



White Tanks FRS #3

North Inlet Channel

Pre-Design Study Report

July 2002

Prepared by:

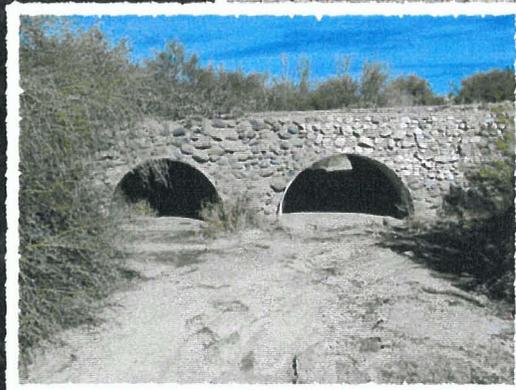
Wood, Patel & Associates, Inc.

Civil Engineers • Hydrologists • Land Surveyors • Construction Managers

In association with:

McKloskey ♦ Peltz, Inc.

LANDSCAPE ARCHITECTS



Contract FCD 2000 C035

Property of
Flood Control District of MC Library
Please Return to
2001 W. Durango
Phoenix, AZ 85009

**WHITE TANKS
FLOOD RETARDING STRUCTURE #3
NORTH INLET CHANNEL**

PRE-DESIGN STUDY REPORT

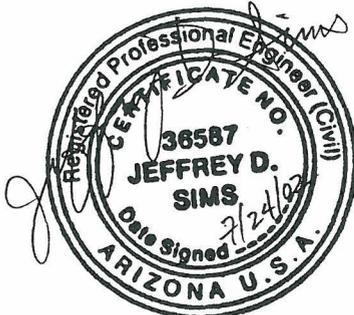
CONTRACT FCD 2000 C036

ASSIGNMENT 3

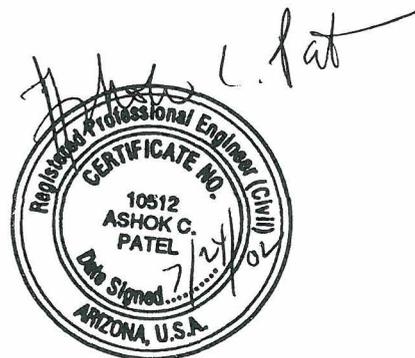
July 24, 2002
WP #011315.03

Prepared for: Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009
Phone: (602) 506-1501
Fax: (602) 506-4601

Prepared by: **Wood, Patel & Associates, Inc.**
2051 West Northern Avenue
Suite 100
Phoenix, Arizona 85021
Phone: (602) 335-8500
Fax: (602) 335-8580



Engineer



Peer Reviewer

TABLE OF CONTENTS

1.0 PROJECT BACKGROUND 1

 1.1 Description 1

 1.2 Purpose 1

 1.3 Location 2

 1.4 Agencies 2

 1.5 Previous Studies 2

2.0 STUDY AREA 3

 2.1 Existing Features 3

 2.2 Current Operation 6

 2.3 Hydrology 6

 2.4 Jurisdictional Delineation 7

3.0 DEVELOPMENT OF ALTERNATIVES 8

 3.1 Description of Alternatives – North Inlet Channel 8

 3.1.1 Alternative 1 – Native Desertscaled Earthen Channel 8

 3.1.2 Alternative 2 – Concrete Channel with Native Desertscaled Overbanks .. 9

 3.1.3 Alternative 3 – Detention Basin Near Olive Avenue 9

 3.1.4 Alternative 4 – Additional Channel on East Side of Beardsley Canal 11

 3.1.5 Alternative 5 – No Action 12

 3.2 Description of Alternatives – Northern Avenue Diversion 13

 3.3 Hydraulic Analysis 14

 3.3.1 North Inlet Channel Hydraulics 15

 3.3.2 Northern Avenue Diversion Hydraulics 15

 3.4 Evaluation of Alternatives 16

 3.4.1 North Inlet Channel Alternative Evaluation 16

 3.4.2 Northern Avenue Diversion Alternative Evaluation 22

4.0 RECOMMENDATIONS & CONCLUSIONS 25

 4.1 North Inlet Channel – Selected Alternative 25

 4.2 Northern Avenue Diversion – Selected Alternative 25

 4.3 Recommendations 25

5.0 15% TO 30% DESIGN PLAN AND PROFILE 26

 5.1 Channel 26

 5.2 Landscape Concept 26



	Recommended Revegetation Plant Species.....	28
5.3	Box Culverts.....	29
5.4	Buried Slope Protection.....	30
5.5	Drops.....	31
5.6	Diversion Weir.....	31
5.7	Probable Cost of Construction.....	32
6.0	FINAL DESIGN – ISSUES AND RECOMMENDATIONS.....	33
7.0	REFERENCES.....	35



APPENDICES

Appendix A	Public Meeting Exhibits and Newsletters
Appendix B	Summary of HEC-1 Model Output for Northern Avenue Diversion
Appendix C	North Inlet Channel Preliminary Design Quantities and Cost Estimate
Appendix D	Northern Avenue Diversion Preliminary Design Quantities and Cost Estimate
Appendix E	<i>Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects</i> , Flood Control District of Maricopa County
Appendix F	404 Map
Appendix G	15% to 30% Design Plan and Profile
Appendix H	HEC-RAS Model Output
Appendix I	15% to 30% Opinion of Probable Construction Costs

LIST OF PLATES

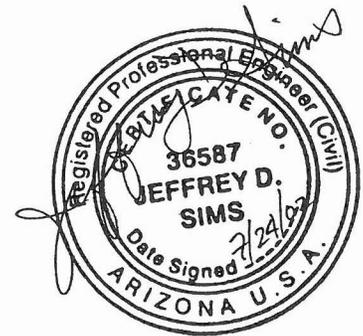
Plate 1-1	Vicinity Map
Plate 2-1	Flood Insurance Rate Map
Plate 3-1	North Inlet Channel Alternative 1 Plan and Profile
Plate 3-2	North Inlet Channel Alternative 2 Plan and Profile
Plate 3-3	North Inlet Channel Alternative 3 Plan and Profile
Plate 3-4	North Inlet Channel Alternative 4 Plan and Profile
Plate 3-5	Northern Avenue Diversion Alternative Map

LIST OF TABLES

Table 3-1	North Inlet Channel Unit Prices
Table 3-2	North Inlet Channel Cost Summary
Table 3-3	North Inlet Channel Alternative Advantage Evaluation
Table 3-4	Northern Avenue Diversion Unit Prices
Table 3-5	Northern Avenue Diversion Cost Summary

jmb

Y:\WP\Reports\Public Works Dept\011315.03 White Tanks FRS#3 North Inlet Channel Pre-Design Study Report.doc



1.0 PROJECT BACKGROUND

1.1 Description

This project is a pre-design study for the White Tanks Flood Retarding Structure (FRS) #3, North Inlet Channel. The basis for the design is the *Level II, Draft, Phase II Alternatives Analysis Report, Loop 303 Corridor / White Tanks Area Drainage Master Plan Update*, Contract 99-40 by URS, September 2001 (Loop 303 Report). The two segments evaluated for the project are:

1. North Inlet Channel from Peoria Avenue to White Tanks FRS #3.
2. Northern Avenue Diversion from the North Inlet Channel to Reems Road.

The North Inlet Channel consists of a constructed channel to replace the existing Beardsley Canal Wash.

The study includes evaluating channel alternatives for the North Inlet Channel, as well as diversion alternatives along Northern Avenue. The Northern Avenue Diversion has been evaluated for hydraulics and the optimum split flow considerations; however, no design plans have been developed for this segment. Pre-design plans have been prepared to the 15% to 30% level for the North Inlet Channel.

1.2 Purpose

The purpose of this pre-design study is to identify a project to prevent breakouts from the Beardsley Canal Wash across the Beardsley Canal between Peoria Avenue and the White Tanks FRS #3. It is also desired to identify potential partners for cost sharing in the project. The study investigated alternatives for providing flood protection along the project corridor and developed cost estimates for each alternative. The pre-design study investigated various conveyance cross-sections for each segment of the project and the potential for multi-use features within the facility. Another element of the pre-design study was to investigate the potential benefit to FRS #3 of diverting a portion of the runoff from the proposed North Inlet Channel into a channel along Northern Avenue.

1.3 Location

The project is located within the unincorporated area of Maricopa County. The existing Beardsley Canal Wash begins at the White Tanks FRS #3 and extends north past Peoria Avenue. Channelization of the existing wash will be referred to as the North Inlet Channel. The Northern Avenue Diversion begins on the west side of the Beardsley Canal and extends east about 4.5 miles along the north side of Northern Avenue to Reems Road. Plate 1-1 shows a map of the project location.

1.4 Agencies

The Flood Control District of Maricopa County (District) is the lead agency for this project. Other study stakeholders include:

- Maricopa County Municipal Water Conservation District No. 1 (MWD)
- Sonoran Ridge Development
- Clearwater Farms Estates

1.5 Previous Studies

This section briefly describes studies and reports that contain information pertinent to this study.

White Tanks Flood Retention Structure No. 3, Inlet Improvements, Final Conceptual Design Report, AGK Engineers, Inc., December 1994 – This study developed alternatives for improvements to the Beardsley Canal Wash that have not been implemented since the hydrology and the Flood Control District policy regarding the aesthetics of flood control features have changed.

Level II, Draft, Phase II Alternatives Analysis Report, Loop 303 Corridor / White Tanks Area Drainage Master Plan Update, URS, September 2001 – This report is the basis for design and includes an evaluation of the entire White Tanks drainage basin hydrology and drainage plan.

FIRM Map No. 04013C1580G and 04013C1590G, July 19, 2001, FEMA – These maps show the special flood hazard areas which would be inundated by the 100-year flood for Cholla Wash, Waterfall Wash, and the Beardsley Canal Wash. The breakout across the Beardsley Canal into the Perryville Road Wash is also shown.

2.0 STUDY AREA

2.1 Existing Features

The White Tanks FRS #3 is located in the vicinity of Glendale Avenue and Jackrabbit Trail. The structure was constructed by the Soil Conservation Service in 1954 to provide flood protection to farmland and irrigation facilities in the downstream area.



Outlet of Beardsley Canal Wash Crossing at Olive Avenue.

Storm runoff from the east slope of the White Tank Mountains generally flows southeasterly to the existing Beardsley Canal Wash and thence southerly along the west side of the Beardsley Canal to FRS #3. The Beardsley Canal Wash has roadway crossings at Northern and Olive Avenues. The crossing at Olive Avenue is through one (1) 7-foot and one (1) 8-foot corrugated metal pipe (CMP). These pipes are about half full of debris and silt. It appears that the reason for this siltation is that immediately upstream of this crossing is the confluence with Waterfall Wash. The ponding created by the limited capacity of the culverts causes the sediment brought in to fall out at this location. This siltation appears to be concentrated primarily at the culvert crossing. The crossing at Northern Avenue consists of two (2) 6-foot CMPs. These pipes are free of deposition, apparently because there are no confluences close to the crossing and the downstream side of the pipes has no blockage caused by vegetation.



