000	Proposed	193.00	894.92	896.73		896.78	0.001457	1.83	105.65	72.01	0.27
Channel 1	7000	Existing	600.00	894.92	898.40		898.49	0.001240	2.43	246.85	97.00	0.27
Channel 1	6500	Proposed	193.00	894.17	896.01		896.06	0.001369	1.80	107.16	71.19	0.26
Channel 1	6500	Existing	600.00	894.17	897.84		897.92	0.001038	2.30	260.47	97.07	0.25
Channel 1	6000	Proposed	193.00	893.42	895.42		895.47	0.001044	1.66	116.19	71.05	0.23
Channel 1	6000	Existing	600.00	893.42	897.39		897.46	0.000800	2.13	281.28	96.67	0.22
Channel 1	5650	Proposed	193.00	892.89	894.87	893.69	894.92	0.001158	1.77	108.78	65.03	0.24
Channel 1	5650	Existing	600.00	892.89	896.98	894.54	897.06	0.000803	2.23	269.02	86.46	0.22
Channel 1	5600		Culvert									
Channel 1	5550	Proposed	193.00	892.70	894.56		894.62	0.001392	1.86	103.73	66.38	0.26
Channel 1	5550	Existing	600.00	892.70	896.19		896.30	0.001383	2.65	226.84	85.04	0.29
Channel 1	5500	Proposed	193.00	892.67	894.49		894.54	0.001487	1.88	102.44	67.62	0.27
Channel 1	5500	Existing	600.00	892.67	896.12		896.23	0.001393	2.62	229.34	87.91	0.29
Channel 1	5000	Proposed	193.00	891.92	893.76		893.82	0.001434	1.87	103.36	67.29	0.27
Channel 1	5000	Existing	600.00	891.92	895.46		895.56	0.001287	2.56	234.79	87.82	0.28
Channel 1	4650	Proposed	193.00	891.50	893.11	892.30	893.18	0.002348	2.22	87.06	63.43	0.33
Channel 1	4650	Existing	600.00	891.50	894.98	893.14	895.09	0.001402	2.66	225.80	84.90	0.29
Channel 1	4625		Culvert									
Channel 1	4500	Proposed	193.00	878.00	888.40		888.40	0.000004	0.29	656.92	81.38	0.02
Channel 1	4500	Existing	600.00	878.00	888.44		888.46	0.000040	0.91	660.83	81.55	0.06
Channel 1	4300	Proposed	193.00	877.80	888.39		888.40	0.000004	0.29	676.20	82.65	0.02
Channel 1	4300	Existing	600.00	877.80	888.44		888.45	0.000037	0.88	679.63	82.79	0.05
Channel 1	4000	Proposed	193.00	877.50	888.39		888.40	0.000004	0.27	702.14	83.91	0.02
Channel 1	4000	Existing	600.00	877.50	888.43		888.44	0.000034	0.85	704.87	84.02	0.05
Channel 1	3500	Proposed	193.00	877.20	888.39		888.39	0.000003	0.25	761.61	91.09	0.02
Channel 1	3500	Existing	600.00	877.20	888.42		888.43	0.000028	0.79	763.92	91.19	0.05
Channel 1	3000	Proposed	193.00	876.70	888.39		888.39	0.000002	0.20	949.08	115.00	0.01
Channel 1	3000	Existing	600.00	876.70	888.41		888.42	0.000018	0.63	951.09	115.00	0.04
Channel 1	2500	Proposed	193.00	876.20	888.39		888.39	0.000001	0.18	1045.00	115.00	0.01
Channel 1	2500	Existing	600.00	876.20	888.40		888.41	0.000014	0.57	1046.28	115.00	0.03
Channel 1	2000	Proposed	193.00	875.70	888.39		888.39	0.000001	0.17	1158.44	115.00	0.01
Channel 1	2000	Existing	600.00	875.70	888.40		888.40	0.000010	0.52	1159.19	115.00	0.03
Channel 1	1500	Proposed	193.00	875.20	888.39		888.39	0.000001	0.16	1243.89	115.00	0.01
Channel 1	1500	Existing	600.00	875.20	888.39		888.40	0.000008	0.48	1244.22	115.00	0.03
Channel 1	1000	Proposed	193.00	874.70	888.39	875.50	888.39	0.000001	0.14	1343.35	115.00	0.01
Channel 1	1000	Existing	600.00	874.70	888.39	876.34	888.39	0.000006	0.45	1343.35	115.00	0.02

Reach A Hydarulics Plan: Recommended - no Tailwater uniform slope 3/4/2009

Loop 303 Channel Channel 1



HEC-RAS Plan: uniform River: Loop 303 Channel Reach: Channel 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Channel 1	9500	Proposed	640.00	900.50	903.59		903.75	0.002324	3.19	200.44	83.54	0.36
Channel 1	9500	Existing	1500.00	900.50	904.48		904.93	0.004767	5.41	277.26	88.88	0.54
Channel 1	9499		Lat Struct									
Channel 1	9000	Proposed	573.58	899.50	902.49		902.63	0.002120	2.98	192.30	82.95	0.35
Channel 1	9000	Existing	750.53	899.50	902.71		902.90	0.002763	3.57	210.20	84.23	0.40
Channel 1	8999		Lat Struct									
Channel 1	8500	Proposed	538.90	898.50	901.53		901.65	0.001772	2.75	195.74	83.20	0.32
Channel 1	8500	Existing	574.07	898.50	901.64		901.76	0.001764	2.81	204.29	83.81	0.32
Channel 1	8499		Lat Struct									
Channel 1	8000	Proposed	537.22	897.54	900.61		900.74	0.001871	2.91	184.77	75.31	0.33
Channel 1	8000	Existing	567.08	897.54	900.73		900.87	0.001800	2.92	194.40	76.56	0.32
Channel 1	7965	Proposed	537.22	897.20	900.66	898.26	900.71	0.000053	1.81	297.35	86.00	0.17
Channel 1	7965	Existing	567.08	897.20	900.78	898.30	900.84	0.000053	1.84	308.20	86.00	0.17
Channel 1	7951		Bridge									
Channel 1	7935	Proposed	537.22	897.17	900.57		900.62	0.000531	1.84	292.19	86.00	0.18
Channel 1	7935	Existing	567.08	897.17	900.68		900.74	0.000531	1.88	302.10	86.00	0.18
Channel 1	7500	Proposed	537.22	896.69	900.23		900.31	0.000995	2.23	240.51	90.82	0.24
Channel 1	7500	Existing	567.08	896.69	900.35		900.43	0.000979	2.26	251.31	92.35	0.24
Channel 1	7000	Proposed	537.22	896.15	899.74		899.82	0.000970	2.24	240.03	88.65	0.24
Channel 1	7000	Existing	567.08	896.15	899.87		899.95	0.000950	2.26	251.23	90.17	0.24
Channel 1	6500	Proposed	537.22	895.60	899.29		899.36	0.000870	2.14	250.47	90.85	0.23
Channel 1	6500	Existing	567.08	895.60	899.42		899.50	0.000844	2.16	263.08	92.56	0.23
Channel 1	6000	Proposed	537.22	895.10	898.88		898.94	0.000789	2.07	259.81	92.58	0.22
Channel 1	6000	Existing	567.08	895.10	899.03		899.10	0.000740	2.07	274.46	93.00	0.21
Channel 1	5910	Proposed	537.22	895.01	898.85	896.53	898.92	0.000080	2.05	261.48	91.19	0.21
Channel 1	5910	Existing	567.08	895.01	899.01	896.58	899.07	0.000076	2.05	276.12	93.00	0.21
Channel 1	5860		Culvert									
Channel 1	5810	Proposed	537.22	894.89	898.32		898.41	0.001146	2.37	226.78	87.14	0.26
Channel 1	5810	Existing	567.08	894.89	898.41		898.50	0.001157	2.42	234.77	88.26	0.26
Channel 1	5700	Proposed	537.22	894.77	898.19		898.28	0.001174	2.40	223.67	85.72	0.26
Channel 1	5700	Existing	567.08	894.77	898.28		898.37	0.001188	2.45	231.38	86.78	0.26
Channel 1	5200	Proposed	537.22	894.25	897.55		897.65	0.001365	2.54	211.27	83.21	0.28
Channel 1	5200	Existing	567.08	894.25	897.63		897.73	0.001389	2.60	218.12	84.16	0.28
Channel 1	4800	Proposed	537.22	894.00	895.53	895.53	896.19	0.021813	6.56	81.92	62.43	1.01
Channel 1	4800	Existing	567.08	894.00	895.58	895.58	896.27	0.021398	6.63	85.47	63.08	1.00
Channel 1	4790	Proposed	537.22	892.00	893.58	893.55	894.25	0.002121	6.56	81.93	58.56	0.98
Channel 1	4790	Existing	567.08	892.00	893.63	893.60	894.33	0.002142	6.70	84.61	58.95	0.99
Channel 1	4787	Proposed	537.22	892.00	893.55	893.55	894.25	0.002277	6.71	80.05	58.29	1.01
Channel 1	4787	Existing	567.08	892.00	893.61	893.61	894.33	0.002233	6.79	83.46	58.79	1.00
Channel 1	4785	Proposed	537.22	890.00	891.60	891.57	892.30	0.002107	6.70	80.21	55.12	0.98
Channel 1	4785	Existing	567.08	890.00	891.65	891.63	892.38	0.002126	6.85	82.83	55.42	0.99
Channel 1	4782	Proposed	537.22	890.00	891.57	891.57	892.30	0.002258	6.85	78.45	54.92	1.01
Channel 1	4782	Existing	567.08	890.00	891.63	891.63	892.38	0.002213	6.94	81.76	55.30	1.01
Channel 1	4780	Proposed	537.22	888.00	889.61	889.58	890.33	0.002113	6.80	79.01	53.06	0.98
Channel 1	4780	Existing	567.08	888.00	889.67	889.65	890.41	0.002106	6.93	81.88	53.33	0.98
Channel 1	4777	Proposed	537.22	888.00	889.59	889.59	890.33	0.002227	6.91	77.70	52.93	1.01
Channel 1	4777	Existing	567.08	888.00	889.65	889.65	890.41	0.002187	7.01	80.90	53.23	1.00
Channel 1	4775	Proposed	537.22	886.00	889.31	887.60	889.47	0.000185	3.13	171.81	58.71	0.32
Channel 1	4775	Existing	567.08	886.00	889.44	887.65	889.59	0.000182	3.17	179.07	59.22	0.32

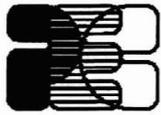
HEC-RAS Plan: uniform River: Loop 303 Channel Reach: Channel 1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Channel 1	4700		Culvert									
Channel 1	4650	Proposed	537.22	885.60	888.78		888.95	0.002065	3.33	161.35	56.63	0.35
Channel 1	4650	Existing	567.08	885.60	888.88		889.05	0.002069	3.39	167.05	57.00	0.35
Channel 1	4500	Proposed	537.22	885.40	888.57		888.74	0.002045	3.30	162.85	57.69	0.35
Channel 1	4500	Existing	567.08	885.40	888.67		888.85	0.002049	3.36	168.65	58.09	0.35
Channel 1	4300	Proposed	537.22	885.00	888.16		888.33	0.002081	3.32	161.82	57.52	0.35
Channel 1	4300	Existing	567.08	885.00	888.26		888.43	0.002086	3.38	167.55	57.92	0.35
Channel 1	4000	Proposed	537.22	884.40	887.54		887.70	0.002069	3.27	164.17	59.62	0.35
Channel 1	4000	Existing	567.08	884.40	887.64		887.81	0.002073	3.33	170.04	60.08	0.35
Channel 1	3500	Proposed	537.22	883.40	886.51		886.67	0.002070	3.22	166.81	62.35	0.35
Channel 1	3500	Existing	567.08	883.40	886.60		886.77	0.002074	3.28	172.85	62.88	0.35
Channel 1	3000	Proposed	537.22	882.40	885.52		885.67	0.001925	3.05	175.88	67.70	0.33
Channel 1	3000	Existing	567.08	882.40	885.62		885.77	0.001925	3.11	182.42	68.40	0.34
Channel 1	2500	Proposed	537.22	881.40	884.50		884.66	0.002093	3.23	166.22	62.29	0.35
Channel 1	2500	Existing	567.08	881.40	884.59		884.76	0.002107	3.30	171.93	62.80	0.35
Channel 1	2000	Proposed	537.22	880.40	883.40		883.57	0.002289	3.29	163.32	63.94	0.36
Channel 1	2000	Existing	567.08	880.40	883.49		883.66	0.002301	3.35	169.05	64.50	0.37
Channel 1	1500	Proposed	537.22	879.40	882.45		882.56	0.001726	2.70	199.05	85.63	0.31
Channel 1	1500	Existing	567.08	879.40	882.54		882.65	0.001728	2.74	206.71	86.82	0.31
Channel 1	1300	Proposed	537.22	879.00	882.22	880.45	882.29	0.001001	2.20	243.87	93.00	0.24
Channel 1	1300	Existing	567.08	879.00	882.31	880.50	882.38	0.001000	2.25	252.17	93.00	0.24

Appendix B

Meeting Memos & Other Documents

Memorandum



**PROJECT ENGINEERING
CONSULTANTS, LTD.**
ENGINEERS • PLANNERS • SURVEYORS

Project Name: Loop 303 Outfall Channel Pre-Design Reach A

Date: 2-27-09

From: Mike Heaton

To: File

Regarding: Visit with Buckeye Irrigation District Manager

On Thursday 2-26-09 I went with Michael Duncan from the FCDMC to a meeting with Ed Gerak the General Manager of the Buckeye Water Conservation & Drainage District. We discussed the outfall channel pre-design.

Items discussed include:

- The wasteway for the BID canal will continue to discharge to the outfall channel. The BWCDD and the FCD will have to work out an IGA to determine the requirements for maintained and operations and other issues. It was unknown how bid the easement is for the wasteway.
- There is no dry-up for this portion of the canal. Typically it is in November, but this canal has some requirements that require it to be flowing year round. This will necessitate the use of a pump-around for the flows during construction of the crossing.
- The average flows in this section approximately:
 - Average lowest flows – 2,000 mi (50 cfs)
 - Average normal flows – 6,000 mi (150 cfs)
 - Average high flows – 11,000 mi (275)
- Stantec is the BWCDD engineer of record, but they are trying to do more in-house to try to get more done. Ed Gerak has his PE.
- The BWCDD has development standards and they will forward them for inclusion in the final report.
- Typically they would require 4 feet between the invert of the canal, but in this case they would work with us. The channel will have to be lined in the vicinity of the crossing for a distance extending 100 feet each way from the construction area.
- Construction for the outfall channel is scheduled for 2014, but due to current conditions will likely be pushed back. It will likely be built before the Loop 303 freeway.
- In most cases we should try to return tailwater to the BWCDD and not discharge to the outfall channel. Much of the land in this area is not within the district, but is private land (Lakin) and is watered by well.

Buckeye Water Conservation & Drainage District

205 ROOSEVELT AVENUE
P.O. BOX 1726
BUCKEYE, ARIZONA 85326-0160
PH: (623) 386-2196
FAX: (623) 386-7789

June 2006

**Reference: Irrigation and Drainage System Relocation Guidelines
For Land Development and/or Street Improvements**

1. Introduction

The following Buckeye Water Conservation and Drainage District (District) policies and standards are provided as guidelines for Developers and Planners involved in projects impacting existing District irrigation and drainage facilities.

These guidelines are presented as generalized criteria only; the District reserves the right to modify policies, specifications and/or design requirements for each project on a case-by-case basis.

Independent, professional planners, engineers, attorneys, or other consultants whose professional expertise is appropriate for a particular project will assist the District. All costs and fees associated with the review of development plans and/or the modification of District facilities are the responsibility of the Developer. These costs are typically incurred for, but not limited to, pre-design engineering planning and analysis, engineering survey and design, legal work, construction, construction inspection and project administration.

An independent engineer selected by the District will design all necessary modifications to the District's irrigation and drainage facilities. All District facilities modified to accommodate a development project will be designed and constructed to current applicable District standards.

Generally, a licensed contractor selected by the Developer will complete the construction of relocated District facilities. However, the District reserves the right to selectively determine that some, or all of the relocated facilities will be constructed by the District. A construction observer selected by the District will monitor the construction of all District facilities.

Prior to the commencement of work by the District beyond the initial planning and coordination stage of a development project, the Developer must sign a Participation Agreement Letter with the District and provide advance funds covering the estimated cost of the work.

The following general topics are discussed in these guidelines:

- District Funding Requirements
- General Procedure for the Relocation of District Facilities
- District Easements
- Placement of Relocated District Facilities
- Utilities
- District Landscaping Restrictions

Irrigation and Drainage System Relocation Guidelines For Land Development and/or Street Improvements

- Acceptance of Surface Drainage
- District Irrigation Wells
- Gates for Irrigation Delivery Structures
- Frames and Covers for Irrigation Manholes
- Maintenance of District Irrigation Service

2. District Funding Requirements

All costs, directly or indirectly, associated with the relocation of District irrigation and/or drainage facilities are the sole responsibility of the Developer or payor. The District will not share in the costs of funding a relocation project.

Typical costs incurred by the District that must be funded by the Developer in association with a relocation project include, but are not limited to: engineering planning and design, construction coordination and observation, as-constructed survey; project management, legal costs, coordination and plan review with utility companies, utility location services, governmental and/or municipal plan review fees, and project administration and overhead costs.

In general, the Developer's Contractor will complete the physical construction of the District facilities for a relocation project. The District does not typically incur costs for the labor and materials directly associated with the construction of their relocated facilities.

The District requires the Developer to provide funds for the expected estimated costs that will be incurred by the District for a specific relocation project prior to the commencement of any substantial work by the District. In this regard the District will typically provide the Developer with separate funding requirement notifications for the pre-design, design and post design (construction) phases of the project.

The District will place these funds in a special account to be applied against costs incurred by the District in association with the relocation project. Once these funds are depleted, the District has no obligation to incur further costs or to proceed further with the design, modification or relocation of its facilities until the Developer provides subsequent funds in the amount(s) requested by the District.