*Outlet of the Beardsley Canal Wash crossing at
Northern Avenue.*

The Beardsley Canal is operated by the Maricopa County Municipal Water Conservancy District No. 1 (MWD) within a 75-foot right-of-way. There are two utilities that run parallel to the canal. MCI has a buried line on the west side of the canal and Broadwing Fiber Optic has a buried canal on the east side. The District owns a 60-foot right-of-way along the west side of the canal. The low flow portion of the Beardsley Canal Wash is located within this right-of-way. In general, the flow line of the Beardsley Canal is about 3 to 4 feet above the flow line of the Beardsley Canal Wash.

Between FRS #3 and the Northern Avenue crossing, the existing channel is mostly prismatic with a well-defined cross-section. The channel north of Northern Avenue is defined but is in a natural condition without any improvements. The natural channel intercepts overland flow from the northwest for almost the entire length; however, Cholla Wash and Waterfall Wash concentrate most of the flow.

The existing conditions of the Beardsley Canal Corridor from just north of Olive Avenue to south of Northern Avenue reflect two fairly diverse characters. On the west, the immediate landscape character is reflective of a desert wash/riparian character. In contrast, the east side of the canal is sparsely vegetated, consisting of primarily Creosote and Bursage with very few trees. The majority of significant vegetation is concentrated along the immediate western slope of canal embankment and existing channel/wash bottom. It should be noted that the landscape character found on the west side of the corridor is a direct result of the higher concentrations of intercepted runoff collected and retained by the dike effect created by the elevated canal embankment. West of Beardsley

Canal, the density of trees and other vegetation is significantly greater than that found on the east side of the canal. The concentration of plant material varies from very dense to the immediate west of the canal and then transitions to the much reduced density beyond the limits of the existing channel/wash flow lines. West of the existing Beardsley Canal Wash, the vegetation patterns return to those typical of the natural desert conditions found in the adjacent foothills and White Tank Mountains further to the west.

The major landscape vegetation primarily consists of Blue Palo Verde and Native Mesquite, along with some Ironwood, Foothills Palo Verde, and occasional Desert Willow.

Currently the areas adjacent to the Beardsley Canal corridor are typically either undisturbed desert or in agricultural use. It is our understanding that a significant portion of the adjacent areas are either under development or in the planning stages for residential community development.



Beardsley Canal Wash south of Northern Avenue.

Along the Northern Avenue Diversion alignment, there are existing tailwater ditches and tail water ponds on the north side of the road. Most of the area on the north side of Northern Avenue between the proposed North Inlet Channel and Reems Road is undeveloped farmland with the exception of Crystal Springs Estates between 177th and 178th Avenues.

2.2 Current Operation

The Beardsley Canal Wash's eastern sideslope is the Beardsley Canal maintenance road embankment. The 100-year storm conveyance capacity of the wash is inadequate at several locations. Therefore, there is a danger of the embankment overtopping by flood waters during the 100-year event. This is shown in the FEMA Flood Insurance Rate Map in Plate 2-1.

Subsidence was investigated during the preparation of the AGK Inlet Improvements Report (see Reference 11). The estimated subsidence between 1994 and 2035 was estimated at 1.7 feet at Peoria Avenue, 0.0 feet at Olive and Northern Avenues, and 0.0 to 1.4 feet at Glendale Avenue. Subsidence should not be of much concern, due to the fact that most of the proposed alternative improvements are located between Olive and Northern Avenues. For improvements outside of this area, subsidence can be designed for by adjusting drop structure heights. Also, if a 1 or 2 foot subsidence over a mile of channel causes a minor slope decrease, the freeboard will provide additional capacity for flow conveyance.

2.3 Hydrology

The hydrologic analysis was performed using HEC-1 software. The base model developed by URS for the Loop 303 Level II Report was modified for each alternative investigated as part of this study to determine peak flow rates and volumes. The major components that impact the models are discussed in Section 3.0, Development of Alternatives.

The North Inlet Channel hydrology was based upon a new District existing-conditions model, which estimates breakout flows of 622 cfs at Olive Avenue and 1896 cfs at Northern Avenue during the 100-year event. The breakout at Northern Avenue can be eliminated by increasing the capacity of the culvert under the road. This will result in an increase of the historical flow in the channel south of Northern Avenue. Since the channel south of Northern Avenue is located within District property, flow increases in this segment are not as critical as in the segment between Olive Avenue and Northern Avenue. Any alternative to prevent breakout flow at Olive Avenue cannot cause adverse impacts due to an increase in the 100-year flow rate to the channel segment between

Olive and Northern Avenue. This was a consideration during the development of the alternatives for this section.

Existing hydrologic models were also adjusted to assess the feasibility of diverting flow from the Beardsley Canal Wash east along Northern Avenue. Models were run with various combinations of: different flow rates; with or without a basin at Olive Avenue; with base flow or peak flow diversions; and with online or offline basins at the Loop 303 and Reems Road. The different combinations were used to develop the Northern Avenue Diversion Alternatives. Over twenty models were run to determine which combination of features would best fulfill the objectives of the Northern Avenue Diversion. These objectives are described in Section 3.2 – *Description of Alternatives – Northern Avenue Diversion*. A summary of output for the HEC-1 models is included in Appendix B.

2.4 Jurisdictional Delineation

A preliminary U.S. Army Corps of Engineers' Section 404 jurisdictional delineation was performed on the project site for project planning purposes. The preliminary delineation was done using 200-scale aerial photographs of the area and an approved delineation for an adjacent parcel called Sonoran Ridge Estates. The delineation represents our understanding of characteristics of the Waters of the U.S. and how they apply to the site, as it existed in March of 2002. Only the U.S. Army Corps of Engineers can make the final determination as to whether or not the washes are jurisdictional. Refer to Appendix F for a map of the preliminary jurisdictional delineation.

3.0 DEVELOPMENT OF ALTERNATIVES

3.1 Description of Alternatives – North Inlet Channel

Four alternatives have been developed to prevent breakout along the Beardsley Canal Wash. The alternatives are: native desertscaped earthen channel, concrete channel with native desertscaped overbanks, detention basin near Olive, and additional channel on east side of Beardsley Canal. A no action alternative is also discussed. Each alternative is further described below.

The channel alignment has been divided into different segments based upon flow rates and treatments. Segment 1 is from Waterfall Wash to Olive Avenue. Segment 2 continues from Olive Avenue to Cholla Wash. Segment 3 is between Cholla Wash and Northern Avenue and Segment 4 extends from Northern Avenue to FRS #3. In the initial phase of this study, the channel investigations included an additional segment between Peoria Avenue and the north end of Segment 1 at Waterfall Wash. However, since it was determined that the existing wash has adequate capacity for the 100-year flows and there is not a risk of breakout above the Waterfall Wash confluence, the District removed this segment from the analysis.

3.1.1 Alternative 1 – Native Desertscaped Earthen Channel

The native desertscaped earthen channel alternative is an earth channel from Waterfall Wash to the FRS #3 that includes kinder and gentler topographic features. It requires drops to maintain sub-critical flow conditions. The proposed channel slope is 0.05% with 6:1 side slopes, 2.0 feet of freeboard, and a maximum permissible velocity of 3.0 ft/s.

The maximum permissible velocity was determined using *TR-25, Design of Open Channels, NRSC*. From References 11 and 18, it is estimated that the D_{75} of material in the wash is between 1 and 2 millimeters. The non-scouring velocity for sediment laden flow is thus estimated to be approximately 3 ft/s from Figure 6-1 of *TR-25*. This can be compared with existing flow velocities in the Beardsley Canal Wash of 6 to 12 ft/s.

This alternative includes a 6-foot wide equestrian trail, a 5-foot wide pedestrian trail, landscaping, and multi-use facilities. A 5-barrel 10-foot by 6-foot box culvert at Olive Avenue and a 10-barrel 10-foot by 6-foot box culvert at Northern Avenue was considered as part of this Alternative. The approximate length of the channel and trail improvements is 10,750 feet. A sketch of the channel cross-section is shown in Appendix A. A conceptual layout and profile of Alternative 1 are shown in Plate 3-1, sheets 1 through 3.



These culverts at the Olive Avenue crossing would be replaced by a 5-barrel 10'x6' box culvert in Alternative 1.

3.1.2 Alternative 2 – Concrete Channel with Native Desertscaped Overbanks

This alternative consists of constructing a 6-inch thick concrete-lined channel with native desertscaped overbanks consisting of trails, landscaping, and multi-use features. The longitudinal channel slope would be between 0.31% and 0.35%, with 2:1 side slopes, 2.0 feet of freeboard, and a maximum flow velocity is 15 ft/s. The box culvert sizes at Olive and Northern are the same for this alternative as in Alternative 1. The length of improvements for this alternative is also 10,750 feet. The channel cross-section is depicted in Appendix A. Plate 3-2, sheets 1 through 3, shows the conceptual plan and profile for Alternative 2.

3.1.3 Alternative 3 – Detention Basin Near Olive Avenue

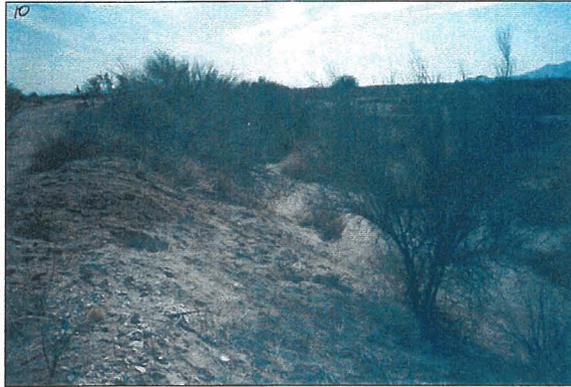
The goal of Alternative 3 is to prevent breakouts across the Beardsley Canal with a minimum of channel improvements. The flow rate in the Beardsley Canal Wash cannot be increased above the existing conditions where adverse impacts

to adjacent property would occur. The breakout flow at Olive Avenue for the 100-year event is 622 cfs according to the Loop 303 study and 500 cfs according to FEMA. Alternative 3 prevents the breakout at Olive Avenue and does not increase existing flow rates in the Beardsley Canal Wash Corridor between Olive and Northern Avenues.

This alternative includes constructing an off-line detention basin in the northwest corner of the Olive Avenue and Beardsley Canal crossing to reduce the downstream peak by about 650 cfs. A drop structure and a segment of concrete-lined channel would be constructed near the basin along with an overflow spillway structure to divert flow into the basin. A site plan sketch of the basin is shown in Appendix A. As part of the improvements, a 5-barrel 10-foot by 6-foot box culvert would be constructed at Olive and a 12-barrel 10-foot by 7-foot box culvert would be constructed at Northern. These culverts would provide a 100-year dry crossing across the Beardsley Canal Wash. The equestrian and pedestrian trails would extend past Olive Avenue along the concrete-lined channel to the drop structure. The length of trails would be approximately 9,840 feet. Plate 3-3, sheets 1 through 3, shows the plan of Alternative 3.

Slope protection on the west embankment of the Beardsley Canal would be put in place at the confluence with Cholla Wash. The purpose of the slope protection is to prevent erosion of the Beardsley Canal embankment from impinging flow from Cholla Wash. The protection will be of sufficient height to provide protection against run-up.