Any funds remaining in the project account at the end of the design phase of the relocation project will be credited towards the subsequent post design phase of the project. Funds remaining in the project account after post design and the final acceptance by the District of the adequacy of the relocated facilities will be refunded to the payor.

3. General Procedure for the Relocation of District Facilities

3.1 General

The procedure for the relocation of District facilities is a multi-step process divided into three distinct phases; pre-design, design and post-design. The District will provide a separate notification of the funding requirement for each phase of the project to the Developer at an appropriate time.

Irrigation and Drainage System Relocation Guidelines For Land Development and/or Street Improvements

3.2 Pre-Design Phase

The pre-design phase of a District relocation project includes the initial meetings with the Developer, and typically the Developer's Engineer, to discuss the details of the development project, District procedures and requirements, and the District's preparation of a scope-of-work and budget for the subsequent design phase.

The Developer should arrange to meet with the District and the District's Engineer as early as possible during the planning phase of the development project in order to obtain information concerning the District's rights, responsibilities, and requirements prior to the preparation of a preliminary plat and/or final plans. At this meeting the Developer should provide a plan or plat depicting the location of streets, lands dedicated for public use, open space, retention areas, lot layouts, utility locations, etc.

The District and the District's Engineer will review the Developer's preliminary plans to determine the impact the development will have on the integrity and operational flexibility of the District's facilities. If it is determined that relocation of District facilities is required for the development project and that relocating the District's facilities is in the District's best interest, the District and the District's Engineer will work with the Developer to determine the general scope and breadth of the relocations, identify potential alignment alternatives and note potential complications in the design process. The approval of a new alignment, and/or the location of any new District facility, is solely the responsibility of the District.

At the Developer's request, the District will prepare and submit a scoping package for the design phase of the project. This package will include a detailed scope of work, an engineering budget and a Participation Agreement Letter (PAL). To initiate the preparation of this package the Developer must provide a non-refundable fee of \$10,000 to the District. The District will provide a written notification of the fee requirement to the Developer when requested.

The estimated scope of work and budget for the design phase will be based on the alternatives and features discussed with the Developer and the Developer's Engineer and will typically include a schematic layout of the proposed RID facilities. The PAL is the standardized contractual agreement between the District and the Developer. Any changes proposed by the Developer to this document must be reviewed by the District's Attorney and may require approval of the District's Board of Directors.

The Developer should carefully review the scoping package for the design phase to ensure that it will meet the requirements of the development project. The scoping package is valid for 90-days from the date of its transmittal letter.

3.3 Design Phase

The design phase of the relocation project includes the engineering design of the District's facilities, the preparation of construction plans, and the procurement of any municipal and/or governmental approvals required for the plans.

To initiate the design phase the Developer must return a signed PAL to the District along with the required funding as detailed in the scoping package. Once the PAL and funds have been received, the District will issue a notice to proceed with the project to the District's Engineer.

Ideally, the paving and grading design for the development should be approximately 60% complete prior to the commencement of the District's relocation design. This will provide the

**Irrigation and Drainage System Relocation Guidelines
For Land Development and/or Street Improvements**

best opportunity for the Developer's Engineer and the District's Engineer to effectively coordinate and accommodate elements of the interdependent design projects.

The Developer's Engineer will need to provide all pertinent CADD files and preliminary plans for the development project. The District's Engineer will typically utilize the same horizontal coordinate system and vertical datum established for the development project by the Developer's Engineer to facilitate both the coordination of the design process and the construction of the District facilities. To avoid a duplication of effort, the District's Engineer, to the extent practicable, will utilize the provided CADD files for the preparation of the District's construction plans.

The Developer is solely responsible for the accuracy of the plans and/or CADD files supplied by the Developer's Engineer. The District and/or the District's Engineer will not be responsible for any costs resulting from errors and/or emissions in the plans and/or CADD files provided by the Developer.

The District's Engineer will schedule and perform any surveying required to complete the hydraulic design of the relocated facilities. To the extent possible, any survey information provided by the Developer's Engineer will be utilized for this purpose.

The District's Engineer will evaluate and identify the need for locating existing underground utilities that may be in conflict with the relocated facilities. If utility locating is required, the District's Engineer will provide a detailed request to the Developer identifying these locations for the Developer to obtain. If requested, the District's Engineer will obtain a cost estimate from a licensed Contractor for these services and provide this information to the Developer for funding.

The completed preliminary plans will be submitted to both the Developer and any appropriate municipal agencies for review and comment. The Developer is solely responsible for any review fees levied by municipal agencies and any notification for payment of these fees received by the District's Engineer will be forwarded to the Developer for payment directly to the appropriate agency.

When the review comments have been addressed and any necessary approvals granted by the municipal agencies involved have been secured, the approved plans will be released by the District to the Developer. The release of the approved plans effectively ends the design phase of the relocation project.

Prior to the release of the approved plans, any outstanding costs incurred by the District during the design phase of the project that exceed the funds provided by the Developer must be paid in full. Any excess funds remaining in the project account at the end of the design phase are generally applied toward the estimated costs of the post design phase of the project.

The District's approved plans are valid for one year from their date of release. If the construction of the project has not commenced within that period the District reserves the right to reevaluate the plans for conformance to current applicable District standards and specifications and any other changes that may affect the design and/or proposed location of District facilities. The determination of the suitability for construction of expired plans, and any modifications needed to bring the plans into conformance with the current standards, is solely at the discretion of the District.

Irrigation and Drainage System Relocation Guidelines For Land Development and/or Street Improvements

3.4 Post-Design Phase

The post design phase of the relocation project covers the construction, testing and final acceptance of the relocated District facilities.

Prior to the commencement of any construction of District facilities the Developer must fund the estimated costs and expenses that will be incurred by the District during this phase of the relocation project. The Developer or the Developer's Contractor must also obtain a License to Construct from the District before beginning any work.

When a general schedule for the construction of the District facilities has been determined, the Developer should request the District to provide a scoping package for the post design phase of the relocation project. The scoping package will include an estimated scope of work and budget for items including construction observation, as-constructed survey, post-design engineering support and the completion of record drawings and mapping updates for the District's records.

The package will typically also include a License to construct for the project. The license must be signed by the Developer or the Developer's Contractor and returned to the District's office, along with the \$500 license fee, for approval signature by the District. A copy of the signed license must be available at the construction site at all times. A signed License to Construct will not be issued by the District until the post-design funding has been provided.

4. District Easements

The District's Engineer will determine appropriate dimensions and limits for the creation of these legal descriptions. These dimensions will be provided to the Developer for the preparation of the respective legal descriptions.

The Developer will submit the completed easement documents for the termination and/or definition, including the sealed legal descriptions, to both the District's Engineer and Attorney for review and approval. Once the documents have been approved, the District's Attorney will have them recorded.

Once the District accepts the relocated facilities as adequate, a defined easement can then be recorded, and the easement for the facilities that are being abandoned can be terminated.

An easement for a District pipeline may contain, or be used for among other things, driveways, limited parking, sidewalks, lawns or alleys. While the easement is typically centered along the pipeline, it may be offset to accommodate specific features of a particular project. District easements for open ditch facilities are typically exclusive; the inclusion of any other public or private facilities within these easements is solely at the District's discretion.

A District easement for a pipeline and appurtenant structures may be located either wholly or partially within a City, Town or County right-of-way based on the consenting approval of the jurisdictional municipal agency. District easements for an open ditch and an adjacent operations and maintenance road are typically located wholly outside of municipal rights-of-way and public utility easements.

5. Placement of Relocated District Facilities

5.1 Open Ditch Facilities

The District has no requirement that existing open ditch facilities be piped (tiled) as part of a relocation project. However, the governing municipality generally requires the piping of the

Irrigation and Drainage System Relocation Guidelines For Land Development and/or Street Improvements

District's facilities within the boundary of the development project as part of the development agreement.

In general, most of the District's existing lateral canals follow an approximate alignment along section or mid-section lines. Rarely do the existing facilities exactly parallel these boundary lines, and in many instances the alignment may meander from one side of the boundary line to the other.

The District's existing open ditch facilities include not only the prism of the ditch, but also the adjacent operations and maintenance (O&M) road(s). Even when the prism of the existing ditch is located wholly outside of the development area boundary, the District's Engineer must assess the impact of the development project on the District's ability to access, maintain and operate their facility and potential impacts to neighboring properties.

Should the Developer wish to accommodate an existing District ditch without relocation, the District may require that the property wall or other permanent features constructed for the development project be offset from the boundary line of the property to provide sufficient clearance for District facilities. The District's Engineer will determine the width required to accommodate the existing facilities and provide this information to the Developer.

Typical cross-sections for lined and unlined District ditches and O&M roads are shown on Figure 1. In general, the width requirement for these facilities is approximately 40 feet, but contributing factors such as vertical grades and accessibility can extend this requirement to 50 feet or more.

The construction of an unlined ditch as a relocation of a District facility is not allowed. Any existing unlined District ditch that will be relocated as part of a development project must be constructed as a concrete lined ditch or pipeline.

5.2 Piped Facilities

Typical requirements for placement of a District pipeline are illustrated on Figures 2 and 3.

As shown on Figure 2, the preferred location for a District pipeline is behind the proposed curb and gutter and beneath the sidewalk. This location will generally maximize the area that can be landscaped within the right-of-way while protecting the pipeline. Alignments placing a District pipeline within the paved section of a roadway are not preferred and are generally only considered along small residential streets. If a pipe must be located under the street, a minimum horizontal clearance of two feet is required from the lip of the gutter to the outside wall of the pipe. District pipelines may not be located beneath drainage channels or retention basins.

Minimum clearances from the outside wall of a District pipe to any permanent above-grade structure such as a building or wall are illustrated in Figure 3. A four-foot minimum clearance is required around all sides of a District delivery structure.

6. Utilities

The District facilities have senior prior rights over most municipal and public service utility lines within their service area. All proposed and existing utility lines must cross beneath the District facilities and the relocation of District facilities will often require that existing utility lines be lowered to resolve conflicts.

Irrigation and Drainage System Relocation Guidelines For Land Development and/or Street Improvements

Requests by the Developer to lower a District pipeline to avoid the relocation of an existing utility line, or to accommodate the installation of a new utility line, will be reviewed by the District on a case-by-case basis. Unless the crossing utility holds a more senior prior right, the determination regarding the lowering of a District pipeline is solely at the discretion of the District.

Restrictions for utility pipelines, conduits and/or ducts that cross, or run parallel to, a District pipeline are illustrated on Figure 4. All underground utilities paralleling a District pipeline must maintain a minimum two-foot horizontal clearance between the outside of the District pipe and the open excavation for the utility. All utilities crossing a District pipeline must pass beneath the pipe with a minimum vertical clearance of one foot. Sanitary sewer conflicts will be evaluated on a case-by-case basis.

Single service residential utility lines of 1" or less, street light electrical lines and traffic signal lines may over-cross a District pipeline with a 6" minimum clearance. All proposed over-crossings of a District pipeline by a utility line larger than 1" would be reviewed on a case-by-case basis. Prior written approval from the District must be obtained before any over-crossing utility is installed.

The Developer is solely responsible for the coordination and relocation of all conflicting utilities.

The District's Engineer will make all reasonable efforts to identify conflicting utilities on the District's construction plans. To aid in this task, the District requires that all known utilities crossing the District's proposed alignment be potholed to determine their actual location and elevation. However, the utilities identified on the plans may not represent all existing and/or proposed conflicting utilities within the project limits. Neither the District, nor the District's Engineer, guarantees the location and/or the elevation of utilities, and neither will be responsible for their relocation.

7. District Landscaping Restrictions

Restrictions concerning landscape plantings adjacent to a District pipeline are shown on Figure 5. A minimum clearance of four feet between the outside wall of the pipeline and a tree trunk is required. Mature tree canopies must not overhang a District pipeline. The spacing between trees along the alignment must provide at least 16 feet of clearance both longitudinally and transversely. Plant groupings are limited to a maximum length of 16 feet as measured along the pipeline alignment. Spacing requirements between plant groupings are identical to those for tree spacing.

Landscape plantings within a District easement containing a lateral canal or ditch are not permitted. Canopies of mature trees planted adjacent to a District easement containing a lateral canal or drainage ditch may not encroach into the easement.

Landscaping plans for the development project must be submitted to the District for review and approval.

8. Acceptance of Surface Drainage

The District may accept agricultural return flows at historically established points of inflow into their system. Under no circumstance will the District allow a proposed commercial, industrial or residential development to discharge storm water, surface water flows, or flood flows into District facilities.

Irrigation and Drainage System Relocation Guidelines For Land Development and/or Street Improvements

9. District Irrigation Wells

District irrigation well sites are typically located upon deeded property owned by the District. The site boundaries can generally be adjusted to meet the needs of the development provided the total area of the site remains the same.

There are a number of minimum requirements regarding the location of the well pad relative to the site enclosure and the accessibility to the site for District equipment. The Developer should discuss these requirements with the District's Engineer on a case-by-case basis.

The District requires that all of their well sites be fully enclosed, and all construction plans prepared by the District's Engineer will specify 6' chain link fence topped with 1' of barbed wire per MAG standards. However, the Developer may arrange for some other type of approved enclosure such as a decorative block wall. In this regard the Developer must provide detailed construction plans for the alternative enclosure to the District's Engineer for review and approval. All designs for alternative enclosures must include:

- A total minimum height of 7' including a feature designed to prohibit entrance by scaling the enclosure. A 6' high block wall topped with outwardly curved wrought iron bars is an example of an acceptable alternative.
- A feature providing visibility into the site from the main point of access and/or adjacent roadways such as one or more panels of wrought iron bars set within a block wall.

10. Gates for Irrigation Delivery Structures

For operational and maintenance continuity throughout their system, the District specifies the installation of mild steel gates fabricated by Fresno Valves and Castings, Inc. (Fresno) at their delivery structures. The dimensions of the individual gates are unique to each delivery structure and must be designed and fabricated accordingly.

The lead-time for procurement of these gates can be substantial (3 to 4 months) and the Developer should consider the impact this may have on construction scheduling and sequencing for the project.

To expedite the delivery of the gates the District's Engineer can initiate the shop drawing review process and purchase of the gates provided the Developer pre-funds the purchase of the gates to the District.

In this regard, the District's Engineer will provide the specific dimensions and specifications of the gates to Fresno for a cost quote. The Fresno quote will then be provided to the Developer for consideration. Once the District has received funds for the gates, the District's Engineer will accept the Fresno quote on behalf of the District and initiate Fresno's preparation of shop drawings. The completed gates will be shipped to the District's Buckeye maintenance yard where the Developer's Contractor can pick them up. Any additional costs incurred by the District during the manufacturing or shipping in excess of the original quoted cost will need to be reimbursed prior to the Contractor taking delivery of the gates.

Shop drawings for any gates purchased directly by the Developer or the Developer's Contactor must be reviewed and approved by the District's Engineer. The installation of unapproved gates is not acceptable and is at the Developer's sole risk. Any gates rejected by the District under this circumstance must be removed and replaced with approved gates at the discretion of the District.

**Irrigation and Drainage System Relocation Guidelines
For Land Development and/or Street Improvements**

11. Frames and Covers for Irrigation Manholes

The District maintains an inventory of manhole frames and covers as specified in their construction plans. The Developer's Contractor is encouraged to purchase these items directly from the District at their cost. The District Construction Observer and/or Engineer must approve the use of frames and covers not purchased directly from the District. Any frames or covers installed without District approval is at the Developer's own risk and may require removal and replacement at the District's discretion.

12. Maintenance of District Irrigation Service

Existing District facilities must remain operational, and may not be disturbed or rendered inaccessible to the District until the construction of the relocated District facilities have been completed, tested and accepted as adequate by the District.

The scheduling for an irrigation outage to complete a tie-in between new and existing facilities must be coordinated with the District Superintendent and the District Construction Observer. The District schedules an annual, district-wide "dry-up" for approximately two weeks during the month of November. The availability and duration of an unscheduled irrigation outage during any other time period will be determined solely at the discretion of the District.

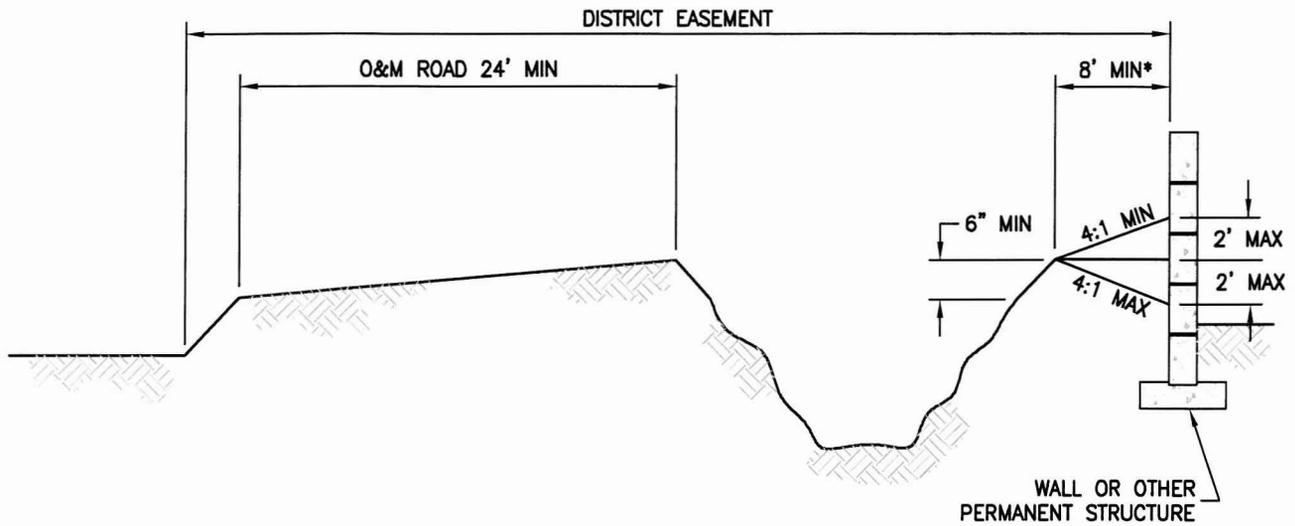
The Developer should be aware that the construction of new facilities along the same alignment as the existing facilities will likely increase the irrigation outage time required for construction.

Temporary irrigation by-pass facilities may be constructed to facilitate the demolition of the existing District facilities prior to the completion of the proposed permanent facilities. The District must grant prior approval for the use of a temporary irrigation by-pass. At the discretion of the District, sealed engineering plans for the by-pass facilities may be required. These plans must be submitted to the District for review and approval prior to construction. The abandonment and demolition of the existing District facilities replaced by the temporary by-pass may proceed only after the constructed temporary facilities have been field verified and accepted as adequate by the District.

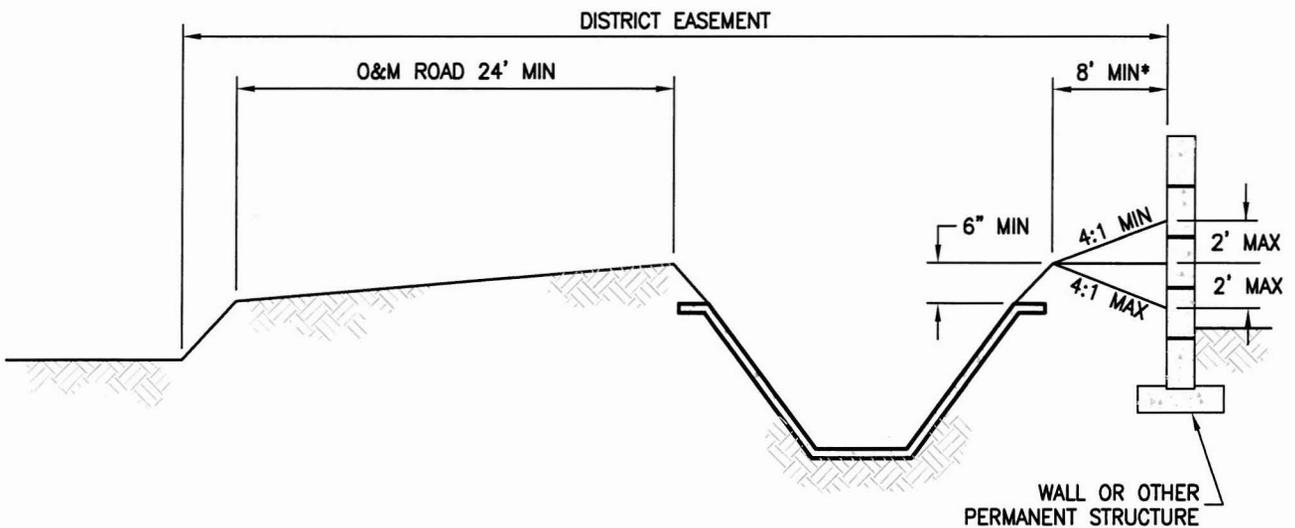
BUCKEYE WATER CONSERVATION AND DRAINAGE DISTRICT

Jackie Meck

General Manager



UNLINED DISTRICT DITCH
NTS



LINED DISTRICT DITCH
NTS

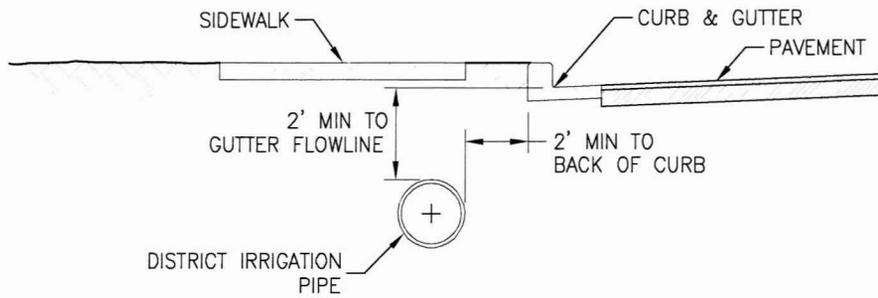
* THE FINAL DIMENSIONS OF THE OPERATIONS AND MAINTENANCE ROAD AND THE EMBANKMENT WILL BE DETERMINED BASED ON A REVIEW OF THE DISTRICT FACILITIES AND DEVELOPER'S GRADING. THE DIMENSIONS SHOWN ON THIS EXHIBIT ARE ONLY A MINIMUM.

V:\52820\resource\BWCDD Standard\Development Guidelines\cadd\Figure 1.dwg
2007-03-30 04:35PM By: hreid

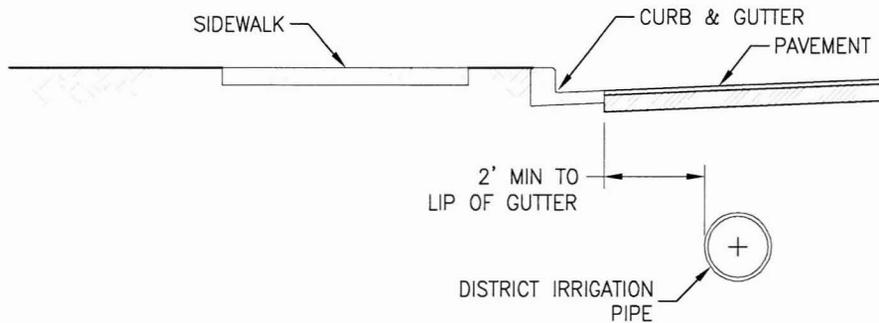


**BUCKEYE WATER CONSERVATION
AND DRAINAGE DISTRICT**
Irrigation and Drainage System Relocation
For Land Development and/or Street Improvements

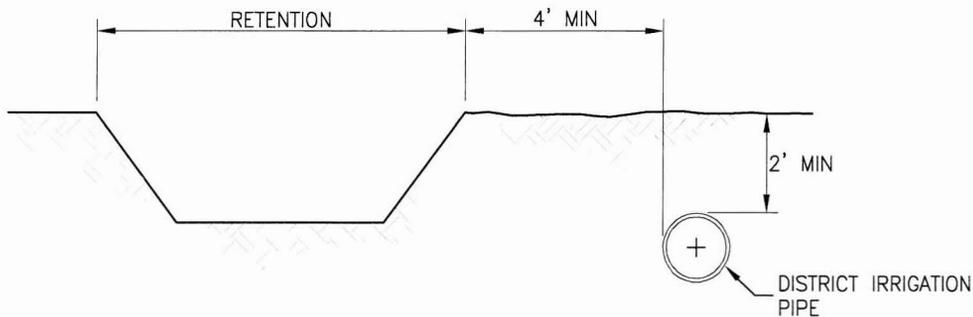
Figure 1



PREFERRED PIPELINE LOCATION
NTS



STREET ALTERNATIVE LOCATION
NTS



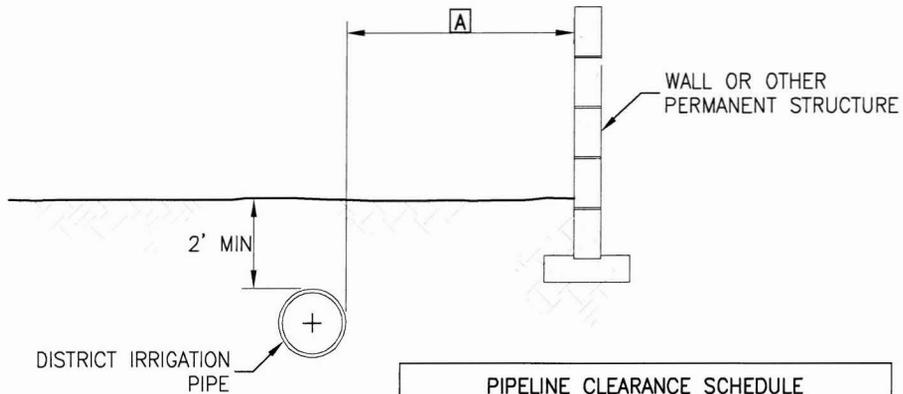
RETENTION CLEARANCE
NTS

V:\52820\resource\BWCDD_Standard\Development_Guidelines\codd\Figure 2.dwg
2007-03-30 04:39PM By: hreid



**BUCKEYE WATER CONSERVATION
AND DRAINAGE DISTRICT**
Irrigation and Drainage System Relocation
For Land Development and/or Street Improvements

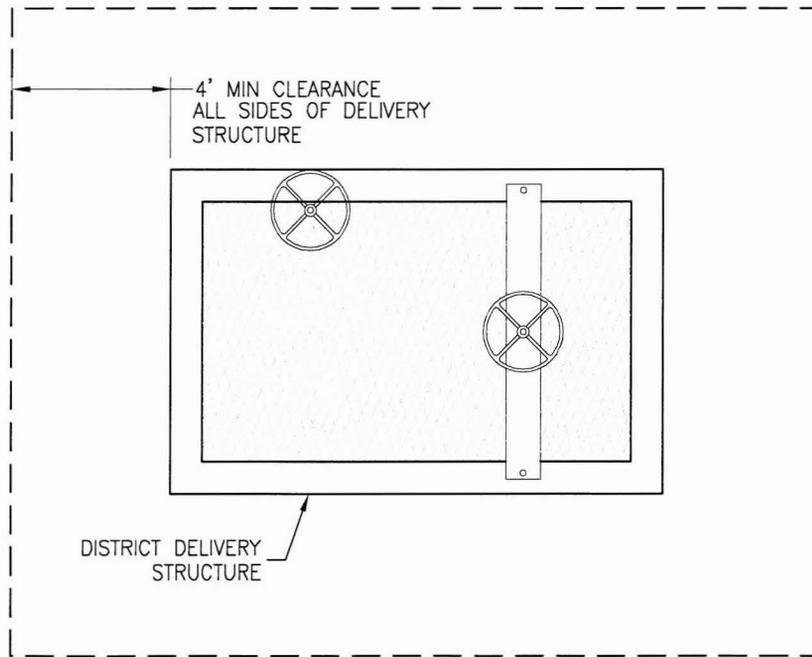
Figure 2



PIPELINE CLEARANCE SCHEDULE					
Pipe Diameter	24"	30"	36"	42"	>42"
A Minimum	7'	7'	8'	8'	*

*REQUIRES ENGINEERING REVIEW

PIPELINE CLEARANCE
NTS



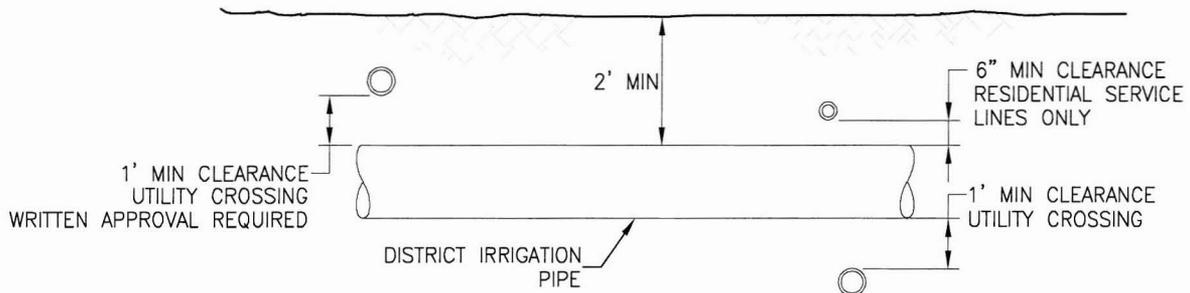
DELIVERY STRUCTURE CLEARANCE -- PLAN
NTS

V:\52820\resource\BWCDD_Standard\Development_Guidelines\cadd\Figure 3.dwg
2007-03-30 04:36PM By: hraid

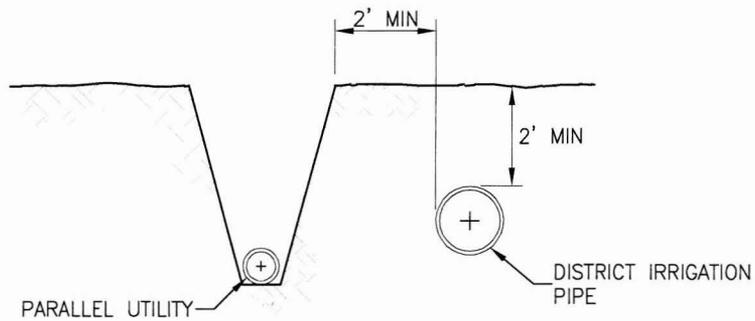


**BUCKEYE WATER CONSERVATION
AND DRAINAGE DISTRICT**
Irrigation and Drainage System Relocation
For Land Development and/or Street Improvements

Figure 3



UTILITY CROSSING – PROFILE
NTS



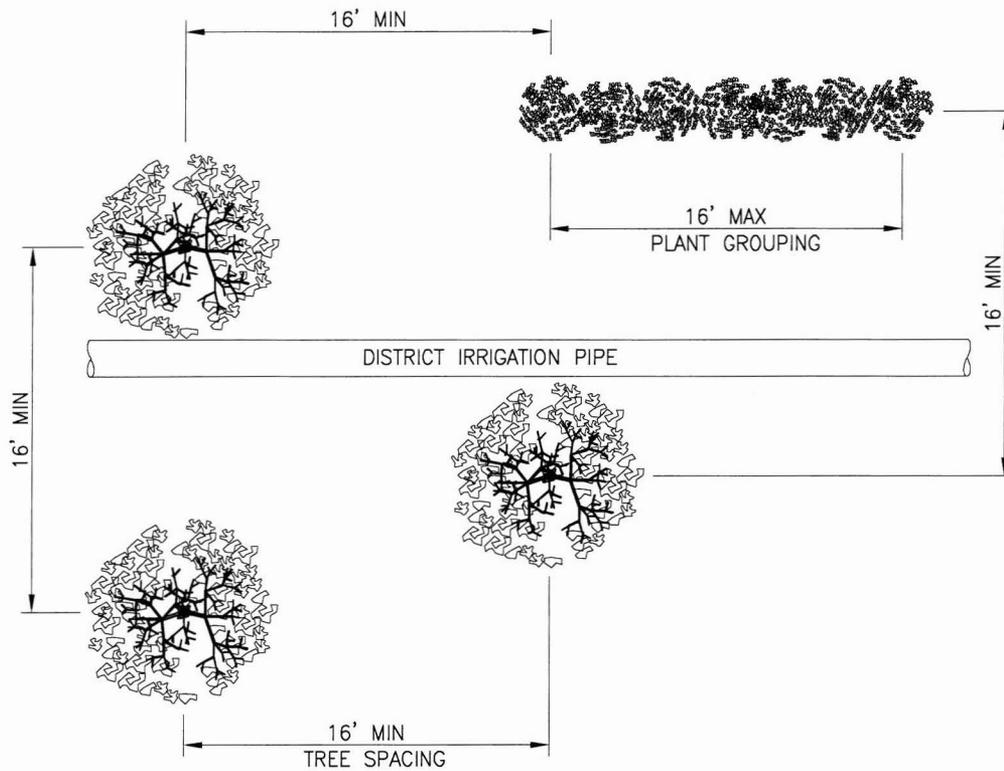
PARALLEL UTILITY – PROFILE
NTS

V:\52820\resource\BWCD\Standard\Development Guidelines\cadd\Figure 4.dwg
2007-03-30 04:36PM By: hreid

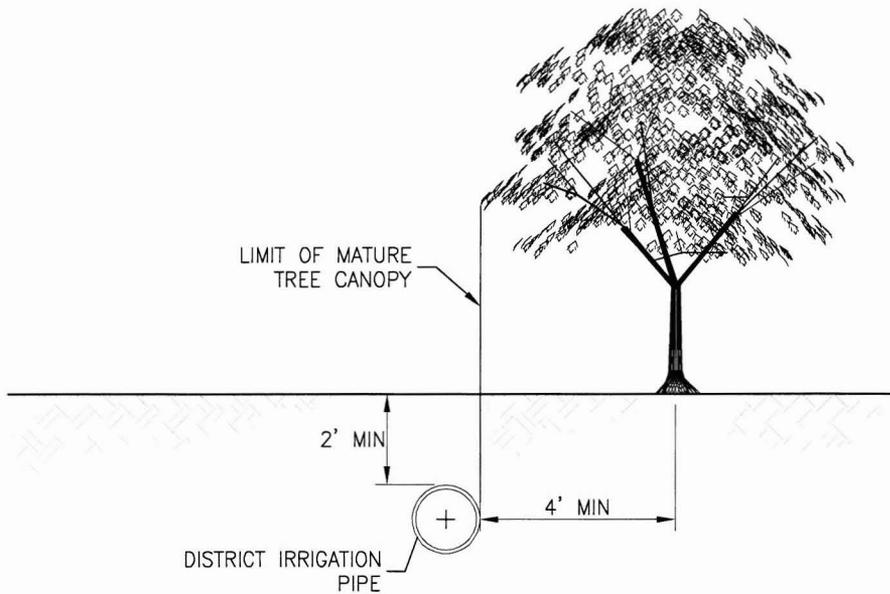


**BUCKEYE WATER CONSERVATION
AND DRAINAGE DISTRICT**
Irrigation and Drainage System Relocation
For Land Development and/or Street Improvements

Figure 4



PLANT AND TREE SPACING PLAN
NTS



TREE CLEARANCE - PROFILE
NTS

V:\52820\resource\BWCCD Standard\Development Guidelines\cadd\Figure 5.dwg
2007-03-30 04:00PM By: hreid



**BUCKEYE WATER CONSERVATION
AND DRAINAGE DISTRICT**
Irrigation and Drainage System Relocation
For Land Development and/or Street Improvements

Figure 5



Flood Control District

of Maricopa County

MEMORANDUM TO FILE

Date: February 26, 2009

To: to file, Loop 303 Outfall Reach A Pre-Design

From: Mike Duncan, Project Manager *MD*

Subject: Meeting with Keith Brown of City of Goodyear

I met with Keith Brown today to go over the pre-design plans/results. Here are some of the highlights.

I pointed out that the drainage opening at the bridge under the railroad is only about 2 or 3 ft. high, the culvert under MC85 is 3 ft high, and the culvert under the BID canal is 4 ft. So no trail connection would be easy at these locations. He concluded that then there is no attractiveness for Goodyear to partner for the part from the river to up to the railroad.