It was determined that the capacity of the channel south of Northern Avenue is adequate; therefore, no upsizing of the channel is needed. However, since this portion of channel will now be carrying a significant increase in flow due to the Northern Avenue culvert improvements, slope protection for the east bank along the channel has been considered. Hydroseeding would be applied to the channel areas impacted by construction activities south of Northern Avenue.



West embankment of Beardsley Canal to receive slope protection at confluence with Cholla Wash.

Between Olive and Northern Avenues, no improvements would be made along the existing natural corridor of the Beardsley Canal Wash, with the exception of slope protection at Cholla Wash discussed earlier in this section. Additionally, a 100-foot trail corridor would be placed on the east side of the Beardsley Canal right-of-way.

3.1.4 Alternative 4 – Additional Channel on East Side of Beardsley Canal

Alternative 4 would also prevent breakouts with partial improvements. It includes a diversion of 622 cfs at Olive Avenue into a proposed additional channel on the east side of the Beardsley Canal between Olive and Northern Avenues. This diversion would be routed back into the Beardsley Canal Wash at Northern Avenue. This additional channel on the east side of the Beardsley Canal (East Channel) would be a kinder and gentler earth-lined channel and would include pedestrian and equestrian trails, a maintenance path, landscape features, and amenities. The channel would be at a 0.09% slope with varying side slopes, 2.0 feet of freeboard, and a 10-foot bottom width. A sketch of a typical east channel cross-section is shown in Appendix A. The diversion at Olive would require a drop into a 10-foot by 6-foot box culvert to cross under the road and canal. The crossing at Northern would require a 10-foot by 6-foot box culvert. The plan and profile for Alternative 4 are shown on Plate 3-4.

A Manning's n value of 0.03 was used for the channel. This is appropriate for an earth-lined channel with gradual undulating banks, vegetative cover, and an

aged-channel condition. Excessive vegetative growth with a Manning's n value of 0.04 will still work, since the channel was designed with an extra foot of freeboard.

With this alternative, slope protection at Cholla Wash and along the channel south of Northern Avenue would also be constructed.

The maximum permissible velocity was determined using *TR-25, Design of Open Channels, NRSC*. It is assumed that the D_{75} of material along the East Channel alignment would also be between 1 and 2 millimeters. The non-scouring velocity for sediment laden flow is thus estimated to be approximately 3 ft/s from Figure 6-1 of TR-25.

In addition to the box culverts required for the East Channel, box culverts would be required for the Beardsley Canal Wash crossings at Olive Avenue and Northern Avenue to provide dry crossings at these locations. This alternative proposes a 4-barrel 10-foot by 6-foot box culvert at Olive Avenue and a 12-barrel 10-foot by 7-foot box culvert at Northern Avenue. The length of trails proposed for this alternative is about 9,180 feet.

3.1.5 Alternative 5 – No Action

The No Action Alternative would not alter the existing Beardsley Canal Wash in any way. The 100-year storm discharge would breakout at Olive and Northern Avenues. A significant concern of a possible canal breach exists where the Cholla Wash impinges upon the Beardsley Canal embankment. If the breach occurs, it would create a significant flood hazard to the parcel/property owners on the downstream side of the canal. A floodplain delineation would also need to be performed east of the canal to determine which properties would be at risk. These properties would need flood insurance due to the continued risk of breakout from the Beardsley Canal Wash. The current floodplain limits on the west side of the Beardsley Canal would remain as is. The risk of damages to the Beardsley Canal would not change.

3.2 Description of Alternatives – Northern Avenue Diversion

The purpose of the Northern Avenue Diversion Alternative is to identify an optimum split flow condition at the North Inlet Channel. The goal is to reduce the volume of storm runoff that is routed into FRS #3. The District wants to determine the feasibility of converting the FRS #3 dam structure into a detention basin. Reducing the excavation required during this conversion by routing storm runoff down Northern Avenue is one element they want to investigate.

The Northern Avenue Diversion features are shown in Plate 3-5. It is assumed that the diversion channel will be located on the north side of Northern Avenue, as per the Loop 303 Report. The Northern Avenue Diversion is separated into segments of different flow rates. The first segment (upstream of NR1) is between the diversion from the North Inlet Channel at Northern Avenue and the delivery canal that crosses Northern Avenue east of the Beardsley Canal. The second segment (NR1 to NR2) extends east of this point to Citrus Road. The third segment (NR2 to NR3) continues from Citrus Road to Cotton Lane, the fourth segment (NR3 to NR4) extends from Cotton Lane to the Loop 303, the fifth segment (NR4 to NR5) is from the Loop 303 to Sarival Avenue, and the final segment (NR5 to NR6) is from Sarival Avenue to Reems Road. (See Plate 3-5 for the segment locations.)



View of Northern Avenue looking east. The Northern Avenue diversion will be located on the north side of the dirt road.

A baseline model for the Northern Avenue Diversion Alternatives was created using data from the Loop 303 Report and unpublished hydrology currently being used by URS to prepare the final report. The URS model was modified by Wood/Patel to use off-line basins instead of on-line basins at the intersections of Northern Avenue with Loop 303 and Reems Road. The required storage volume for on-line basins was 735 acre-feet for the Loop 303 basin and 225 acre-feet for the Reems Road basin. Using off-line basins reduces the required storage to 600 acre-feet for the Loop 303 basin and 180 acre-feet for the Reems Road basin. The basins were assumed to have depths of 14 feet with 4:1 side slopes and 3 feet of freeboard.

The Northern Avenue Diversion Alternatives 1 through 4 model diverting base flows of 600, 700, 800, and 1000 cfs respectively from the North Inlet Channel. The base flow is defined as the bottom portion of the hydrograph, whereas the peak flow is defined as the top portion of the hydrograph. Alternative 5 scalps a peak flow of 600 cfs for the diversion. Alternative 6 for the Northern Avenue Alternatives is the No Action Alternative.

The criteria used by URS for diversion channel design and unit costs were used for alternatives developed by Wood/Patel to allow direct comparison with the baseline model. Accordingly, an earth channel cross-section was assumed with grass lining, a Manning's n-value of 0.03, 6:1 side slopes, a maximum depth of 6 feet, and a maximum velocity of 6 ft/s. The diversion channel excavation depth was calculated as the flow depth rounded up to the closest integer plus 2 feet of freeboard.

Each of the alternatives with the exception of the No Action Alternative includes sloping drops with stilling basins. Culverts at major road crossings are assumed to be 72-inch RCP with a capacity of about 195 cfs per barrel. Each alternative also includes an additional 60 feet of top width for landscaping. Multi-use and aesthetics are also included as components of the diversion channel design.

3.3 Hydraulic Analysis

The primary function of flood control channels is to convey flood flows while protecting life and property. The channel hydraulics were analyzed using the slope conveyance

method. Detailed hydraulic calculations were not performed at this level for drop structures, detention basins, drop inlets, or slope protection; however, these were evaluated for development of the 15% to 30% plans.

3.3.1 North Inlet Channel Hydraulics

The North Inlet Channel alternatives were analyzed using the slope conveyance method. The allowable Froude Number was limited to 0.86 for subcritical flow and was maintained greater than 1.13 for supercritical flow. A backwater analysis was not performed on the channels as part of the alternatives analysis. The culverts were analyzed for hydraulic capacity using FHWA's culvert analysis program, HY-8, Version 6.1 with basic assumptions for tailwater. The resulting headwater requirements were compared with existing topography to verify feasibility. The broad-crested weir equation was used to estimate the length of overflow required for the Alternative 3 off-line detention basin at Olive Avenue.

3.3.2 Northern Avenue Diversion Hydraulics

Many options were considered for the Northern Avenue Diversion to determine their cost effectiveness. Base flow diversions from the North Inlet Channel of 600, 700, 800, and 1000 cfs were analyzed along with a scalped peak flow of 600 cfs. The hydraulic analysis of the alternatives was performed with the channel slope being the same as in the baseline model. The channel bottom width was varied as needed to maintain a channel velocity of less than 6 fps.

Drop structures were analyzed as sloping drops into stilling basins to maintain consistency with the Loop 303 report. The sloping drop was assumed to be at a 10:1 slope with a corresponding length of 10 times the height of the drop. The length of the stilling basin was assumed to be 10 times the flow depth at the bottom of the drop. The depth was calculated using Manning's equation and an n-value of 0.042.

No hydraulic analysis was performed for culvert crossings. The crossings were assumed to be in 72-inch RCP culverts with 195 cfs of flow per barrel. This

assumption was used for the Wood/Patel alternatives to allow a direct comparison to the URS baseline model.

3.4 Evaluation of Alternatives

The cost to implement each alternative was estimated to assist with alternative selection. Other evaluation criteria are identified in the discussion of alternative opportunities and constraints. Criteria to be considered in a discussion of alternative opportunities and constraints include safety, partnering, adjacent land use, ability to implement, public acceptance, agency acceptance, operation and maintenance costs, and environmental impacts.

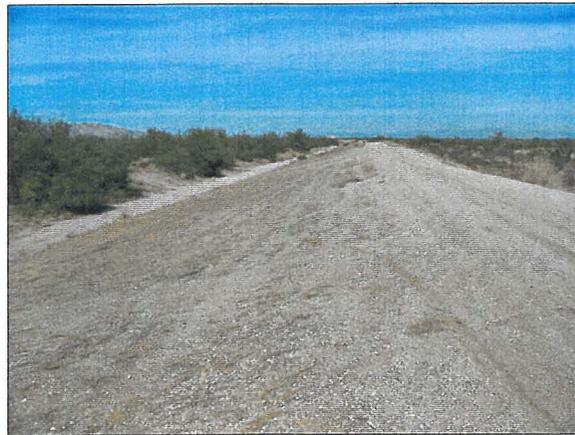
Evaluations of each alternative for the North Inlet Channel and the Northern Avenue Diversion are discussed below.

3.4.1 North Inlet Channel Alternative Evaluation

A detailed cost estimate has been prepared for each of the alternatives. Unit prices used for the North Inlet Channel elements are shown in Table 3-1. The excavation quantities for Alternative 1 were calculated using the difference between the existing ground surface and a surface of the proposed channel cross section generated in MicroStation. The existing ground surface comes from interpolated 2-foot contours and the excavation quantities will be correct within the accuracy of the DTM used to generate the surface. The excavation quantities for Alternative 2 were calculated as a percentage of the excavation calculated for Alternative 1, based upon the ratio of the cross-sectional areas of Alternative 1 and Alternative 2. A unit cost of \$3.25/C.Y. was used for excavation.

Concrete channel lining at a cost of \$310/C.Y. was used for Alternative 2 – Concrete-Lined Channel. The channel lining assumes a 7-inch bottom slab thickness and 5.5 inches for the thickness of the side slopes. The cost of colored concrete for Alternative 3 is \$340/C.Y. The costs for drop structures were estimated using \$310/C.Y. for concrete and \$45/C.Y. for riprap. The drop structure quantities were estimated assuming a stair-step drop and a structure width of 70% of the channel width. The only exception to this is the drop above the basin in Alternative 3. This drop was analyzed using references 15, 16 and

17. The cost of slope protection is \$3/S.F. for 5-inch thickness, \$3.60/S.F. for 6-inch thickness, and \$4.80/S.F. for 8-inch thickness. The cost for landscaping of \$12,000/acre is from the "Rural" column of Table 1 in the Flood Control District *Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects*. See Appendix E for a copy of this policy. Hydroseeding was assumed to cost \$2,200 per acre. Right-of-way was assumed to be \$16,000/acre per input from the District.