He thought the basin site might have potential but there is no parks budget to speak of for quite a while (and I pointed out that even the un-built Bullard Wash turfed and landscaped greenway would be ahead of this on a budget list).

Regarding the portion north of Broadway, within El Cidro, which the City has purchased, Goodyear's interest would be in the "value for the land" and what that could get them.

Regarding the existing "half-length" box culvert under Lower Buckeye Road, just east of Cotton Lane, the City's intent there would be to have it connected to the future FCD channel at a location near Lower Buckeye Rd. and just west of Cotton Ln. However, there is no "movement" on the platted property at the SE corner of Cotton/Lower Buckeye.

Keith's suggested philosophy, regarding the existing versus future hydrology, would be to build based on the future conditions (discharges and volumes), and any big storms in the interim time period, would cause some flooding, but probably not as severe as it would today without a drainage system in place.

Keith also noted that he heard that MAG and ADOT are, in the face of lesser or limited funding, considering the idea of building some freeway segments as smaller parkways at first, to realize better bang-for-the-buck. He noted that this segment of the Loop 303 could be a good match for the parkway-first situation.

I asked Keith to let me know of anything in the Pre-Design that he saw as a potential fatal flaw. I noted to Keith that his familiarity with this Pre-Design could help in the development process of the IGA between the District and Goodyear. At this time Keith is thinking that there could be some near-time items in the IGA, and also some provisions for future cooperation items.



Drainage Modifications

Drainage Modification Procedures

- If it is necessary to enter the railroad company's property to conduct a survey for the completion of required engineering plans and location information, the Permit To Be On Railroad Property for Utility Survey (PDF File) [13K PDF] form must be printed, executed and returned following the instructions given in the permit.
- The Application (PDF File) [8K PDF] and the appropriate Exhibit "A" document must be printed and completed in their entirety. Choose the appropriate Exhibit "A" to accompany your application from the following:
 - Exhibit "A" - Flammable (PDF File) [177K PDF]
 - Exhibit "A" - Non-Flammable (PDF File) [179K PDF]

Failure to complete Exhibit "A" merely delays the review process of the entire application. Please review the Sample Copy of Completed Exhibit "A" (PDF File) [42K GIF] which is provided to enable you to complete the form as accurately as possible.

- Engineering plans must be completed in accordance with the requirements stipulated in the Drainage and Waterway Encroachment Planning Guide & Construction Procedures and Drainage and Waterway Hydrology Study Guide. Failure to do so merely delays the review process. In addition, any application not conforming to railroad minimum standards will delay processing. If there is a valid reason why compliance with the railroad standards is not possible, these reasons must be clearly explained or the application will be rejected and returned to you for further explanation.
- If possible, please provide a City, County or topographical map of the area, showing the proposed installation.
- When using a street name on the application which has been changed, please include the current name as well as any previous name. Many of the old railroad company maps do not reflect these name changes.
- A non-refundable \$1,055 application fee must accompany your application. Applicant will reimburse the railroad company for all expenses incurred for review of drainage applications. All expenses will be due and payable when billed.
- Applications should be submitted to the appropriate individual within the Real Estate Department. Select the representative for your region from the map of Pipeline, Wireline, Right of Entry and Drainage Contacts, and address the application to:
[Name of Your Region Representative]
Union Pacific Railroad Company
1400 Douglas Street, Mail Stop 1690
Omaha, Nebraska 68179
- Generally, agreement processing time will be approximately 3 to 6 months. Please allow sufficient lead time for document handling prior to desired construction date. Before construction begins, agreements must be executed by the licensee and contractor, if applicable, and returned to this office. Verbal authorizations will not be permitted or granted. Generally, a minimum of 48 hours advance notice after execution of an agreement will be required prior to entry.
- License fees and insurance certificates, if required, must be submitted at the time you execute and return the agreement. Because license fees are based on property values, we will only be able to provide you with fee information after your application has been reviewed and approved.
- Depending on the scope of the work and proximity to our tracks we may require that Railroad

Protective Liability Insurance be obtained, in addition to general liability insurance. We have acquired a blanket Railroad Protective Liability Insurance policy which may allow inclusion of your project under our coverage for an additional charge. We've found that in many instances it may be cheaper for the contractor to do this than to obtain their own coverage. However, we do encourage you to shop around, as you may find a more favorable rate. An application form and additional information on Railroad Protective Liability Insurance can be found in this section.

- **Note: Only applications that are prepared on our standard application form identified as Exhibit "A." will be accepted**
- **Questions? Need Assistance? Check the map of Pipeline, Wireline, Right of Entry and Drainage Contacts for the names of those who can help**

APPLICATION

(Please allow 30-45 days for crossings and 90-120 days for encroachments)

1. Name of Licensee _____
(Exact Name of the Owner of the Utility)

State of Incorporation _____; if not incorporated, please list entity's legal status

2. Address, email, phone and Fax number of Licensee

Contact Name: _____

Address: _____

Email _____ Phone _____ Fax _____
3. Name, address and phone number of individual to whom agreement is to be mailed
if different than Item 2.

4. Contact information for individual to contact in the event of questions.

Email _____ Phone _____ Fax _____
5. Location of installation –

(City, County and State)

_____ Ft (N), (S), (E), or (W) of the (N), (S), (E), (W) or (center) line of
Section _____; Township _____ (N), (S); Range _____ (E), or (W)

* Texas applications, provide local Survey detail _____
6. Do you have an existing agreement at this location with Union Pacific that is affected
by this request.
() No () Yes, Union Pacific's Audit No. or Folder No. _____
7. Is this installation a crossing _____ or an encroachment _____ or both _____
8. Will this facility serve Union Pacific Railroad? _____ Yes _____ No

UNION PACIFIC RAILROAD
1400 DOUGLAS STREET MS 1690
OMAHA NE 68179



**PERMIT TO BE ON RAILROAD PROPERTY
FOR NONINTRUSIVE CIVIL ENGINEERING SURVEY WORK**

RECITALS:

1. The undersigned party seeking permission to be on Railroad property is hereinafter called "Permittee".
2. Due to the nature of Railroad operations, Railroad property can be a dangerous place for people and/or property. Railroad's safety rules and practices shall be strictly observed and followed at all times while on Railroad property.

WHEREAS, Permittee desires to obtain temporary permission to enter and be on or about the tracks and/or property of the UNION PACIFIC RAILROAD COMPANY (hereinafter called "Railroad"), for the purpose of performing nonintrusive civil engineering survey work, without the use of vehicles and/or machinery on Railroad's property; and

WHEREAS, the Railroad is willing to allow the Permittee temporary permission to be on or about its premises for the purpose aforesaid on the terms and conditions stated herein:

NOW THEREFORE, Railroad grants to Permittee temporary permission to be on or about the tracks and/or property of the Railroad for the purpose above stated, subject to the following conditions:

1. Before exercising any privilege under the permission herein given, Permittee shall contact the Railroad Superintendent's office having jurisdiction over the property involved.
2. Permittee shall become familiar with and strictly observe Railroad's safety rules and all other rules, regulations, or directions of Railroad's Superintendent or his representatives.
3. Permittee shall agree to the terms and conditions of this instrument, and shall so evidence by his execution of same.
4. The above recited permission is granted solely upon the condition that Permittee shall and hereby does agree to indemnify, protect and save harmless, Railroad from any and all loss or damage that Railroad may sustain or become liable for, caused by, resulting from, or by reason of any injury to or death of any persons whomsoever, or destruction of property of any kind to whomsoever belonging, howsoever suffered or caused, regardless of whether caused solely or contributed to in part by the negligence or fault of the Railroad, in or incident to or in connection with the aforesaid work on Railroad's property hereinabove referred to. Public Agencies shall indemnify Railroad as herein described to the extent allowed by law.
5. Upon completion of your work, but in no event later than the last day of the term of this agreement, Permittee will remove all of his tools, equipment, and other property of any kind whatsoever, and restore Railroad's property to substantially the same condition that existed prior to the performance of your work hereunder.
6. This permit may be revoked at any time by the Railroad, but if not revoked shall expire at the end of the last date written below. PLEASE complete the following information and execute in the space marked "By". You should then FAX a copy to 402-233-3496 for execution on behalf of the Railroad Company, after which one copy will be returned to you by fax. You must KEEP your fully-executed copy in your possession at all times while on Railroad property. It MUST be shown on request to any Railroad employee or official.

(Company Name)

(Street Address)

(City, State, Zip)

(Telephone) (Return Fax Number)

(E-mail Address)

By: _____ / _____
(Print Name) (Signature)

Title: _____

Date of Survey: _____ / _____
(30 Day Max)

Location of Survey: _____
(City, State)

UNION PACIFIC RAILROAD COMPANY

BY: _____
Director - Contracts

Real Estate
Union Pacific Railroad Company
STOP 1690
1400 Douglas Street
Omaha NE 68179-1690
Alternate fax: (402) 501-0340

Please include map of location (ex:- google, mapsco)



Drainage Modifications

Drainage and Waterway Hydrology Study Guide

Instructions for Preparing Hydrology Study

Applicant must prepare a hydrology study for the drainage and waterway facilities as follows:

- Prepare a drawing showing the area involved. This drawing should include the top of rail elevation, the top of subgrade elevation, the bottom of ditch elevation, the invert elevation of the drainage structure and show the track, subgrade, ditch and any other important information (fences, pipelines, other culverts, etc.).
- Prepare a drawing showing a cross section at the point the water enters the railroad right of way.
- Advise the drainage area, the amount of water, the flow rate, the type of protection provided at the outlet end, where the water will flow, the nearest structure to remove the runoff from the right of way and the capacity of the existing structure.
- Advise the existing and proposed 50- and 100-year water surface elevations at both the point the water enters the right of way and at the existing structure that removes the water from the right of way.

Criteria for Drainage Improvements

The Railroad's hydrology/hydraulic criteria for drainage improvements are as follows:

- Ensure that the water does not contact bridge structures in the 50-year event.
- Ensure that water does not pond over the top of culverts or structures in the 50-year event.
- Ensure that water does not overtop the railroad's subgrade, which is 2' 3" below the base of rail, or damage upstream property in the 100-year event.
- Ensure that any new installations on railroad property comply with local, state, and federal design requirements.



Drainage Modifications

Drainage and Waterway Encroachment Planning Guide & Construction Procedures

Preparation of Construction Drawings for Engineering Review Process

The following information may be used to aid in the preparation of construction drawings for engineering review process by the railroad company and may expedite the approval of the drawings by the railroad for consideration of a drainage facilities on the right of way.

- The drainage ditch must be located at the outer limits of the railroad company right of way within 5 feet of property line and a minimum of 35 feet from centerline of nearest track with a flat bottom drainage ditch for future maintenance.
- The drainage structure plans must be approved and stamped by a registered engineer for the state the structure is to be located in.
- The following must be shown on the drawings: bridges, culverts, signal, signal houses, and other signal facilities, street, and road crossings, overpasses and bridge piers in relation to track and drainage facilities, pole line, railroad mile post, streets and name of streets, river, fences, underground facilities, railroad right of way, all necessary dimensions measured at right angles to the main track, and any other information which could be helpful.
- All excavations and back filling must be done using workmanship acceptable to the railroad. All back filling must be placed in a maximum of 6-inch layers and compacted to 95% of maximum standard density as determined by ASTM T-99 or ASTM D698. All areas disturbed in any manner must be reseeded in a manner to prevent erosion using a grass seed mixture native to the area.
- Drainage ditches cannot be installed in the slope of cut or fill sections of the roadbed nor can the slope of cut or fill sections of the roadbed be benched, unless permission has been obtained from the vice president of engineering services office in writing to do otherwise. Drainage ditches found in the slope section of the roadbed without permission to be installed there will have to be removed and the slope restored to Union Pacific's satisfaction at the complete cost of the applicant. In addition, the owner will be liable for all damage cost to train operations and roadbed restoration costs due to a slip or slide caused by improper installation of the drainage ditch or structure being installed in the slope without the permission from the railroad company.
- Any proposed pipeline crossings may use the Standard Pipeline Crossings Applications (see information on Pipeline Installation). Each crossing location must be filled out separately, Track bores must be a minimum of 60 inches below base of rail. Wet bores are not permitted on Union Pacific Railroad property. The ends of steel casings (see Union Pacific Common Standard 1029) will have to be a minimum of 30 feet from centerline of the track when measured at right angle to the track. Also bore pits must be a minimum of 30 feet from the centerline of the track when measured at right angle to the track. Also bore pits must be a minimum of 30 feet from centerline of track when measured at right angles to the track. In addition, no bore pits can be located in the slope of a cut or fill section of the road bed. The bore pit size must be kept to a minimum.
- Manholes must be capable of withstanding H-20 highway loading requirements and must be installed so as not to create a stumbling hazard.
- Construction drawings submitted to the railroad must contain the following information in addition to Nos. 2 and 3 above:
 - General notes along with the symbols and their meanings.
 - A sheet showing all the special details.

- Small scale maps showing overall drainage routes.
- Sheet showing all details for installation at track. Include all shoring plans (sealed by registered professional engineer in the respective state).
- As built drawings shall be provided on standard railroad right of way maps to standards specified by railroad.
- Before work can begin on railroad rights of way, the agreement between Union Pacific and the owner must be fully executed. An agreement between the railroad and the contractor must also be fully executed, and employees of the applicant and its contractor personnel that will be on and about railroad property must have a copy of the Minimum Safety Requirements for Contractors Exhibit B and be safety-trained by a Union Pacific Project Inspector.

Construction Procedures

- The drainage facilities must be located behind (field side) all signal facilities because of the numerous underground signal cable running between track and the signal facility. Signal department personnel will remove and replace all guy wires on railroad poles lines.
- Trees or brush must be chipped to _ inch size and can be blown onto railroad rights of way or removed from site; however, care must be taken not to obstruct ditches, streams tracks, railroad structures, or private property. Trees or brush which cannot be chipped to _ inch size must be removed from the right of way.
- Please keep in mind it normal takes three weeks to obtain flagman for a project; therefore, work schedules will have to be planned accordingly.
- Adequate barrier protection is required for all excavation on railroad right of way to protect individuals from falling into holes.
- Grading is required on the railroad right of way on all areas disturbed by construction to prevent ponding or storm water.
- Erosion protection must be established on all areas disturbed by construction using perennial grasses native to areas.
- All drainage projects approved by the railroad company may require a railroad flagman for work within 25 feet of the track and on the railroad right of way at applicant's expense.
- All costs incurred for any and all parts of review, approval, and construction will be at applicant's expense.



Railroad Protective Liability Insurance

Railroad Protective Liability Insurance – For Projects Under \$10,000,000 and do not exceed 12 months

Overview

When working within Union Pacific Railroad's right of way, your company will be required to obtain Railroad Protective Liability Insurance for the project.

For RPLI application requests, you may be asked by your insurance carrier to provide train movement information. Due to the circumstances of September 11, 2001, for security and safety reasons, Union Pacific Railroad employees no longer supply train information to parties outside the Railroad. The major insurance companies are aware of this situation.

Obtaining this insurance for smaller projects can be a time-consuming and costly purchase for the contractor. With the Railroad Protective Liability Program made available by Union Pacific through a national broker, your company may save both time and money. In as little time as it takes to complete a single-page application and send a check, the Railroad Protective Liability coverage is in place. We consider this program a time saver in obtaining Railroad Protective Liability insurance.

***PLEASE READ** – there have been some modifications/enhancements to this site and the Railroad Protective Liability Application.

- If you are utilizing an old application, please begin to use the most updated version to ensure your request is fulfilled accurately and promptly.
- The Railroad Protective Liability Program does NOT cover new bridge construction, structural repair to bridges, widening of bridges and bridge demolition. Coverage for bridge construction must be obtained from your insurance agent/broker.

Current Rate Schedule

Section A

Installation of overhead wire and underground wire or pipe.

TRAVERSE INSTALLATIONS

Overhead	Underground	Open Cut
\$1,600	\$1,800	\$1,480

Section B

LONGITUDINAL (PARALLEL) INSTALLATIONS

Length (in feet)	Overhead	Underground
0 – 250	\$1,600	\$1,800
251 – 500	\$1,700	\$1,900
501 – 1,000	\$1,800	\$2,050

1,001 - 2,000	\$2,000	\$2,250
2,001 - 4,000	\$2,475	\$2,725
4,001 - 6,000	\$2,700	\$3,000
6,001 - 8,000	\$2,900	\$3,150
8,001 - 10,000	\$3,050	\$3,350
Over 10,000 must be submitted for rating and approval.		

Section C

Construction not including wire and pipe installation:

Construction includes: building and demolition, building repair, cutting grass/landscape, grass cutting, landscaping, maintenance work, parking lot construction, private grade crossings (installation and maintenance), rock scaling, seed planting, sidetrack construction, sign board construction, signal repair, spraying, spur construction, station repair, survey work, test borings, weed control. BRIDGES - DOES COVER bridge inspection, bridge maintenance, bridge painting and bridge surface repair. BRIDGES - DOES NOT cover new bridge construction, structural repair to bridges, widening of bridges and/or bridge demolition

Full contract value shall not exceed \$10,000,000.

CONTRACT VALUE WITHIN 50' OF UP PROPERTY	PREMIUM
\$0 - \$25,000	\$750
\$25,001 - \$250,000	\$2000
\$250,001 - \$1,250,000	\$3,400
\$1,250,001 - \$2,500,000	\$5,100
\$2,500,001 - \$3,500,000	\$10,000
\$3,500,001 - \$5,000,000	\$17,400
\$5,000,001 - \$6,000,000	\$20,300
\$6,000,001 - \$7,000,000	\$23,700
\$7,000,001 - \$8,000,000	\$27,040
\$8,000,001 - \$9,000,000	\$30,400
\$9,000,001 - \$10,000,000	\$33,800

If you elect to take advantage of the program, please do not send your application for this insurance coverage to the Union Pacific Railroad. Please make your premium check payable to Marsh, USA and send with your application via US Mail (do not send via Express Mail to P.O. BOX) to:

Marsh, USA
 NW8622
 P.O. Box 1450
 Minneapolis, MN 55485-8622

Contact Marsh, USA with any coverage or premium questions:

Please take our Customer Satisfaction Survey

Phone: (800) 729-7001

Fax: (816) 556-4362

**Attn: Bill Smith
Cindy Long**

e-mail address: william.j.smith@marsh.com

e-mail address: cindy.long@marsh.com

Appendix C

Utility & Potholing Information

Project Number	2005C014	Project Manager	Mike Duncan
Date	12/1/2008		Flood Control District of Maricopa
Description	LOOP 303 Drainage improvements		County, Phoenix, Arizona
Candidate Assessment Report Phase II			
Consultant	Project Engineering Consultants, Ltd		

Serial No.	Sheet	Station	Size and Type	Description	Northing	Easting	Elevation
1	5	77+31	20" Southern Pacific Pipe Line	Pothole	874498.48	539142.78	
1A	5	78+70	LEVEL 3 Fiber Optic	Pothole	874635.37	539117.96	
2	5	77+22	12" Southern Pacific Pipe Line	Pothole	874490.94	539146.66	
2A	5	77+21	LEVEL 3 Fiber Optic	Pothole	874489.37	539147.42	
3	5	77+09	MCI Fiber Optic	Pothole	874478.34	539151.9	
3A	5	76+91	Qwest	Pothole	874461.24	539156.04	
4	4	55+57	4" Steel Gas	Pothole	873433.45	540686.8	
5	3	45+19	Paloverde 96" Cooling line	Pothole	872872.27	541545.41	
6	5	75+31	Monitor Wells	Remove and Relocate the Monitor Wells			
7	5	74+10	Monitor Wells	Remove and Relocate the Monitor Wells			
8	5	76+68	Electric or Telephone Manhole	Remove and Relocate the Telephone MH			
9	5	77+50	Powerpoles	Remove and Relocate the Power Poles			
10	5	76+48	Powerpoles	Remove and Relocate the Power Poles			
11	5	76+33	Powerpoles	Remove and Relocate the Power Poles			
12	5	73+99	Powerpoles	Remove and Relocate the Power Poles			
13	5	71+67	Powerpoles	Remove and Relocate the Power Poles			
14	4	67+27	Powerpoles	Remove and Relocate the Power Poles			
15	4	63+13	Powerpoles	Remove and Relocate the Power Poles			
16	4	59+04	Powerpoles	Remove and Relocate the Power Poles			
17	4	57+94	Powerpoles	Remove and Relocate the Power Poles			
18	4	57+41	Powerpoles	Remove and Relocate the Power Poles			

CONTROL POINTS							
20	Citrus Road & Broadway Road		NW Cor Sec 26, T1N, R2W	Brass Cap in Pothole	875874.38	539035.01	903.92
21	175th Ave & Broadway Rd		N 1/4 Cor Sec 26, T1N, R2W	Brass Cap in Handhole	875857.55	541684.71	909.31
22	Colton Ln & (Broadway Rd)		NE Cor Sec 26, T1N, R2W	Brass Cap in Handhole	875840.85	544332.46	914.35
23			E 1/4 Cor Sec 26, T1N, R2W	Brass Cap in Handhole	873199.01	544314.17	906.85
24			SE Cor Sec 26, T1N, R2W	Brass Cap in Hole	870557.45	544295.99	892.18
25			S 1/4 Cor Sec 26, T1N, R2W	Brass Cap in Concrete	870569.39	541656.93	890.05
26			SW Cor Sec 26, T1N, R2W	Brass Cap in Handhole	870540.44	539009.39	895.93

Additional Comments: The pothole work for the Southern Pacific Pipe Line must be performed by hand excavation every 50 feet and in the presence of a pipeline representative by contacting Kinder Morgan Area Manager, Mr. Scott Manley at (480) 797-4673, with at least two weeks notice. Mr. Manley will arrange for a pipeline representative to be present during work near the pipelines. Please see Kinder Morgan.PDF for additional information.

Appendix D

Pre-Design Cost Estimate

RECOMMENDED ALTERNATIVE

Loop 303 Outfall Channel Reach A Pre-Design - Opinion Of Probable Cost

ITEM DESCRIPTION	UNIT	UNIT COST	QUANTITY	EXTENDED COST
			Rec. Alt. Total =	\$ 4,338,875.00
Alternative 13 - Dual System				
Channel Excavation	C.Y.	\$ 4.00	153404	\$ 613,616.00
Channel Fill	C.Y.	\$ 5.00	1987	\$ 9,935.00
Channel Lining (Conc. & Steel)	C.Y.	\$ 450.00	350	\$ 157,500.00
Channel ROW	ACRES	\$ 100,000.00	29	\$ 2,880,000.00
Basin Excavation	C.Y.	\$ -	N/A	
Basin ROW	ACRES	\$ -	N/A	
Landscaping & Aesthetics - RR Basin (Enhanced Desert)	ACRES	\$ 61,855.20	N/A	
Landscaping & Aesthetics - Channel (Enhanced Desert)	ACRES	\$ 76,230.00	N/A	
Landscaping & Aesthetics - Channel (Riparian)	ACRES	\$ 91,476.00		\$ -
128' 6-bbl 6x4	CY (Conc.)	\$ 450.00	450	\$ 202,500.00
Apron Inlet Drop structure	CY (Conc.)	\$ 450.00	60	\$ 27,000.00
Pipeline Cap	CY (Conc.)	\$ 451.00	34	\$ 15,334.00
72" RCP w/Hdwl & Apron	LF	\$ 360.00	55	\$ 19,800.00
24" RCP w/Hdwl & Apron	LF	\$ 120.00	132	\$ 15,840.00
113' 6-bbl 10x3	CY (Conc.)	\$ 450.00	635	\$ 285,750.00
90' 3-Span Pre-Cast RR Bridge	SF	\$ 62.00	1800	\$ 111,600.00
	CY (Conc.)	\$ 456.00		\$ -
Pipe 42"	LF	\$ 210.00		\$ -
Pipe 84"	LF	\$ 420.00		\$ -
Pipe 90"	LF	\$ 450.00		\$ -
2-Bbl 6X5 RCBC	LF	\$ 660.00		\$ -
3-Bbl 6X5 RCBC	LF	\$ 942.50		\$ -
4-Bbl 8X5 RCBC	LF	\$ 1,536.00		\$ -
Riprap	CY	\$ -	1111	\$ -

Note: 1) This cost estimate does not include some items such as minor utility relocation, engineering design, or maintenance.

Appendix E

Plans, Profiles and Details



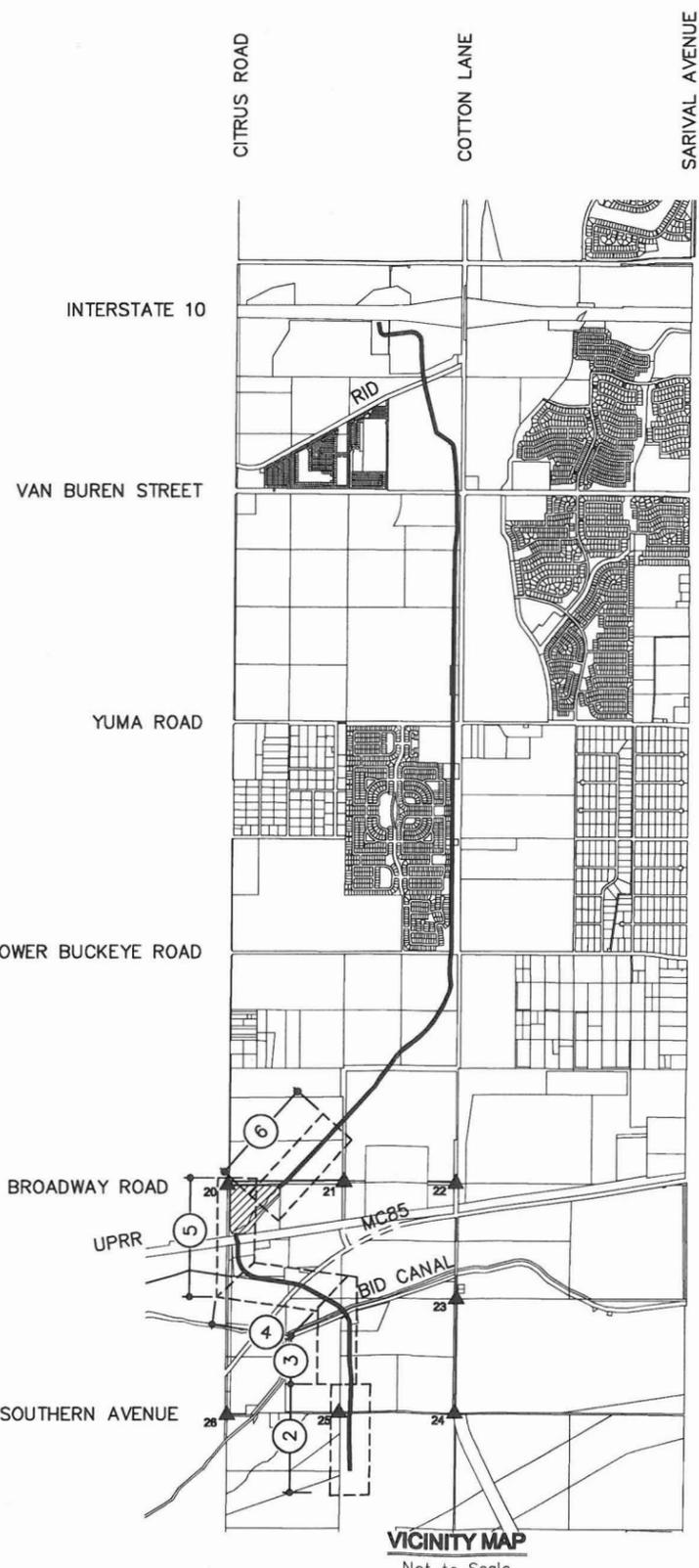
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LOOP 303 OUTFALL CHANNEL
REACH A PREDESIGN (DRAFT)
FCDMC PROJECT NO. 2007C035
ASSIGNMENT NO. 1

CONTROL POINTS

NUMBER	LOCATION	SECTION DATA	DESCRIPTION	NORTHING	EASTING	ELEVATION
20	Citrus Road & Broadway Road	NW Cor Sec 26, T1N, R2W	Brass Cap In Pothole	876874.36	836036.01	903.92
21	178th Ave & Broadway Rd	N 1/4 Cor Sec 26, T1N, R2W	Brass Cap In Handhole	876957.85	841894.71	909.31
22	Cotton Ln & (Broadway Rd)	NE Cor Sec 26, T1N, R2W	Brass Cap In Handhole	876940.85	844332.46	914.35
23		E 1/4 Cor Sec 26, T1N, R2W	Brass Cap In Handhole	873199.01	844314.17	908.85
24		SE Cor Sec 26, T1N, R2W	Brass Cap In Hole	870667.45	844296.99	892.18
25		S 1/4 Cor Sec 26, T1N, R2W	Brass Cap In Concrete	870699.39	841866.93	890.06
26		8W Cor Sec 26, T1N, R2W	Brass Cap In Handhole	870640.44	836009.39	895.93

▲ - CONTROL POINT

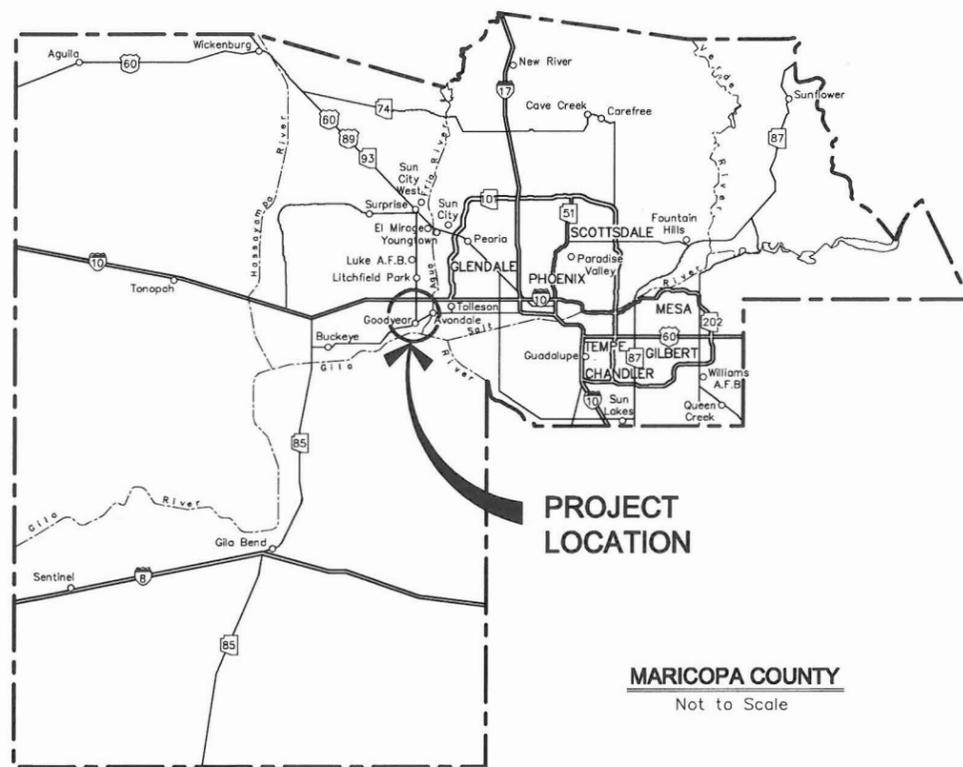


PRE-DESIGN PLANS

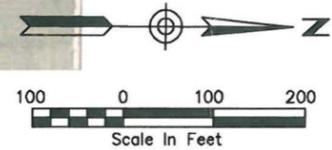
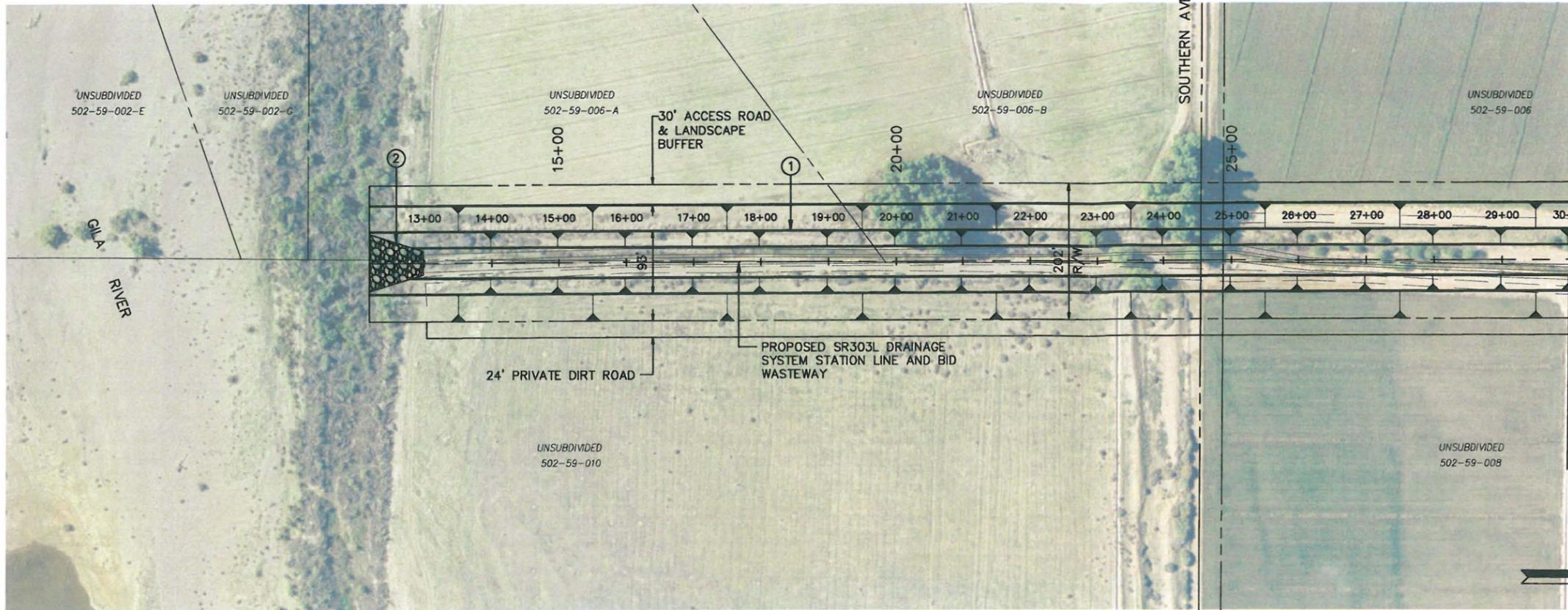
DATUM

VERTICAL DATUM IS BASED ON NAVD 88.
HORIZONTAL DATUM IS BASED ON NAD 83 (1992).
MAPPING PROJECTION IS BASED ON THE ARIZONA STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE.