Area to receive slope protection and hydroseeding south of Northern Avenue.

The quantity of concrete required for box culverts was taken from the ADOT Structures Section standard drawings. The cost of reinforced concrete for box culverts is \$310/C.Y. The pedestrian trail and the equestrian trail would be either hard-packed earth or the trails would be located on the maintenance road as a multi-use path. The 14-foot wide gravel maintenance road is located adjacent to the improved channel sections. The cost for the maintenance road is \$1/S.F.

An analysis was performed to estimate the present value of operation and maintenance costs for each of the alternatives for a period of 50 years. Based on the data from the District, the cost to maintain concrete features is \$40 per acre of concrete surface per year. The cost to maintain all other desert landscaping features is \$531 per acre of surface area per year. The analysis assumes an inflation rate of 3% and an interest rate of 2%.

Alternatives 1 and 2 both affect 10,750 feet of jurisdictional waters. Alternatives 3 and 4 may affect jurisdictional waters at the Cholla Wash confluence and south of Northern Avenue. The maximum length would be 4,700 feet. Alternative 3 also impacts about 6 acres of jurisdictional waters at the detention pond. Alternative 4 has the least impact to jurisdictional waters.

**Table 3-1
North Inlet Channel Unit Prices**

Item	Unit	Unit Price
Excavation	C.Y.	\$3.25
Channel lining – reinforced concrete	C.Y.	\$310
Channel lining – colored reinforced Concrete	C.Y.	\$340
Railing	L.F.	\$15
Overflow structure – reinforced concrete	C.Y.	\$310
8” thick slope protection – concrete	S.F.	\$4.80
6” thick slope protection – concrete	S.F.	\$3.60
5” thick slope protection – concrete	S.F.	\$3.00
Slope protection toe trench – riprap	C.Y.	\$45
Drop structure – reinforced concrete	C.Y.	\$1310
Drop structure transition – riprap	C.Y.	\$45
Right-of-way	Ac	\$16,000
Desert landscaping	Ac	\$12,000
Hydroseeding	Ac	\$2,200
Box culvert – reinforced concrete	C.Y.	\$310
Maintenance path	S.F.	\$1.00
Aesthetic features	%	4%

Operation & Maintenance	Unit	Unit Price
Concrete features	Ac/Yr	\$40
Landscaped features	Ac/Yr	\$531

Table 3-2 shows the breakdown in cost for improvements. As can be seen from the table, Alternatives 1 and 2 will require almost three times as much capital as Alternatives 3 and 4. Alternative 1 also includes an increased cost for right-of-way acquisition in Segment 1 and Segment 2 to account for property takes that include subdivided lots from the Sonoran Ridge Subdivision. It was assumed that the takes that include subdivided lots would cost twice the amount as other right-of-way. The lots affected can be seen in Plate 3-1.

The advantages of the different alternatives are identified in Table 3-3. Alternatives that have a specific advantage are marked.

**Table 3-2
North Inlet Channel Cost Summary**

Construction Elements	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Excavation	\$4,104,412	\$817,100	\$357,178	\$296,436
Channel Lining	\$0	\$6,646,252	\$337,291	\$0
Railing	\$0	\$322,500	\$20,700	\$0
Overflow Structure	\$0	\$0	\$127,100	\$0
Slope Protection	\$0	\$0	\$972,188	\$921,788
Drop Structures	\$2,969,137	\$578,704	\$66,620	\$230,268
Culverts	\$369,939	\$369,939	\$418,587	\$544,447
Landscaping	\$1,231,956	\$171,763	\$213,494	\$193,853
Maintenance Road	\$150,500	\$150,500	\$83,580	\$72,100
Aesthetic Treatment	\$368,064	\$360,376	\$107,937	\$94,632
Construction Subtotal:	\$9,194,009	\$9,417,133	\$2,704,675	\$2,353,523
12% Engineering & Construction Administration	\$1,103,281	\$1,130,056	\$324,561	\$282,423
20% Construction & Other Contingency	\$1,838,802	\$1,883,427	\$540,935	\$470,705
Construction Total:	\$12,136,092	\$12,430,616	\$3,570,170	\$3,106,650
Right-of-Way				
Right-of-Way	\$1,607,620	\$446,899	\$335,879	\$300,771
10% Administrative Costs	\$160,762	\$44,690	\$33,588	\$30,077
Right-of-Way Total:	\$1,768,382	\$491,589	\$369,467	\$330,848
PROJECT TOTAL (Rounded):	\$13,900,000	\$12,900,000	\$3,900,000	\$3,400,000
Operation & Maintenance				
50 Year Operation & Maintenance	\$3,592,083	\$581,375	\$807,885	\$742,051
LIFE CYCLE TOTAL (Rounded):	\$17,500,000	\$13,500,000	\$4,700,000	\$4,200,000

Table 3-3

North Inlet Channel Alternative Opportunities Evaluation

Advantage	Alternative				
	1	2	3	4	5
Increased safety	•	•	•	•	
Cost effectiveness			•	•	•
Partnering opportunities			•	•	
Low impact of adjacent neighbors			•	•	•
Ability to implement monetarily			•	•	•
Acceptable to Public			•	•	
Acceptable to DISTRICT			•	•	
Low environmental impact			•	•	•
Provides relief to FRS #3 inflow volume				•	
Low O & M costs		•	•	•	
Ability to phase construction			•	•	
Low Construction Impact			•	•	•

Some alternative opportunities are not identified in Table 3-3. Because the owner of property over which breakout flow traverses is responsible for the conveyance across the property, an agreement might be possible for cost participation with the MWD in the form of land acquisition for property on the east side of the Beardsley Canal and assistance with improvements through this area as part of Alternative 4. This agreement may also include right-of-way for a channel along Northern Avenue between the Beardsley Canal and Perryville Road if a Northern Avenue Diversion Alternative is selected.

3.4.2 Northern Avenue Diversion Alternative Evaluation

The Northern Avenue Diversion Alternative evaluation includes a determination of cost savings due to reduced excavation in FRS #3 if storm runoff is diverted down the Northern Avenue alignment. *The unit prices used in the URS Loop 303 Report were utilized for all Northern Avenue Diversion elements so a direct comparison could be made to the Baseline model.* These unit prices are shown in Table 3-4. The excavation quantity for the detention basins includes three feet of

freeboard. The area required for the basin includes an extra 30-foot wide strip of land around the basin. It was assumed that drop structures would be grouted riprap.

Table 3-4
Northern Avenue Diversion Unit Prices

Item	Unit	Unit Price
Excavation	C.Y.	\$3.25
Grouted riprap (drop structure)	C.Y.	\$130
Landscaping	Ac	\$2,500
Right-of-way	Ac	\$40,000
72-inch diameter RCP	L.F.	\$345
Headwalls & apron	C.Y.	Varies
Aesthetics & multi-use	S.F.	\$1.30
Detention basin excavation	C.Y.	\$5.00

Table 3-5 shows a cost analysis of the Baseline model and the five Northern Avenue Diversion Alternatives. The Baseline model is the URS Preferred Recommended Alternative for the Loop 303 Report, modified by Wood/Patel to have off-line basins along Northern Avenue instead of on-line basins. The table shows the estimated total cost of improvements for each alternative. The cost for each alternative is obtained by subtracting the cost of improvements for the Baseline model from the cost of improvements for the alternative. The unit cost for excavation in FRS #3, taken from Table 4-1 in the URS *White Tanks FRS #3 Design Issues/Basin Alternatives Report, Vol. I*, is \$8,600 per AcFt. The cost reduction at the FRS #3 Basin, as a result of diversion, is \$8,600 times the diversion volume in AcFt. The net cost of each alternative is the difference between the cost of the alternative and the excavation cost reduction. As seen from the table, a 600 cfs base flow diversion would cost \$0.9 million, and a 600 cfs scalped peak flow diversion would cost \$2.0 million.

**Table 3-5
Northern Avenue Diversion (NAD) Cost Summary (in millions)**

Alternative	Description	Cost to Divert Flow Along Northern	Acre-Feet Diverted	Cost Reduction at FRS #3 Basin as Result of Diversion	Net Cost of Diversion Alternative
Baseline Model	URS preferred recommended alternative	\$0.0 M	0	\$0.0 M	\$0.0 M
NAD Alternative 1	Divert 600 cfs base flow	\$2.8 M	224	\$1.9 M	\$0.9 M
NAD Alternative 2	Divert 700 cfs base flow	\$3.4 M	240	\$2.1 M	\$1.3 M
NAD Alternative 3	Divert 800 cfs base flow	\$3.8 M	258	\$2.2 M	\$1.6 M
NAD Alternative 4	Divert 1,000 cfs base flow	\$4.5 M	288	\$2.5 M	\$2.0 M
NAD Alternative 5	Scalp 600 cfs peak	\$2.1 M	10	\$0.1 M	\$2.0 M

There are several advantages of diverting flow down the Northern Avenue alignment, which include:

- The time to drain FRS #3 or a detention basin will be reduced.
- A diversion down the Northern Avenue alignment is a shorter pathway to an ultimate discharge point for storm runoff at the Agua Fria River.

The disadvantages of sending flow down the Northern Avenue alignment are:

- It is not known when FRS #3 will be converted to a detention facility.
- The cost is higher than providing additional storage capacity at FRS #3.

Selecting the Do-Nothing Alternative would result in the North Inlet Channel operating without a diversion down the Northern Avenue alignment. The entire 100-year storm discharge would be routed into FRS #3.

4.0 RECOMMENDATIONS & CONCLUSIONS

4.1 North Inlet Channel – Selected Alternative

The alternative that best fulfills the goals of the project in terms of cost, public acceptance, agency acceptance, and potential for partnering is Alternative 4 – Additional Channel on East Side of Beardsley Canal. This alternative also has the lowest impact to jurisdictional waters of any of the alternatives.

Alternative 4 has the lowest estimated construction cost of all the alternatives. The estimated cost is a half million dollars less than the next lowest cost alternative. This alternative was the preferred alternative by the majority of those who completed feedback forms at the Public Meeting held on April 16, 2002. It was also preferred by those present at the Stakeholder Meeting held on May 7, 2002. It has agency acceptance and was determined to have a high potential for project partnering at the Stakeholder Meeting.

Other advantages of this alternative include: alternative maintains a trail linkage along the project length, requires the least maintenance effort, has the least impact to adjacent neighborhoods, has a low impact to natural desert, and does not require land acquisition from Sonoran Ridge or the State Land Department.

4.2 Northern Avenue Diversion – Selected Alternative

After reviewing the data prepared, the District determined that No Action would be taken at this time on the Northern Avenue Diversion. Implementation of this diversion is dependant on the outcome of other District projects and goals and will be evaluated later.