PROJECT ENGINEERING CONSULTANTS, LTD.
2310 W. MISSION LANE, STE. 4 PHOENIX, AZ 85021
PHONE (602) 906-1901



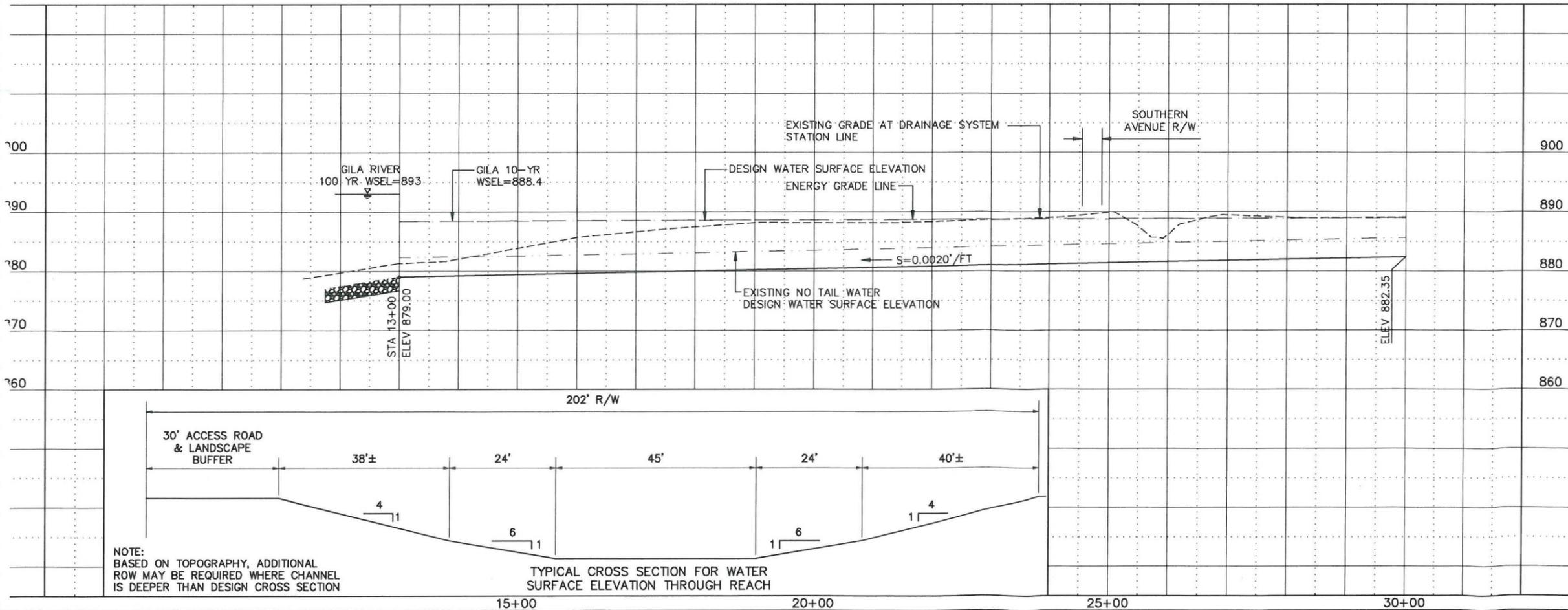
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	
ISSUE RECOMMENDED BY: _____	
PROJECT MANAGER _____	DATE _____
ISSUED FOR PUBLIC BIDDING BY: _____	
CHIEF ENGINEER & GENERAL MANAGER _____	DATE _____
BOARD OF DIRECTORS OF THE FLOOD CONTROL DISTRICT	
MAX WILSON - CHAIRMAN	
DISTRICT 1	FULTON BROCK
DISTRICT 2	DON STAPLEY
DISTRICT 3	ANDY KUNASEK
DISTRICT 4	MAX WILSON
DISTRICT 5	MARY ROSE WILCOX



REMOVE

CONSTRUCT

- ① STA 13+00 TO STA 30+00.00
CONSTRUCT 1700 LIN. FT. CHANNEL
- ② RIP RAP OUTFALL



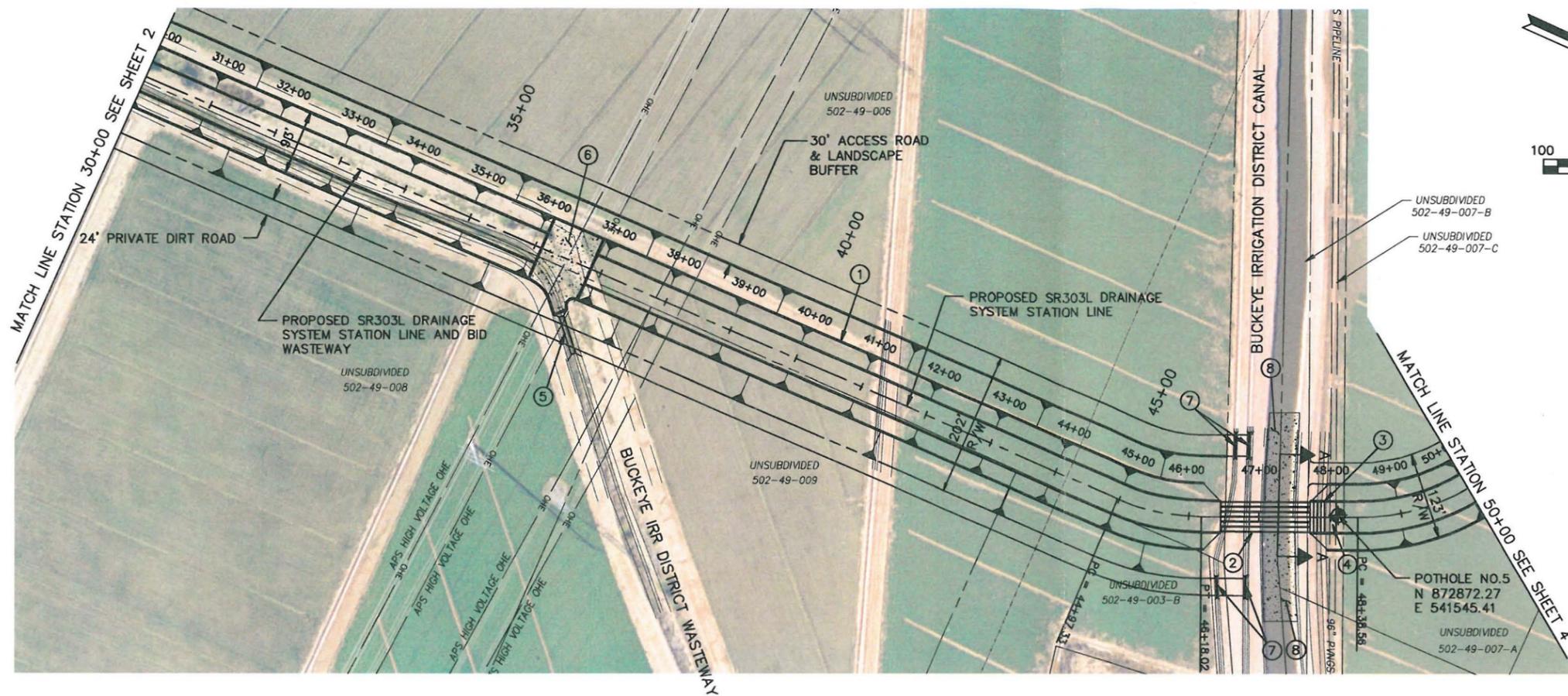
NOTE:
BASED ON TOPOGRAPHY, ADDITIONAL
ROW MAY BE REQUIRED WHERE CHANNEL
IS DEEPER THAN DESIGN CROSS SECTION

TYPICAL CROSS SECTION FOR WATER
SURFACE ELEVATION THROUGH REACH

GENERAL NOTES:

1. UTILITY LOCATIONS ARE BASED ON AS-BUILT AND POT HOLE INFORMATION.
2. FOR LANDSCAPE AESTHETIC TREATMENTS FOR THE IDENTIFIED CROSS SECTIONS AND BASINS SEE THE LANDSCAPE AESTHETICS AND MULTI-USE DESIGN GUIDELINES IN THE LOOP 303 DRAINAGE IMPROVEMENTS CANDIDATE ASSESSMENT REPORT - PHASE 2
3. PRELIMINARY NOT FOR CONSTRUCTION. PRE-DESIGN PLANS, THESE PLANS WERE DEVELOPED TO DETERMINE POTENTIAL UTILITY CONFLICTS, ALIGNMENT AND RIGHT OF WAY REQUIREMENTS FOR THE LOOP 303 DRAINAGE SYSTEM FROM I-10 TO THE GILA RIVER.

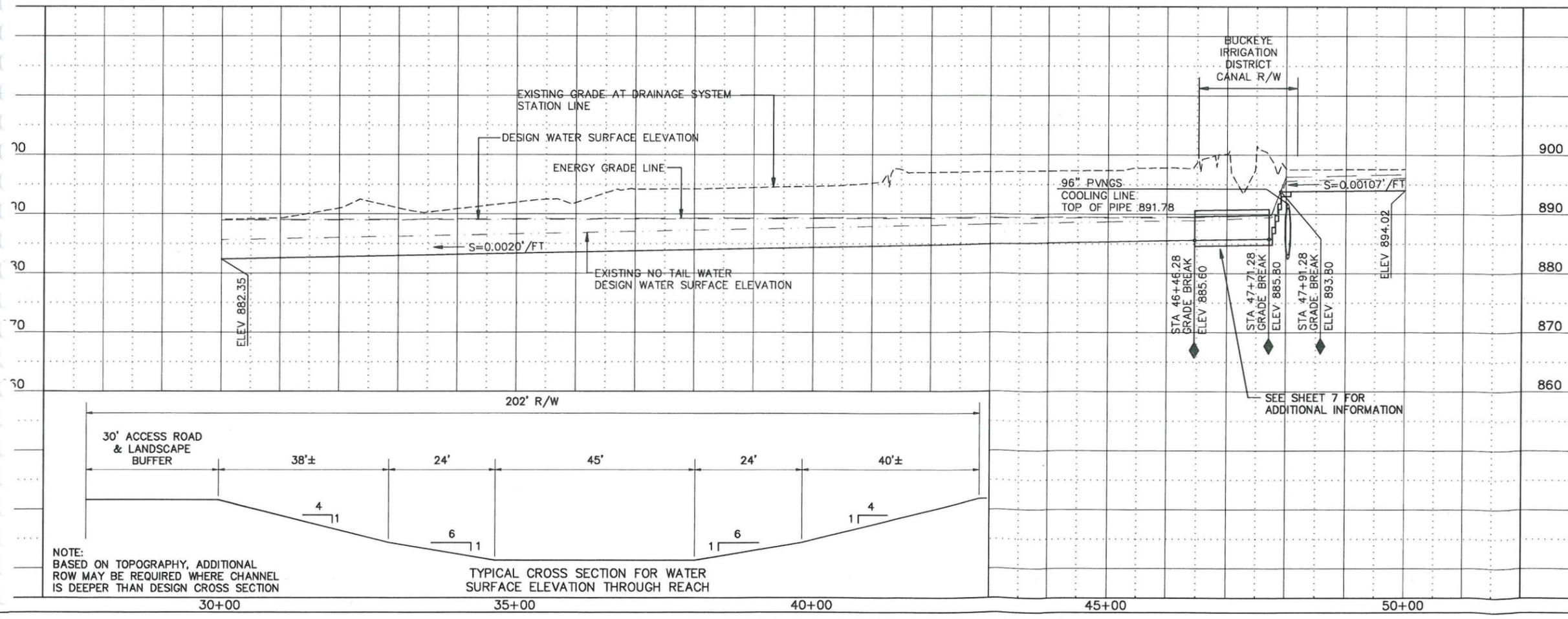
3			
2			
1			
NO.	REVISION	BY	DATE
<p>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</p> <p>LOOP 303 OUTFALL CHANNEL REACH A PREDESIGN (DRAFT) FCDMC PROJECT NO. 2007C035 ASSIGNMENT NO. 1</p>			
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	MDH	02/09
	DRAWN	JG	02/09
	CHECKED	YX	02/09
<p>PROJECT ENGINEERING CONSULTANTS, LTD. 2310 W. MISSION LANE, STE. 4 PHOENIX, AZ 85021 PHONE (602) 906-1901</p>			
DRAWING NO.	PLAN AND PROFILE		SHEET OF
	STA 13+00 TO STA 30+00		2 8



REMOVE

CONSTRUCT

- ① STA 30+00.00 TO STA 46+43.78
STA 47+71.17 TO STA 50+00.00
CONSTRUCT 1872.61 LIN. FT. CHANNEL
- ② CONSTRUCT 128 LIN. FT. 6 BARREL 6' x 4' RCBC WITH HEADWALLS AND APRONS
- ③ CONSTRUCT APRON INLET DROP STRUCTURE
- ④ CONSTRUCT CONCRETE 10 LIN. FT PIPELINE CAP
- ⑤ 55' OF 72" CMP WITH HEADWALLS AND APRONS
- ⑥ 7794 SF CONCRETE LINING IN CHANNEL
- ⑦ 132' OF 24" CMP WITH HEADWALLS AND APRONS
- ⑧ 11072 SF CONCRETE LINING IN BID CANAL



- GENERAL NOTES:**
- UTILITY LOCATIONS ARE BASED ON AS-BUILT AND POT HOLE INFORMATION.
 - FOR LANDSCAPE AESTHETIC TREATMENTS FOR THE IDENTIFIED CROSS SECTIONS AND BASINS SEE THE LANDSCAPE AESTHETICS AND MULTI-USE DESIGN GUIDELINES IN THE LOOP 303 DRAINAGE IMPROVEMENTS CANDIDATE ASSESSMENT REPORT - PHASE 2
 - PRELIMINARY NOT FOR CONSTRUCTION. PRE-DESIGN PLANS, THESE PLANS WERE DEVELOPED TO DETERMINE POTENTIAL UTILITY CONFLICTS, ALIGNMENT AND RIGHT OF WAY REQUIREMENTS FOR THE LOOP 303 DRAINAGE SYSTEM FROM I-10 TO THE GILA RIVER.

NO.	REVISION	BY	DATE
3			
2			
1			

FLORIAN CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

LOOP 303 OUTFALL CHANNEL REACH A PREDESIGN (DRAFT)
FCDMC PROJECT NO. 2007C035
ASSIGNMENT NO. 1

PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	MDH	02/09
	DRAWN	JG	02/09
	CHECKED	YX	02/09

PROJECT ENGINEERING CONSULTANTS, LTD.
2310 W. MISSION LANE, STE. 4 PHOENIX, AZ 85021
PHONE (602) 908-1901

DRAWING NO.	PLAN AND PROFILE	SHEET OF
	STA 30+00 TO STA 50+00	3 8

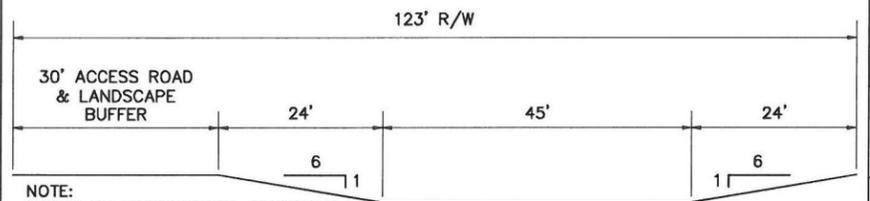
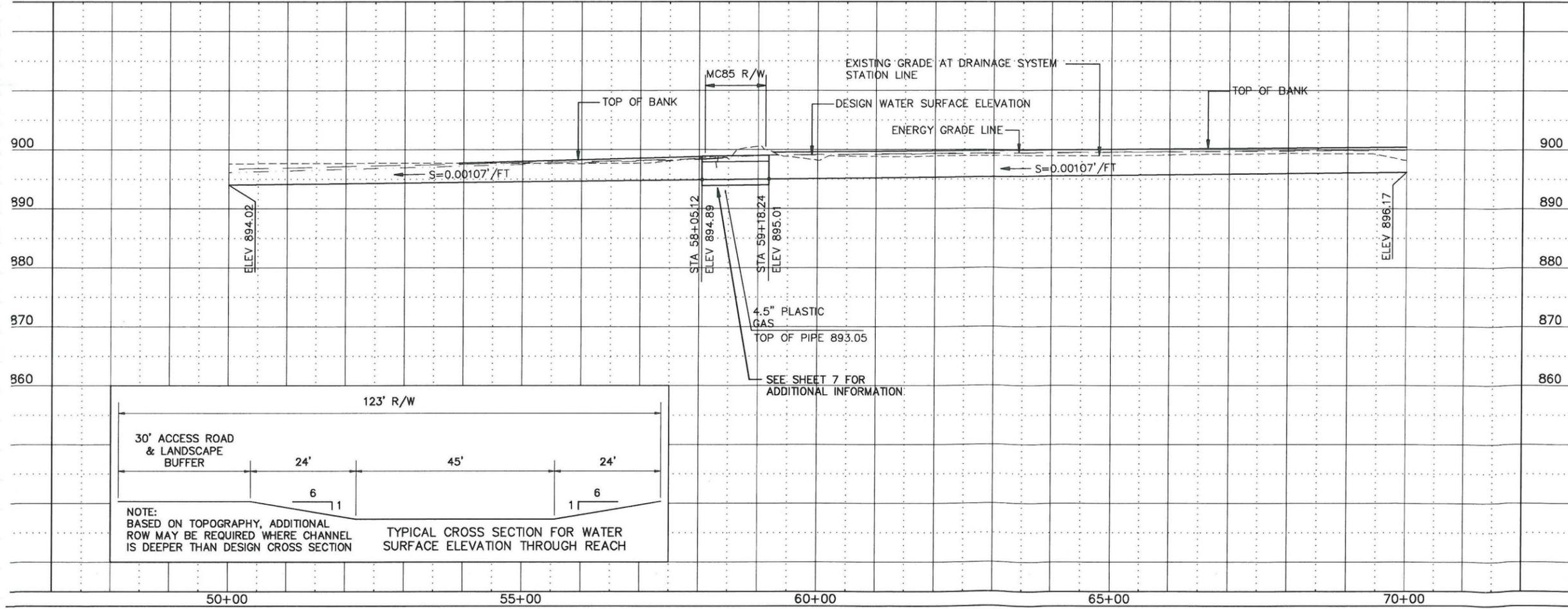
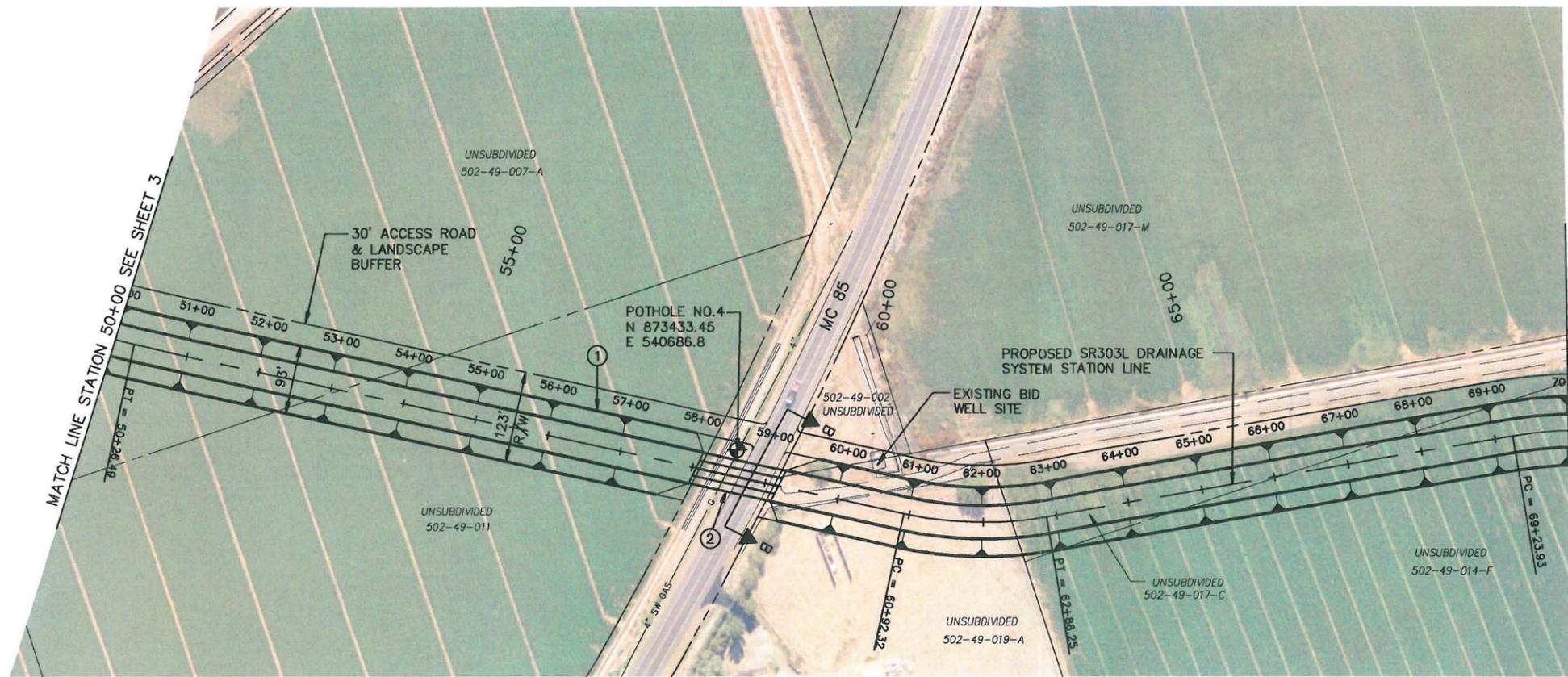
NOTE:
BASED ON TOPOGRAPHY, ADDITIONAL ROW MAY BE REQUIRED WHERE CHANNEL IS DEEPER THAN DESIGN CROSS SECTION