4.3 Recommendations

Our recommendation is to proceed with 15 to 30% plan preparation using Alternative 4 – Additional Channel on East Side of Beardsley Canal.

5.0 15% TO 30% DESIGN PLAN AND PROFILE

This section describes the design features included in the 15% to 30% plans. Appendix G contains a half-size set of the plan and profile sheets. The Beardsley Canal Wash south of Northern Avenue and the proposed additional channel east of the Beardsley Canal between Northern Avenue and Olive Avenue has been modeled with HEC-RAS to determine appropriate hydraulic parameters. The HEC-RAS model output is included in Appendix H. Individual design elements and engineering assumptions are described below.

5.1 Channel

A desertscaaped, meandering channel is proposed between Olive Avenue and Northern Avenue immediately east of the Beardsley Canal. The right-of-way required for this channel alignment is 160 feet wide. The channel side slopes vary from 8:1 to 4:1 with a 10-foot wide meandering bottom. The channel has a design slope of 0.09 % with ten 3.6-foot drops that results in a stable channel design. The estimated design capacity of the channel is 622 cfs with a design velocity of 3.2 ft/s. The freeboard is one foot per District guidelines. The channel embankment upstream of the box culvert at Northern Avenue will be raised two feet to provide for headwater at the culvert inlet.

Modifications to the existing Beardsley Canal Wash south of Northern Avenue are proposed at three locations to provide the necessary capacity and freeboard. Two locations require widening the channel at natural constrictions on the west overbank. One of these requires a temporary construction easement. The third location just south of Northern Avenue requires channel widening on both the east and the west sides of the channel. This work may impact the channel below the ordinary high water mark, which would require that a 404 permit be obtained during final design.

5.2 Landscape Concept

Refer to Typical Existing Condition Photo and Potential Channel Character Sketch for a comparison of the “before” and “after” potential of the selected channel alternative in Appendix A. Also see the Grade Drop Structure Sketch, which depicts how sloping drops may be constructed, and Drainage Structure Aesthetic Enhancement Sketch for examples of possible aesthetic treatments for the drainage control structures. It may also

be helpful to refer to the Alternative 4, North Inlet Channel Cross Section Graphics. These are all found in Appendix A.

The Preliminary Landscape Concept is provided to ensure that various factors are considered and included as an integral part of the overall design process of the Flood Control Improvements. The key components of this flood control project landscape include:

1. Preservation of the existing indigenous vegetation, where possible.
2. Restoration and revegetation of all surface areas disturbed as a result of flood control improvements.
3. Building in opportunities for future recreation amenities, which may include facilities for pedestrian and equestrian use, such as multi-use trails, pedestrian nodes, and access control points.
4. Integration of aesthetic grading and sculptural earth forms as part of the channel grading.
5. Establishing transitional areas to enhance the visual quality of the corridor and provide landscape buffers between adjacent future development.

A primary objective of the preliminary landscape concept is to first insure that the flood control facility is designed and dimensioned to allow for the inclusion of desired aesthetic enhancements and future potential recreation amenities. Secondly, the landscape concept should establish the necessary design guidelines and criteria for landscape-related revegetation, erosion protection, and other aesthetic enhancements.

As an integral part of the project engineering design, provisions have been made to allow adequate space for sculptural grading and earthwork, as well as landscape buffers. Provisions have also been made to allow for future potential recreation amenities. Design of the natural revegetation and restoration of the flood control channel will be reflective of patterns and character of the natural desert washes and White Tanks foothills to the west. Where possible, disturbance will be minimized and existing vegetation will be preserved in place. Revegetation will be accomplished primarily through the use of hydroseeding native seed mix varieties indigenous to the project area. Some supplemental planting of native nursery-grown or salvaged tree species will be included

at selected high-visibility or potential recreation node locations. All landscape plantings and grading will attempt to re-establish the natural character, patterns, and topography of adjacent natural desert washes.

From just north of Olive Avenue, the proposed channel alignment will diagonally cross from the west side of Beardsley Canal, across Olive Avenue, to the east side of the Beardsley Canal. The channel alignment will remain on the east side of the canal until it again diagonally crosses Northern Avenue from the east side of the Beardsley Canal back to the west side of Beardsley Canal. From just north of Olive Avenue to Northern Avenue, the proposed channel design will typically include a 160-foot wide right-of-way, of which a minimum of 94 feet will be required for the actual channel. The remaining 66 feet will be utilized to include a 16-foot wide operations and maintenance road, a potential 8- to 10-foot wide trail, and to allow for the manipulation of both the channel slopes and meandering of the alignment. The remaining portion of the 66 feet will be utilized to provide sculptural grading enhancements and landscape buffers. The desired effect will be to provide varied channel side slopes ranging from a minimum 8:1 slope to a steeper 4:1 maximum slope.

Recommended Revegetation Plant Species

Proposed planting and seed mixes shall consist of the following species:

Trees:

Celtis pallida – Desert Hackberry
Celtis reticulata – Netleaf Hackberry
Cercidium floridum – Blue Palo Verde
Cercidium microphyllum – Foothills Palo Verde
Chilopsis linearis – Desert Willow
Prosopis velutina – Native Mesquite

Shrubs:

Baccharis sarothroides – Desert Broom
Dondonea viscosa – Hopbush
Hyptis emoryii – Desert Lavender
Justica californica – Chuparosa

Larrea tridentata – Creosote
Lycium sp. – Wolfberry
Trixis californica – Trixis
Vauquelinia californica – Arizona Rosewood
Zizyphus obtusifloia – Graythorn

Groundcovers and Accents:

Ambrosia ambrosioides – Giant Bursage
Ambrosia deltoidea – Bursage
Baileya multiradiata – Desert Marigold
Carnegia gigantea – Saguaro
Encelia farinosa – Brittlebush
Ferocactus wislizenii – Barrel Cactus
Fouquieria splendens – Ocotillo
Optuntia phaeacantha – Prickly Pear
Penstemon sp. – Penstemon

Native Seed Mixes:

In addition to the above-listed plant species, the seed mixtures shall include indigenous grasses, forbs, and wildflowers.

Placement of plants will consider proximity to the proposed multi-use trail, required vertical and horizontal clearances, views, security and safety of users, varying degrees of enclosure, climate mitigation, and buffering/screening of adjacent properties.

5.3 Box Culverts

To insure a 100-year dry crossing, the main Beardsley Canal Wash flows (2,201 cfs) will be conveyed under Olive Avenue through two existing pipe culverts, a double-barrel box proposed by the Sonoran Ridge development, and a double-barrel box proposed by this project. The existing pipe culverts are one 86.5” x 67.25” CMP arch, and one 93.5” x 71.75” CMP arch. The box proposed by the Sonoran Ridge development is a double-barrel 10’ x 6’ box and this project proposes a double-barrel 10’ x 5’ box culvert. The length of the box is 50 feet to match the box proposed by the Sonoran Ridge development.

At Olive Avenue, the diversion of breakout flows (622 cfs) into the proposed channel east of the Beardsley Canal will be conveyed through a single 10' x 4' box culvert. The length of this box will be approximately 160 feet. A 50-foot diversion weir will connect to this box at the upstream end. This box crosses diagonally under the Beardsley Canal at Olive Avenue. An effort was made to verify clearances between the box and the Beardsley Canal pipe based on best available information, however, horizontal and vertical crossing clearances with the canal pipe and appurtenances should be verified during final design.

To assure a 100-year dry crossing, the main Beardsley Canal Wash flows (6,423 cfs) will be conveyed across Northern Avenue in an eight-barrel 10' x 7' box culvert with a length of 64 feet. One foot of freeboard is available for the channel design flows at the inlet. The length of the culvert is designed to place the north headwall at the right-of-way line and to accommodate a 30-foot roadway width to match existing conditions. Future improvements will require additional length of box culvert.

A triple-barrel 10' x 4' box culvert will divert flows (622 cfs) from the proposed channel east of the Beardsley Canal back into the Beardsley Canal Wash at Northern Avenue. This box crosses diagonally under the Beardsley Canal at Northern Avenue. An effort was made to verify clearances between the box and the Beardsley Canal pipe based on best available information, however, horizontal and vertical crossing clearances with the canal pipe and appurtenances should be verified during final design. The length of this box will be approximately 280 feet.

5.4 Buried Slope Protection

Slope protection will be buried in the east side embankment of the Beardsley Canal Wash in two segments: 1) at the confluence with Cholla Wash and 2) between Northern Avenue and the White Tanks FRS#3. The buried protection design consists of a concrete lining, constructed at a 2:1 slope with a cutoff at the top of slope and a toe trench filled with loose riprap. The riprap is buried under two feet of earth. The placement of this protection at these locations will disturb jurisdictional waters of the U.S. and will require 404 permit work during final design.

The slope protection at the confluence with Cholla Wash is intended to provide erosion protection for the area that experiences flow disturbances due to the impinging and converging flows. The length of protection needed was estimated using streamlines through the confluence area. The actual length of the protection should be determined using more detailed analysis during the final design stage. The height of the buried protection is 9.5 feet above the wash invert. The toe-down depth varies between 6 and 8 feet below the invert, with the depth dependant on the distance of the protection from the confluence. The thickness of the concrete lining is 8 inches, due to the impinging flow from Cholla Wash.

The slope protection between Northern Avenue and the White Tanks FRS#3 varies between 6 and 11 feet above the wash invert with a toe-down depth of between 6 and 8 feet below the invert. The thickness of the concrete lining is 5 inches because of streamline flow conditions.

5.5 Drops

Ten sloping drops are required along the proposed channel east of the Beardsley Canal. Each drop falls 3.6 feet down a 3:1 slope. The drop has 2-foot thick riprap aprons, extending 10 feet upstream and downstream of 8-foot deep cut-off walls.

5.6 Diversion Weir

Breakout flows at Olive Avenue will be collected in a diversion weir box and routed to the east side of the Beardsley Canal. During the 100-year flood event, 622 cfs will flow over the diversion weir and 2201 cfs will pass through the main Beardsley Canal Wash culverts. The height of the weir is such that no overflow will occur until the flow rate in the main channel has exceeded approximately 960 cfs. This will ensure that the proposed channel east of the Beardsley Canal will be dry during all but significant events. The weir is 50-feet long, 10-feet wide and has a depth of 8.5 feet. It will discharge directly into the box culvert which feeds the proposed channel east of the Beardsley Canal. The diversion weir requires a temporary construction easement and a permanent drainage easement.

The construction of this feature at this location will disturb jurisdictional waters of the U.S. and will require 404 permit work during final design.

5.7 Probable Cost of Construction

The estimated probable cost of construction for the 15% to 30% plans is summarized in Table 5-1.

Table 5-1

Preferred Alternative – Probable Opinion of Construction Cost

Construction Elements	Cost
Excavation	\$319,093
Slope Protection	\$809,144
Drop Structures	\$440,190
Culverts	\$536,426
Landscaping	\$240,842
Maintenance Road	\$72,100
Aesthetic Treatment	\$99,409
Construction Subtotal:	\$2,517,205
12% Engineering and Construction Administration	\$302,065
20% Construction and Other Contingency	\$503,411
Construction Total:	\$3,322,711
Right-of-Way	
Right-of-Way	\$308,283
10% Administrative Costs	\$30,828
Right-of-Way Total:	\$339,111
PROJECT TOTAL (Rounded):	\$3,700,000
Operation and Maintenance	
50-Year Operation and Maintenance	\$878,024
LIFE CYCLE TOTAL (Rounded):	\$4,500,000

6.0 FINAL DESIGN – ISSUES AND RECOMMENDATIONS

This section contains design issues that should be considered during final design of the project. This will help with understanding the level of design represented by the 15% to 30% plans. The following design issues have been identified:

- No boundary survey was completed for this pre-design study. The location of the mid-section line used as the project control line is based on the best available data, however, it is approximate. Actual locations of property and/or control lines should be verified in final design.
- Additional flow breakout locations have been shown by URS (see reference 5) in their ongoing study of this area that should be evaluated in terms of meeting the basic goal of preventing breakouts across the Beardsley Canal.
- A minimum one-foot of freeboard was used for the design of the 15% to 30% plans. FEMA has recognized a zero freeboard condition in the study that determined breakouts along the Beardsley Canal (Regulatory FIRM). A future evaluation of the FEMA requirements with regard to freeboard is needed in the final design.
- The Beardsley Canal wash box culverts at Olive Avenue were designed as an in-kind improvement. The overflow structure is shown at existing north right-of-way, however, the final design will need to reevaluate the location of this structure relative to current right-of-way.
- The main channel box culvert at Northern Avenue is designed with the north headwall located at the ultimate location of the north right-of-way line. The dirt road crossing the proposed boxes requires realignment. The location of the southernmost headwall should be reevaluated during final design.
- Subsidence was investigated during the preparation of the AGK Inlet Improvements Report (see Reference 11). The estimated subsidence between 1994 and 2035 was estimated at 1.7 feet at Peoria Avenue, 0.0 feet at Olive and Northern Avenues, and 0.0 to 1.4 feet at Glendale Avenue. Based upon this data, subsidence should not be of much concern since most of the channel improvements are located between Olive and Northern Avenues. For improvements south of Northern Avenue, any subsidence would only increase slope and reduce flow depths.
- The inspection requirements for buried slope protection will have to be determined prior to the final design phase.

- At the beginning phase of the pre-design study, the Sonoran Ridge development had already platted the northern portion of the subdivision. They chose to leave the Beardsley Canal Wash in a natural state in between Northern and Olive Avenues and the floodplain was redefined using the District's new flows.
- Cholla Wash presents a special concern due to the 90-degree angle of inflow and impinging condition on the Beardsley Canal embankment; therefore, protection will be added at this location.
- It is recommended that a partnering/cost-sharing relationship be established with the Maricopa Water District (MWD) as well as other partners to assist with development of the project due to the benefits that this project will provide to MWD property.
- An attempt was made to account for the cost of aesthetic enhancements presented in this report, however, the ultimate appearance, quantity and location of enhancements in the final design may be different due to budgetary and hydraulic constraints.
- The proposed channel east of the Beardsley Canal was designed with two feet of freeboard. A model check was run to assess the effect of increased vegetative cover in the channel and it was determined that if the Manning's n is increased from 0.03 to 0.04, the resulting freeboard would be one foot.
- A final determination has not been made on the decision to replace White Tanks FRS#3 with a basin or not. The District is also seeking Federal funding assistance for the White Tanks FRS#3 project. These issues will need to be considered during final design.
- An extensive sediment analysis was not performed in this study. Effects of sediment movement on project features and functionality should be investigated during final design.

7.0 REFERENCES

1. URS, *Design Issues and Basin Alternatives Report – Volume 1: White Tanks FRS #3 Modifications Design Project*, August 2001.
2. URS, *Design Issues and Basin Alternatives Report – Volume 2 - Appendices: White Tanks FRS #3 Modifications Design Project*, August 2001.
3. URS, *White Tanks FRS #3 Cultural Resources Inventory*, August 2001.
4. URS, *White Tanks FRS #3 General Environmental Report*, August 2001.
5. URS, *Level II Draft Phase II Alternatives Analysis Report: Loop 303 Corridor/White Tanks Area Drainage Master Plan Update*, September 2001.
6. URS, *Draft Existing Condition Hydrology: Loop 303 Corridor/White Tanks Area Drainage Master Plan Update*, June 2001.
7. PBS&J, *Candidate Assessment Report: McMicken Dam/White Tanks #3*, February 24, 1999.
8. The WLB Group, Inc., *White Tanks/Agua Fria Area Drainage Master Study - Part B: Area Drainage Master Plan*, December 1994.
9. Logan Simpson Design, Inc., *Landscape Aesthetics Assessment and Multi-Use Opportunities Assessment*, July 6, 2001.
10. Premier Engineering Corporation, *Drainage Report for Final Plat – Unit 1, Sonoran Ridge Estates*, March 2000.
11. AGK Engineers, Inc., *White Tanks Flood Retention Structure no. 3 Inlet Improvements, Final Concept Design Report*, December 1994.
12. URS, *White Tanks FRS #3 Design Issues/Basin Alternatives Report*, August 2001.

13. SWCA, Inc., *Sonoran Ridge Estates, Section 404 Report*, August 1, 2001.
14. Dames & Moore, *White Tanks FRS #3 Modification Design Report, Draft Design Issues Report*, November 20, 1998.
15. Chamani, M.R. and N. Rajaratnam, *Jet Flow on Stepped Spillways*, Dept. of Civil Engineering, University of Alberta, Edmonton, Alberta, Canada, 1993.
16. FHWA, HEC No. 14, *Hydraulic Design of Energy Dissipators for Culverts and Channels*, 1983.
17. Christodoulou, G., *Skimming Flow in Stepped Spillways*, Journal of Hydraulic Engineering, Vol 119, No. 5, 1993.
18. Alpha Geotechnical & Materials, Inc., *Geotechnical Subsurface Exploration for the Proposed White Tanks Flood Retarding Structure #3, North Inlet Channel*, January 16, 2002.



APPENDIX A
PUBLIC MEETING EXHIBITS &
NEWSLETTERS

Public Meeting

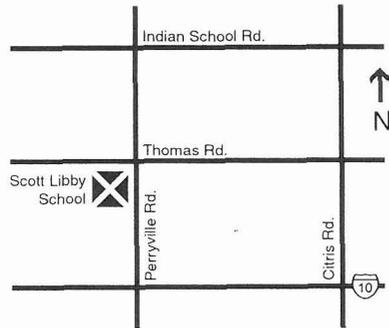
This public meeting is being held to present the preliminary findings of the study and to obtain input from the community. Exhibits of preliminary floodplain delineations will be on display at the meeting, in addition to diagrams of the various solutions. Furthermore, representatives from the Flood Control District and engineering consultants will be available to discuss the study and to answer any questions.

If you are unable to attend and have specific questions or comments, please contact any of the study representatives listed in this brochure by phone, e-mail, or mail.

Meeting Location

Tuesday, April 16
5-7 p.m.

Scott Libby School
18701 West Thomas Road
Litchfield Park



Contact Us

Valerie Swick
Project Manager
Flood Control District
(602) 506-2929
vas@mail.maricopa.gov

Ash Patel
Consultant

Wood Patel & Associates
(602) 335-8500
apatel@woodpatel.com



For more information on the
Flood Control District of Maricopa County,
visit www.fcd.maricopa.gov

Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, AZ 85009

OPEN HOUSE

Preliminary
Floodplain Delineations



White Tanks
North Inlet Channel
Improvements

The Flood Control
District of
Maricopa County



Tuesday, April 16
5-7 p.m.

Scott Libby School
18701 West Thomas Road
Litchfield Park

civil engineers
WOOD
PATEL
consult. management
hydrologists

In cooperation with
Wood, Patel & Associates, Inc.

Problem

The North Inlet Channel of the White Tanks Flood Retarding Structure, which is located west of the Beardsley Canal, currently does not have enough capacity to carry a heavy storm. The stormwater will overtop at the Beardsley Canal roads from the main wash and will create a flood hazard area downstream.

Study Purpose & Goals

The Flood Control District of Maricopa County is looking at a range of alternative solutions to fix the problem and eliminate the flood hazard area.

Simultaneously to the North Inlet Channel Improvement Study, the District is also conducting a floodplain delineation study to determine which properties have the potential to be flooded in the area between Perryville and Citrus Road, and Peoria Avenue and Indian School Road.

Certain improvements to the North Inlet Channel could prevent breakouts over the Beardsley Canal and reduce the floodplain downstream of the canal.

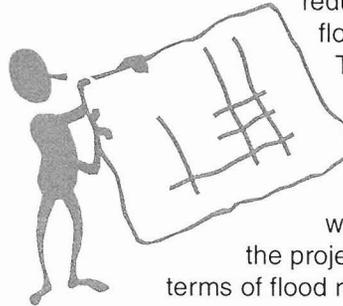
The preliminary floodplain study will be used by the District to better manage the floodplain, to reduce or prevent flood damage, and to maintain the integrity of the floodplains.

The study:

- identifies measures to prevent breakouts over the Beardsley Canal from the North Inlet Channel;
- provides recreational opportunities along the channel;
- considers the aesthetic character of the channel and its associated features
- gathers community input and direction
- identifies cost-share participants

Progress

Over the past five months, the study team not only analyzed area conditions, but worked with local stakeholders and residents to create several solutions that reduce the risk of flooding in the area. The solutions will be evaluated with public input, to determine which best serve the project's goals in terms of flood reduction, safety, use of public funds, recreational features, and community desires. The District will present these solutions at this public meeting.

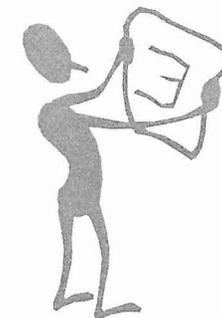
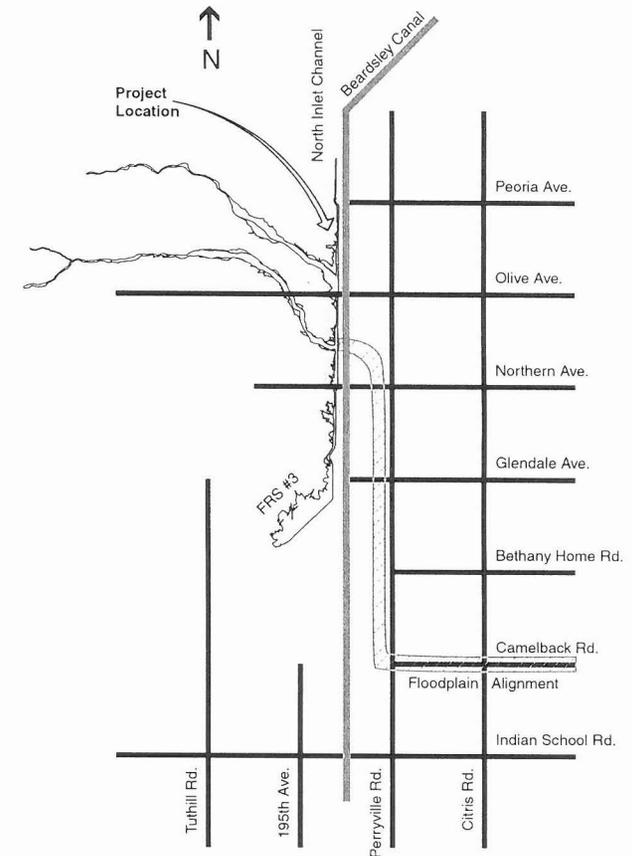


Study Schedule

	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02
Data Collection	■							
Alternative Development		■	■	■				
Alternative Evaluation			■	■	■			
Recommended Alternative					■	■		
Pre-Design Study						■	■	
Stakeholder Involvement		●	●			●		
Public Involvement					●	●		

● = Meetings

Study Area

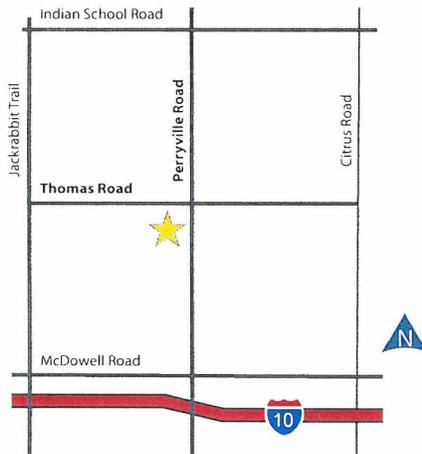


Open House

Exhibits of the preferred alternative will be on display at the public meeting, in addition to diagrams of the various features. Furthermore, representatives from the Flood Control District and the engineering consultants will be available to discuss the alternative and to answer any questions.