TYPICAL CROSS SECTION FOR WATER SURFACE ELEVATION THROUGH REACH

REMOVE

CONSTRUCT

- ① STA 50+00.00 TO STA 58+05.12 AND STA 59+18.24 TP STA 70+00.00
CONSTRUCT 1081.76 LIN. FT. CHANNEL
- ② CONSTRUCT 113 LIN. FT. 4 BARREL 10' x 3' RCBC WITH HEADWALLS AND APRONS



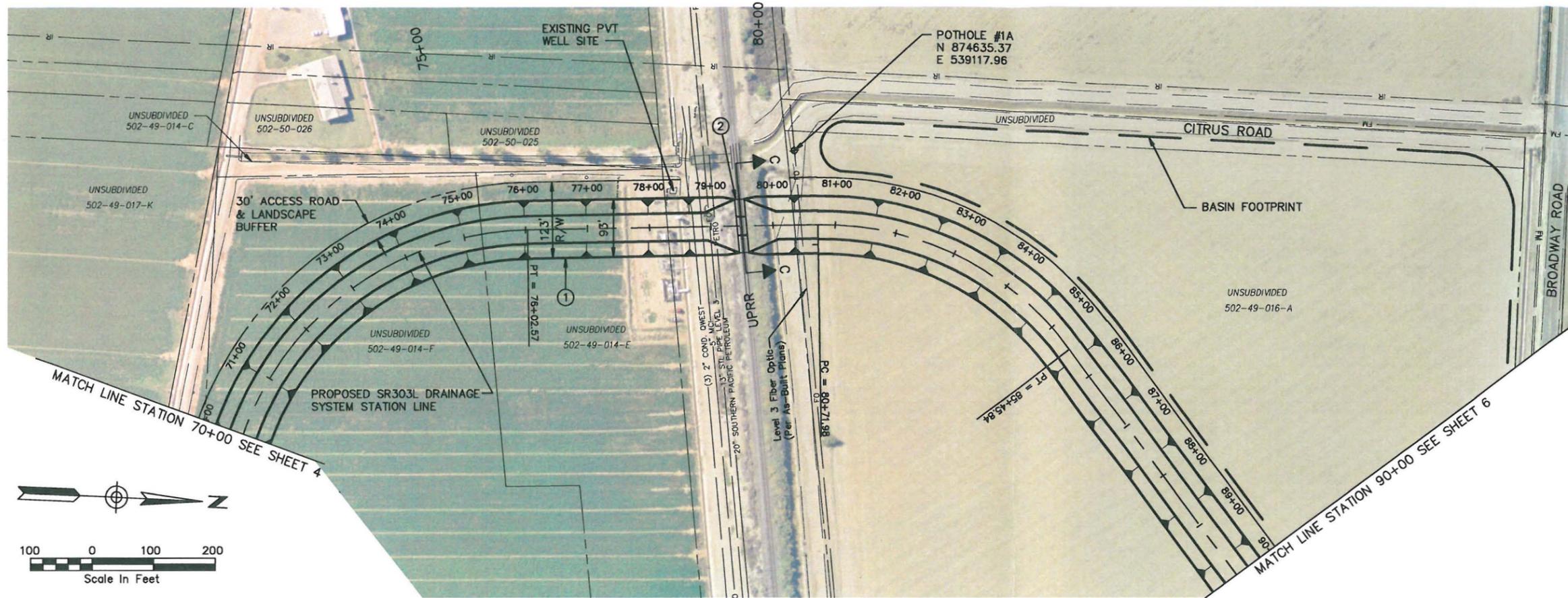
NOTE: BASED ON TOPOGRAPHY, ADDITIONAL ROW MAY BE REQUIRED WHERE CHANNEL IS DEEPER THAN DESIGN CROSS SECTION

TYPICAL CROSS SECTION FOR WATER SURFACE ELEVATION THROUGH REACH

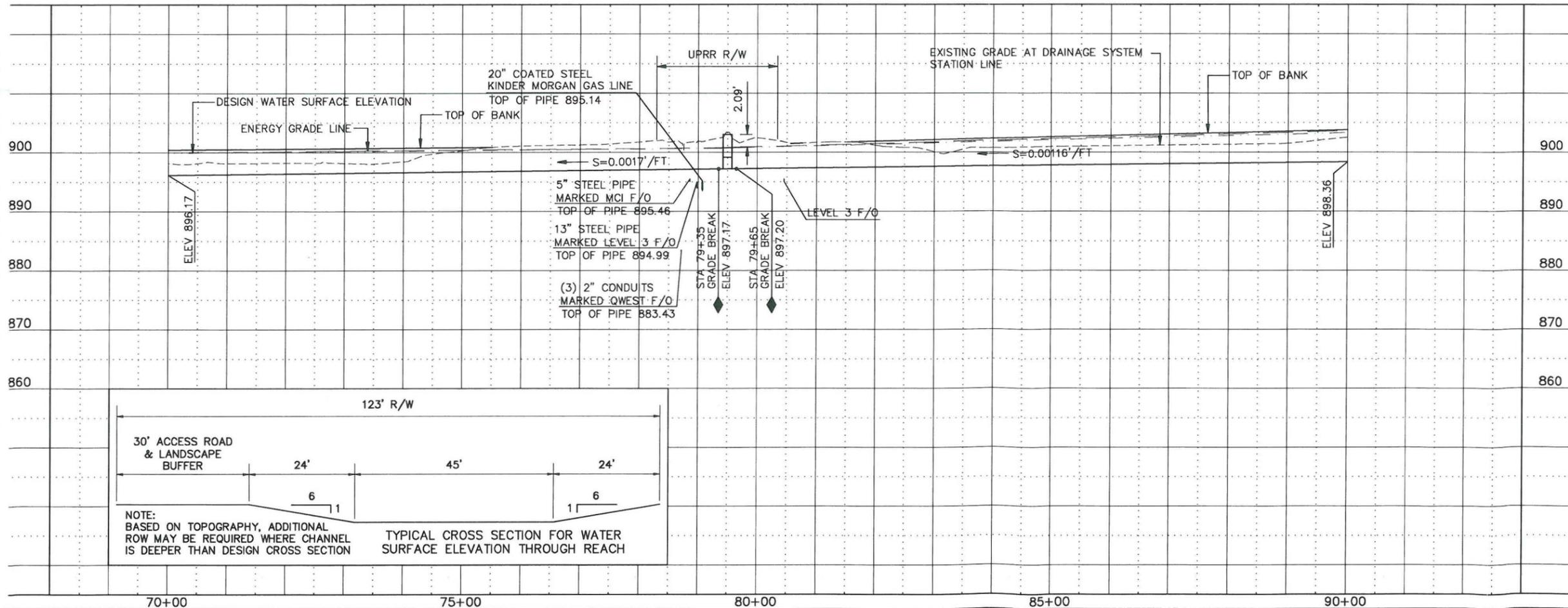
GENERAL NOTES:

- 1. UTILITY LOCATIONS ARE BASED ON AS-BUILT AND POTHOLE INFORMATION.
- 2. FOR LANDSCAPE AESTHETIC TREATMENTS FOR THE IDENTIFIED CROSS SECTIONS AND BASINS SEE THE LANDSCAPE AESTHETICS AND MULTI-USE DESIGN GUIDELINES IN THE LOOP 303 DRAINAGE IMPROVEMENTS CANDIDATE ASSESSMENT REPORT - PHASE 2
- 3. PRELIMINARY NOT FOR CONSTRUCTION. PRE-DESIGN PLANS, THESE PLANS WERE DEVELOPED TO DETERMINE POTENTIAL UTILITY CONFLICTS, ALIGNMENT AND RIGHT OF WAY REQUIREMENTS FOR THE LOOP 303 DRAINAGE SYSTEM FROM I-10 TO THE GILA RIVER.

3			
2			
1			
NO.	REVISION	BY	DATE
<p>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</p> <p>LOOP 303 OUTFALL CHANNEL REACH A PREDESIGN (DRAFT) FCDMC PROJECT NO. 2007C035 ASSIGNMENT NO. 1</p>			
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	MDH	02/09
	DRAWN	JG	02/09
	CHECKED	YX	02/09
	<p>PROJECT ENGINEERING CONSULTANTS, LTD. 2310 W. MISSION LANE, STE. 4 PHOENIX, AZ 85021 PHONE (602) 906-1901</p>		
DRAWING NO.	PLAN AND PROFILE		SHEET OF
	STA 50+00 TO STA 70+00		4 8

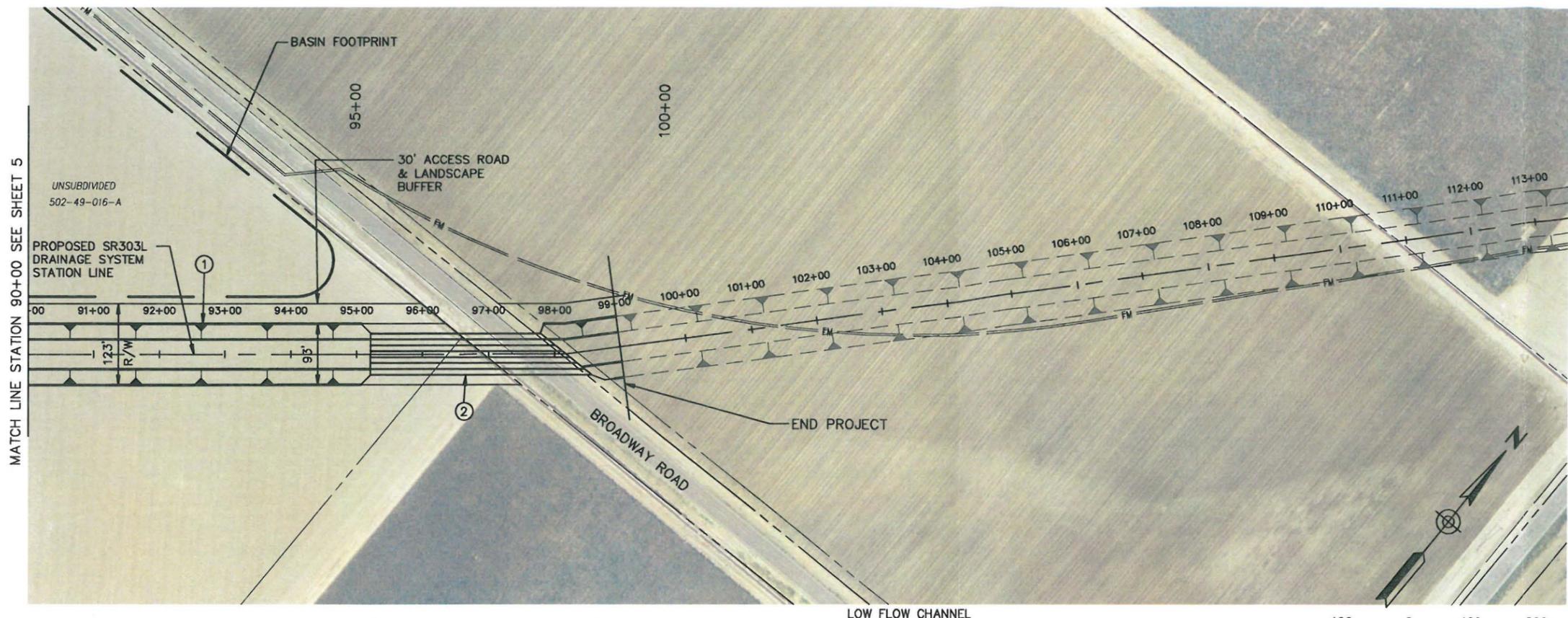


- REMOVE
- CONSTRUCT
- ① STA 70+00.00 TO STA 79+42.48
STA 79+57.48 TO STA 90+00
CONSTRUCT 1985 LIN. FT. CHANNEL
 - ② CONSTRUCT 15 LIN. FT RAILROAD BRIDGE
(MAY BE CONSTRUCTED BY RAILROAD)



- GENERAL NOTES:**
1. UTILITY LOCATIONS ARE BASED ON AS-BUILT AND POTHOLE INFORMATION.
 2. FOR LANDSCAPE AESTHETIC TREATMENTS FOR THE IDENTIFIED CROSS SECTIONS AND BASINS SEE THE LANDSCAPE AESTHETICS AND MULTI-USE DESIGN GUIDELINES IN THE LOOP 303 DRAINAGE IMPROVEMENTS CANDIDATE ASSESSMENT REPORT - PHASE 2
 3. PRELIMINARY NOT FOR CONSTRUCTION. PRE-DESIGN PLANS, THESE PLANS WERE DEVELOPED TO DETERMINE POTENTIAL UTILITY CONFLICTS, ALIGNMENT AND RIGHT OF WAY REQUIREMENTS FOR THE LOOP 303 DRAINAGE SYSTEM FROM I-10 TO THE GILA RIVER.

3			
2			
1			
NO.	REVISION	BY	DATE
<p>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</p> <p>LOOP 303 OUTFALL CHANNEL REACH A PREDESIGN (DRAFT) FCDMC PROJECT NO. 2007C035 ASSIGNMENT NO. 1</p>			
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	MDH	02/09
	DRAWN	JG	02/09
	CHECKED	YX	02/09
<p>PROJECT ENGINEERING CONSULTANTS, LTD. 2310 W. MISSION LANE, STE. 4 PHOENIX, AZ 85021 PHONE (602) 906-1901</p>			
DRAWING NO.	PLAN AND PROFILE	SHEET OF	
	STA 70+00 TO STA 80+64	5	8



MATCH LINE STATION 90+00 SEE SHEET 5

UNSUBDIVIDED
502-49-016-A

PROPOSED SR303L
DRAINAGE SYSTEM
STATION LINE

BASIN FOOTPRINT

95+00

30' ACCESS ROAD
& LANDSCAPE
BUFFER

100+00

BROADWAY ROAD

END PROJECT

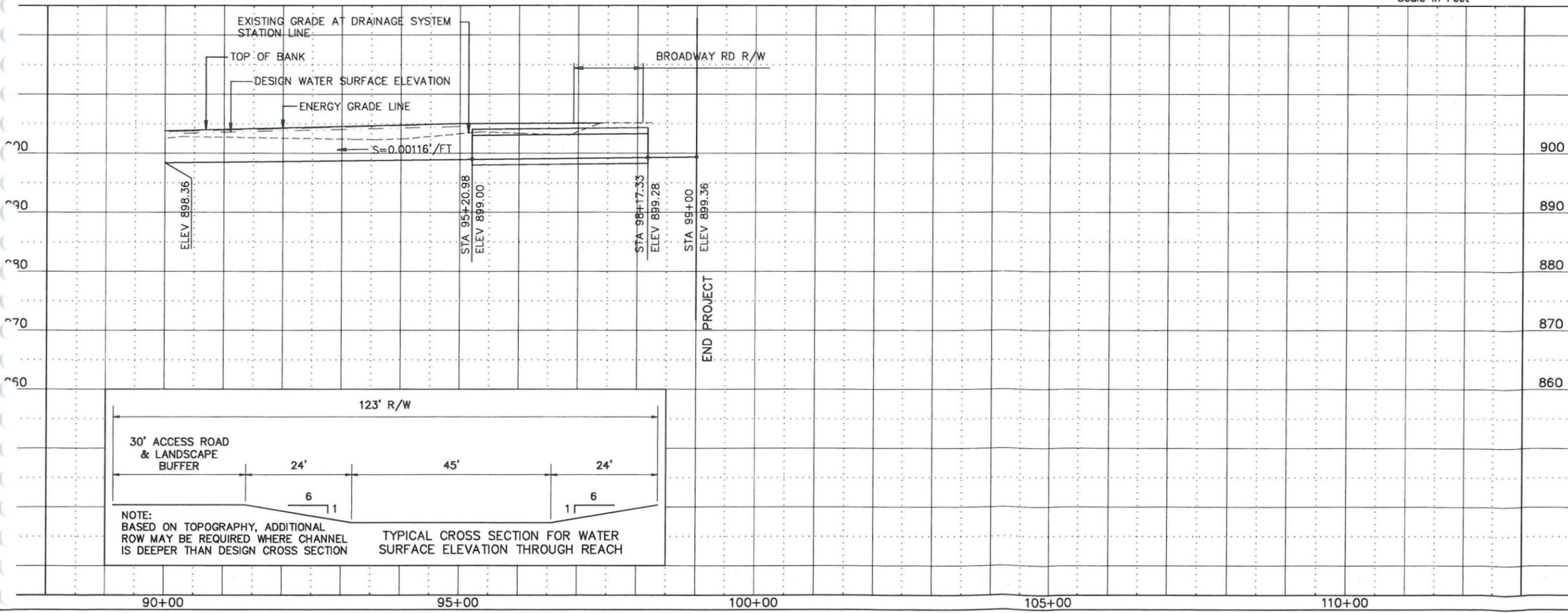
LOW FLOW CHANNEL



REMOVE

CONSTRUCT

- ① STA 90+00.00 TO STA 95+21.86
STA 98+17.97 TO STA 99+00
CONSTRUCT 604 LIN. FT. CHANNEL
- ② CONSTRUCT 296 LIN. FT 7 BARREL 8' X 4' RCBC
WITH HEADWALLS AND APRONS



GENERAL NOTES:

- 1. UTILITY LOCATIONS ARE BASED ON AS-BUILT AND POTHOLE INFORMATION.
- 2. FOR LANDSCAPE AESTHETIC TREATMENTS FOR THE IDENTIFIED CROSS SECTIONS AND BASINS SEE THE LANDSCAPE AESTHETICS AND MULTI-USE DESIGN GUIDELINES IN THE LOOP 303 DRAINAGE IMPROVEMENTS CANDIDATE ASSESSMENT REPORT - PHASE 2
- 3. PRELIMINARY NOT FOR CONSTRUCTION. PRE-DESIGN PLANS, THESE PLANS WERE DEVELOPED TO DETERMINE POTENTIAL UTILITY CONFLICTS, ALIGNMENT AND RIGHT OF WAY REQUIREMENTS FOR THE LOOP 303 DRAINAGE SYSTEM FROM I-10 TO THE GILA RIVER.