Scott Libby Elementary School Cafeteria

5:00 p.m. - 7:00 p.m.
Presentation: 5:30 p.m.
Wednesday, June 5, 2002



Contact Us

Valerie Swick, Project Manager
Flood Control District of Maricopa County
602-506-2929
vas@mail.maricopa.gov

Ash Patel, Consultant Project Manager
Wood Patel & Associates
602-335-8500
apatel@woodpatel.com

Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009
(602)506-1501



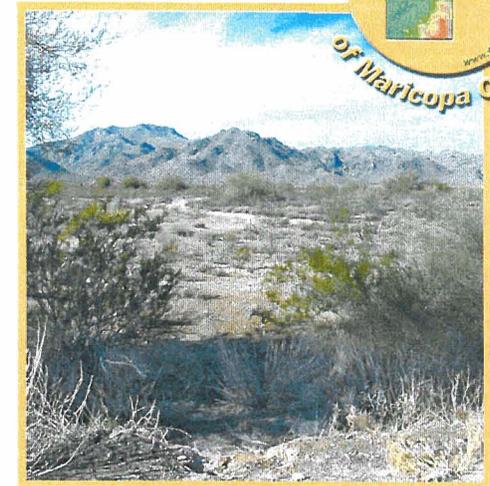
www.fcd.maricopa.gov

OPEN HOUSE

Scott Libby Elementary School Cafeteria

5:00 p.m. - 7:00 p.m.
Presentation: 5:30 p.m.
Wednesday, June 5, 2002

White Tanks North Inlet Channel



Preferred Alternative Selected



In cooperation with Wood, Patel & Associates

Why Is This Project Necessary?

The Beardsley Canal Wash, which flows into the White Tanks Flood Retarding Structure #3 and is located west of the Beardsley Canal, currently does not have enough capacity to carry a heavy storm. The stormwater overtops the canal at certain points and creates a flood hazard area downstream.

Project Overview

Over the past six months, the study team has analyzed the area conditions and problems and worked with local stakeholders and residents to identify possible alternative solutions to reduce the risk of flooding in the area. These alternatives were presented to the community in April, 2002.

Based on community input, the study team has now identified a recommended alternative for the area.

Preferred Alternative

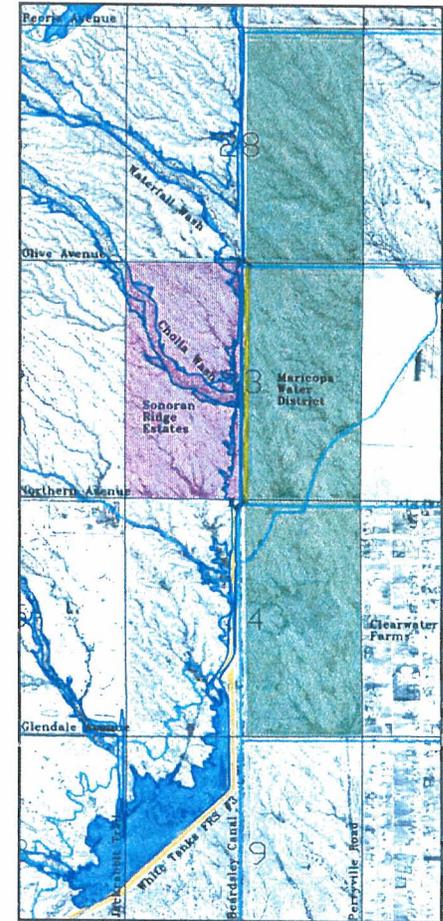
The preferred alternative, which creates an additional channel on the east side of the Beardsley Canal, provides 100-year level of flood protection to the properties east of the canal. It prevents the breakouts over the canal and reduces the floodplain downstream. This alternative, which was preferred by a large majority of the public and the area stakeholders, captures the breakout water at Olive Avenue. The water is then directed south to an additional native desert-scaped earthen channel which crosses back to the east side of the Beardsley Canal at Northern Avenue.

This alternative also provides an open space corridor, which may include pedestrian and equestrian trails from the White Tanks Flood Retarding Structure #3 up to Olive Avenue and culverts at both Northern and Olive Avenues. In this alternative, the natural wash running along the west side of Beardsley Canal would remain undisturbed, except for embankment protection at certain points.

This alternative had a number of advantages over the others presented. The alternative provides the lowest construction impact to the neighborhood, disturbs the least amount of desert, and costs the least of all the proposed alternative solutions.

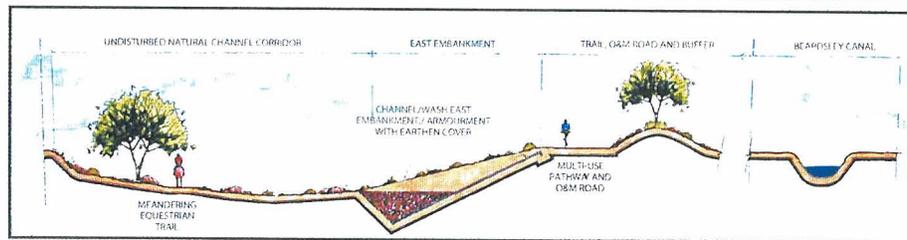
As part of the project, the study team would re-naturalize the new channel corridor to reflect the area topography and character.

Project Area



Next Steps

This pre-design study will be concluded by the end of June 2002. The Flood Control District will then work to secure cost-sharing partners and project funding. Currently, the project is scheduled to move into the design phase in early 2003. The community will remain involved and informed throughout the next phases of the project.

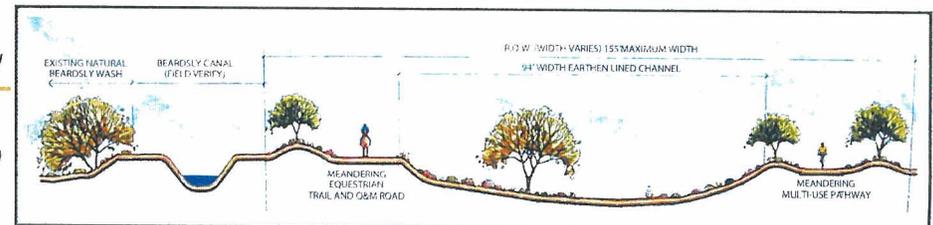


TYPICAL SECTION VIEW

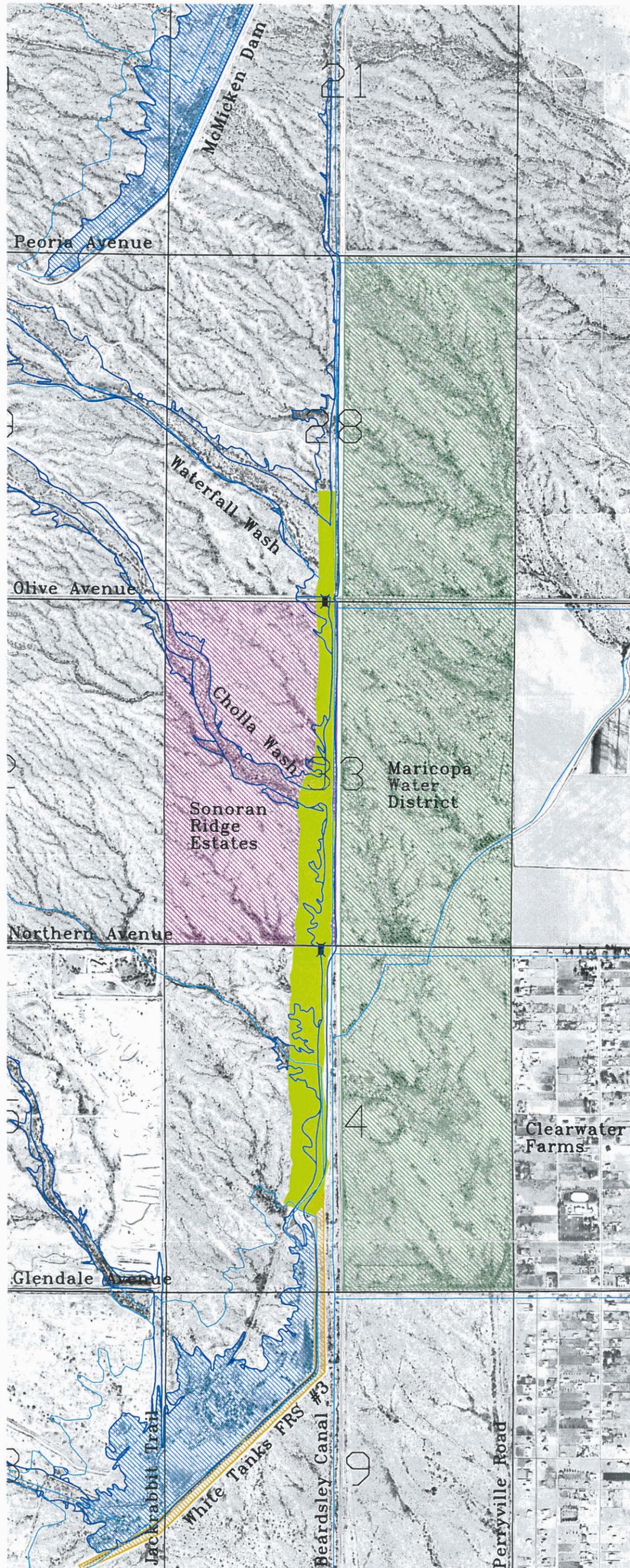
CHANNEL EAST EMBANKMENT ARMOURMENT (SOUTH OF NORTHERN AVENUE) (VIEW LOOKING NORTH)

TYPICAL SECTION VIEW

ADDITIONAL CHANNEL EAST OF BEARDSLEY CANAL (BETWEEN NORTHERN AND OLIVE) (VIEW LOOKING NORTH)



ALTERNATIVE 1 NATIVE DESERTSCAPED EARTHEN CHANNEL



LEGEND

- NATIVE DESERTSCAPED CHANNEL & TRAILS
- CULVERTS

ALTERNATIVE 1 DESCRIPTION

This alternative consists of native desertscaped earthen channel improvements with trails from Flood Retarding Structure #3 to Olive Avenue including culverts at both Northern and Olive Avenues.