NO.	REVISION	BY	DATE
3			
2			
1			

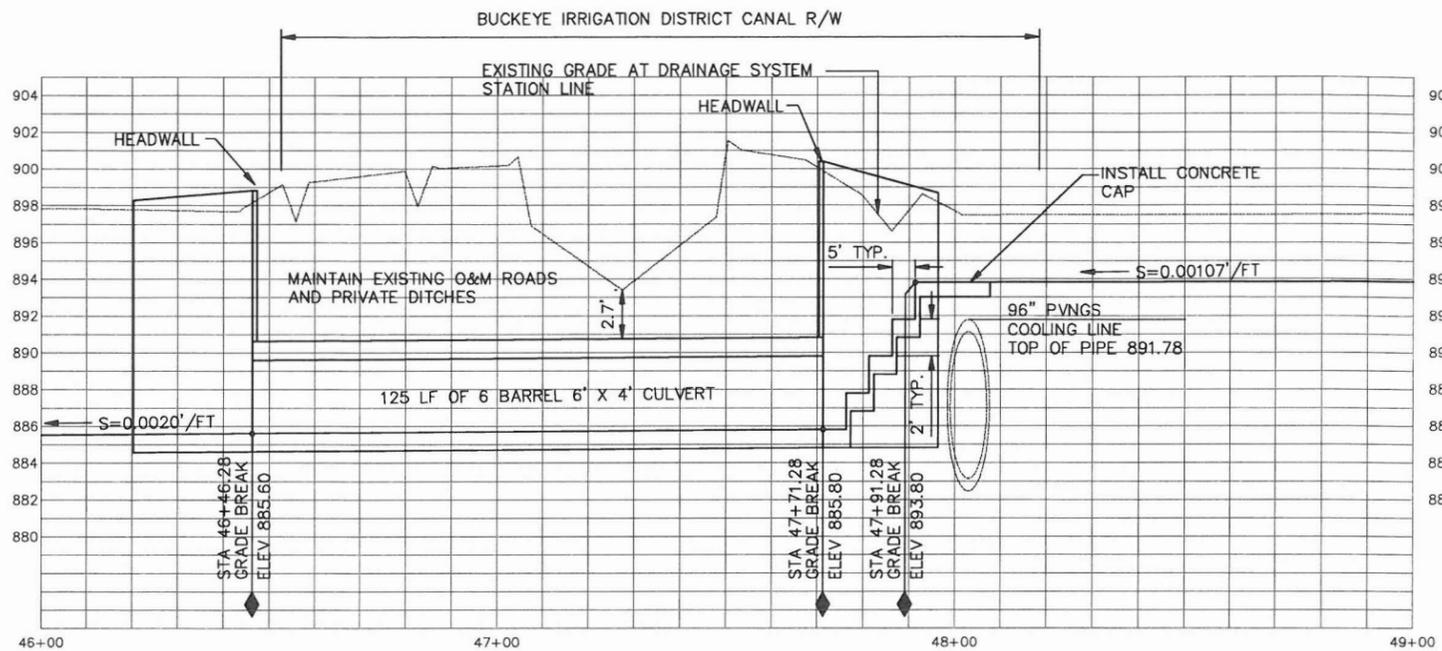
**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY**
ENGINEERING DIVISION

**LOOP 303 OUTFALL CHANNEL
REACH A PREDESIGN (DRAFT)
FCDMC PROJECT NO. 2007C035
ASSIGNMENT NO. 1**

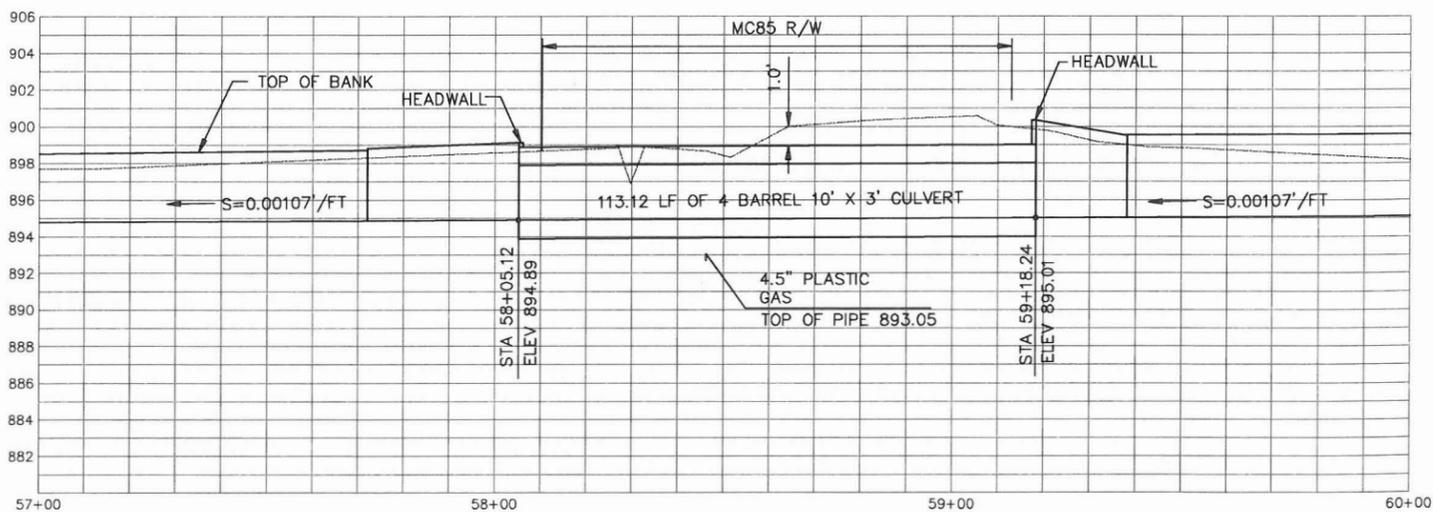
	BY	DATE
DESIGNED	MDH	02/09
DRAWN	JG	02/09
CHECKED	YX	02/09

PROJECT ENGINEERING CONSULTANTS, LTD.
2310 W. MISSION LANE, STE. 4 PHOENIX, AZ 85021
PHONE (602) 906-1901

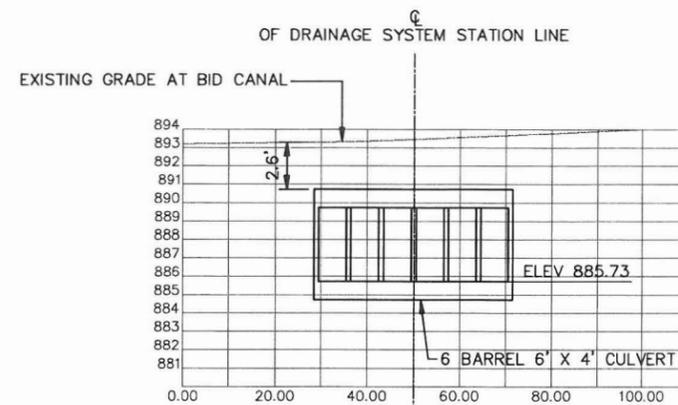
DRAWING NO. **PLAN AND PROFILE** SHEET OF
STA 90+00 TO STA 99+00 **6** **8**



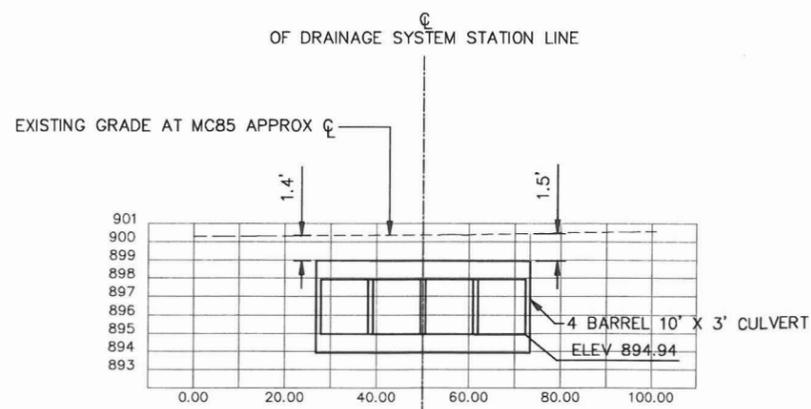
PROFILE AT BID CANAL
 SCALE: HORZ. 1" = 20'
 VERT. 1" = 5'



PROFILE AT MC85
 SCALE: HORZ. 1" = 20'
 VERT. 1" = 5'



SECTION A-A AT BID CANAL
 SCALE: HORZ. 1" = 20'
 VERT. 1" = 5'



SECTION B-B AT MC85
 SCALE: HORZ. 1" = 20'
 VERT. 1" = 5'

REMOVE

CONSTRUCT

3			
2			
1			
NO.	REVISION	BY	DATE

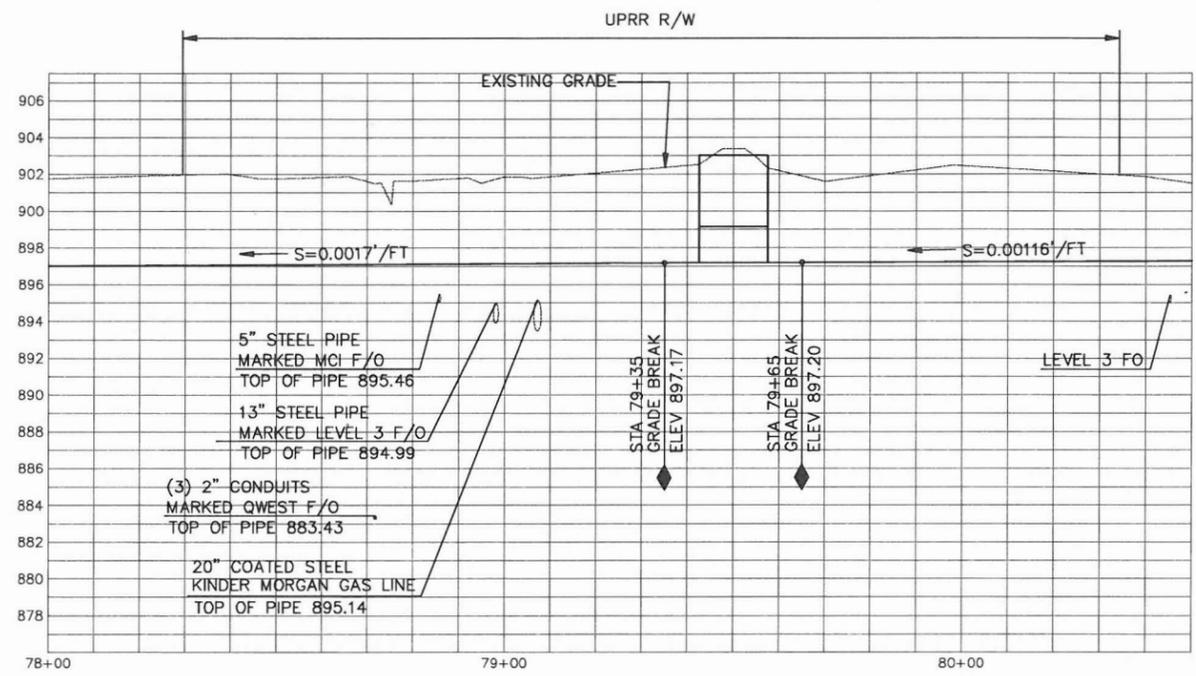
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
 ENGINEERING DIVISION

LOOP 303 OUTFALL CHANNEL REACH A PREDESIGN (DRAFT)
 FCDMC PROJECT NO. 2007C035
 ASSIGNMENT NO. 1

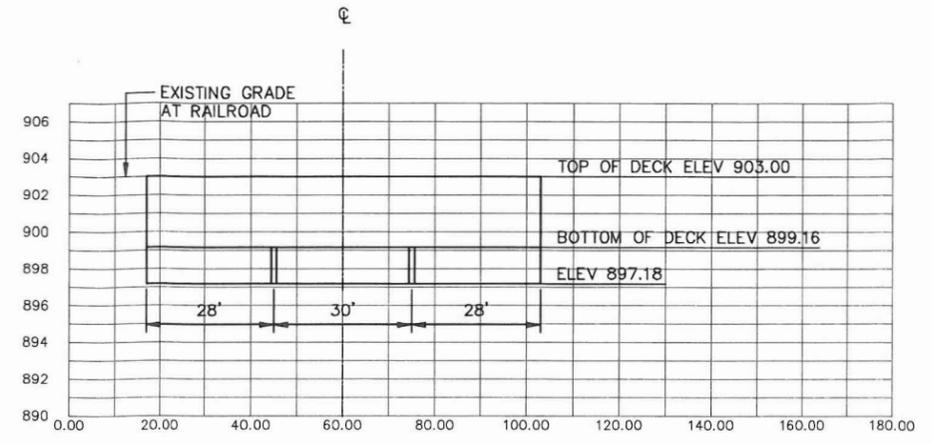
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	MDH	02/09
	DRAWN	JG	02/09
	CHECKED	YX	02/09

PROJECT ENGINEERING CONSULTANTS, LTD.
 2310 W. MISSION LANE, STE. 4 PHOENIX, AZ 85021
 PHONE (602) 906-1901

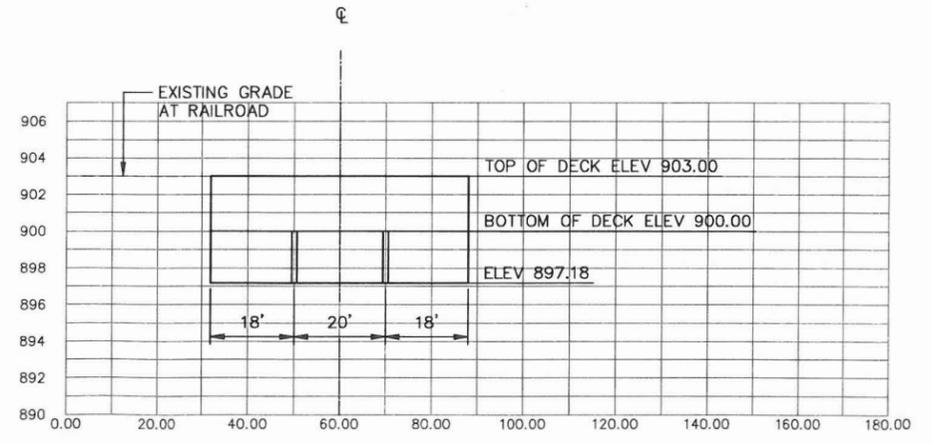
DRAWING NO.	PLAN AND PROFILE STA 87+11.60 TO STA 107+00	SHEET OF 7 8
-------------	--	-----------------



PROFILE AT RAILROAD
SCALE: HORZ. 1" = 20'
VERT. 1" = 5'



SECTION C-C AT RAILROAD 30' SPAN
SCALE: HORZ. 1" = 20'
VERT. 1" = 5'



SECTION C-C AT RAILROAD 20' SPAN
SCALE: HORZ. 1" = 20'
VERT. 1" = 5'

REMOVE

CONSTRUCT

3			
2			
1			
NO.	REVISION	BY	DATE



FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

LOOP 303 OUTFALL CHANNEL
REACH A PREDESIGN (DRAFT)
FCDMC PROJECT NO. 2007C035
ASSIGNMENT NO. 1

PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	MDH	02/09
	DRAWN	JG	02/09
	CHECKED	YX	02/09

PROJECT ENGINEERING CONSULTANTS, LTD.
2310 W. MISSION LANE, STE. 4 PHOENIX, AZ 85021
PHONE (602) 906-1901

DRAWING NO.	PLAN AND PROFILE STA 87+11.60 TO STA 107+00	SHEET OF 8 8
-------------	--	-----------------