VISUAL CHARACTERISTICS

- Variable width native desertscaped earthen channel parallel to the west edge of the existing Beardsley Canal.
- Design and grading will attempt to re-naturalize the channel corridor to be reflective of the topography and character of nearby natural washes.
- Designed to provide opportunities for future recreational trail linkages.
- Revegetation and/or restoration will be accomplished using native seed mixes and select tree plantings.
- The native desertscapes palette includes native Sonoran desert plant species patterned and arranged to reflect the density and patterns found in the washes and foothills of the White Tank Mountains.

OPPORTUNITIES

- Provides 100-year flood protection to the properties east of Beardsley Canal by improving Beardsley Canal Wash Corridor.
- Provides a native desertscaped open space corridor including equestrian and pedestrian trails from the White Tanks Flood Retarding Structure #3 to Waterfall Wash.
- Provides a 100-year crossing across the wash at both Northern and Olive Avenues.

CONSTRAINTS

- Requires 91 acres of right-of-way/easements through Sonoran Ridge Estates and State Land Department. Impacts a large number of lots through Sonoran Ridge Estates.
- Trail access limited to narrow corridor along west side of Beardsley Canal.
- Requires highest effort for the maintenance.
- Maximum area of natural desert disturbed.
- Creates maximum construction impact to the neighborhood.
- Highest cost.

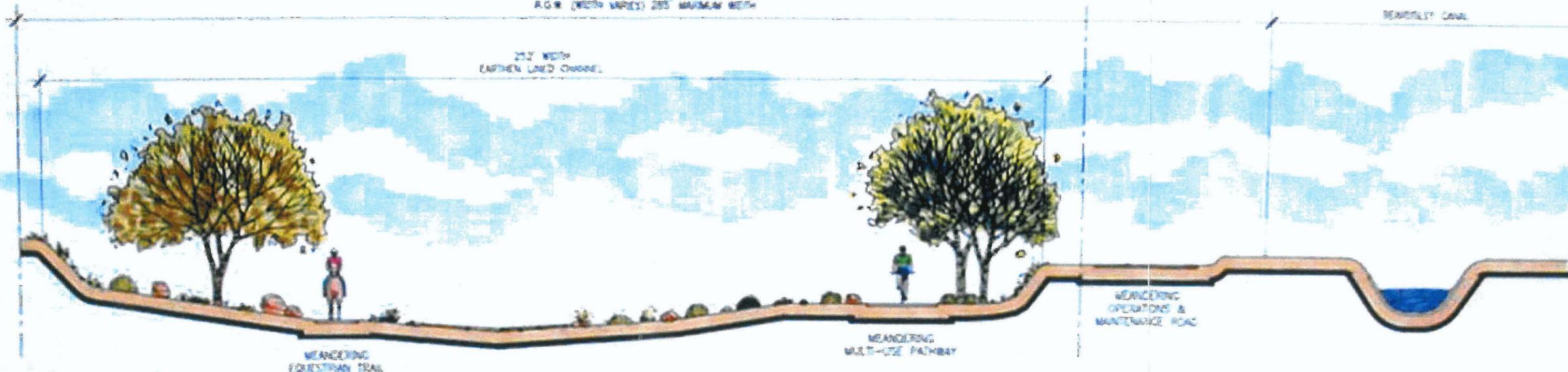
PROJECT COST

\$14 million

NOTE: ALL REVEGETATION
PLANTING SHOWN REFLECTS
PROJECTED GROWTH OF TWENTY
YEARS POST CONSTRUCTION.

ALTERNATIVE 1 NATIVE DESERTSCAPED EARTHEN CHANNEL

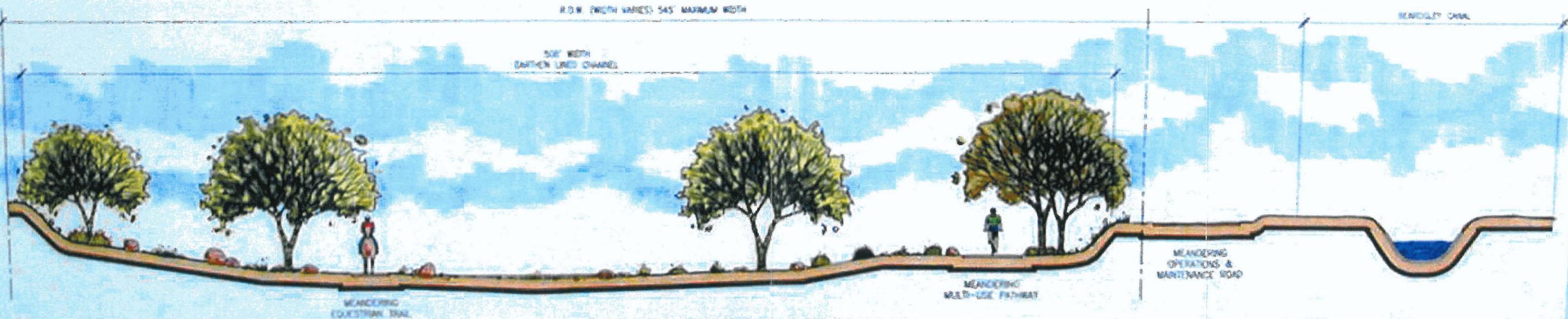
R.O.W. (WIDTH VARIES) 285' MAXIMUM WIDTH



TYPICAL SECTION VIEW

CHANNEL WEST OF BEARDSLEY CANAL (NORTH OF CHOLLA WASH)
(VIEW IS LOOKING NORTH)
N.T.S.

R.O.W. (WIDTH VARIES) 545' MAXIMUM WIDTH



TYPICAL SECTION VIEW

CHANNEL WEST OF BEARDSLEY CANAL (SOUTH OF CHOLLA WASH)
N.T.S.

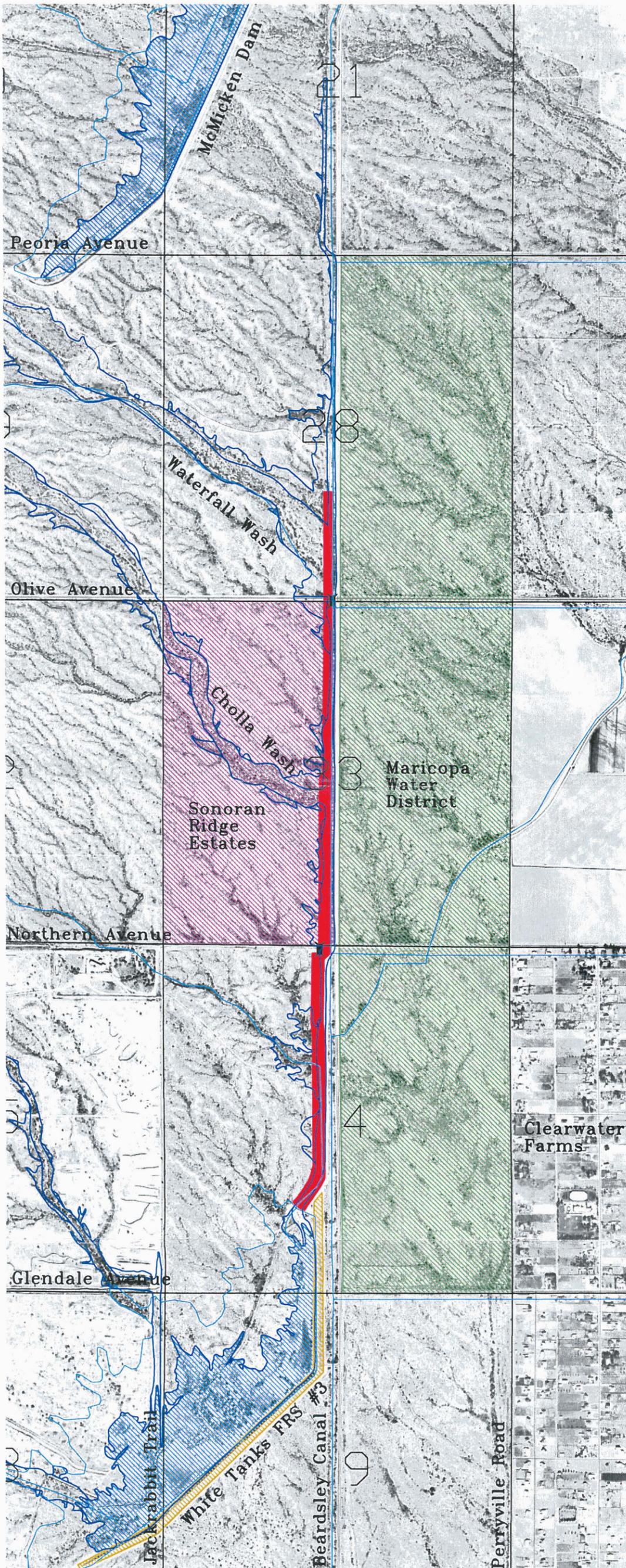
McCloskey • Peltz, Inc.
LANDSCAPE ARCHITECTS

WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists, and Land Surveyors

NORTH INLET CHANNEL
MARICOPA COUNTY
ARIZONA



ALTERNATIVE 2 CONCRETE CHANNEL WITH NATIVE DESERTSCAPED OVERBANKS



LEGEND

- CONCRETE CHANNEL & TRAILS
- ⊗ CULVERTS

ALTERNATIVE 2 DESCRIPTION

This alternative consists of concrete channel improvements with native desertscaped overbank and trails from the White Tanks Flood Retarding Structure #3 to Olive Avenue including culverts at both Northern and Olive Avenues.

VISUAL CHARACTERISTICS

- Varied width concrete lined channel with native desertscaped buffer strips, parallel to the west side of the existing Beardsley Canal.
- Access control barrier railing will be placed along both sides of the concrete channel as a safety measure.
- Design and grading of the native desertscaped buffer strips will attempt to re-naturalize these areas to be reflective of the topography and character of nearby natural washes.
- Designed to provide opportunities for future recreational trail linkages.
- Revegetation and/or restoration will be accomplished using native seed mixes and select tree plantings.
- The native desertcape palette includes native Sonoran desert plant species patterned and arranged to reflect the density and patterns found in the washes and foothills of the White Tank Mountains.

OPPORTUNITIES

- Provides 100-year flood protection to the properties east of Beardsley Canal by improving Beardsley Canal Wash Corridor.
- Provides a native desertscaped open space corridor including equestrian and pedestrian trails from the White Tanks Flood Retarding Structure #3 to Waterfall Wash.
- Provides a 100-year crossing across the wash at both Northern and Olive Avenues.

CONSTRAINTS

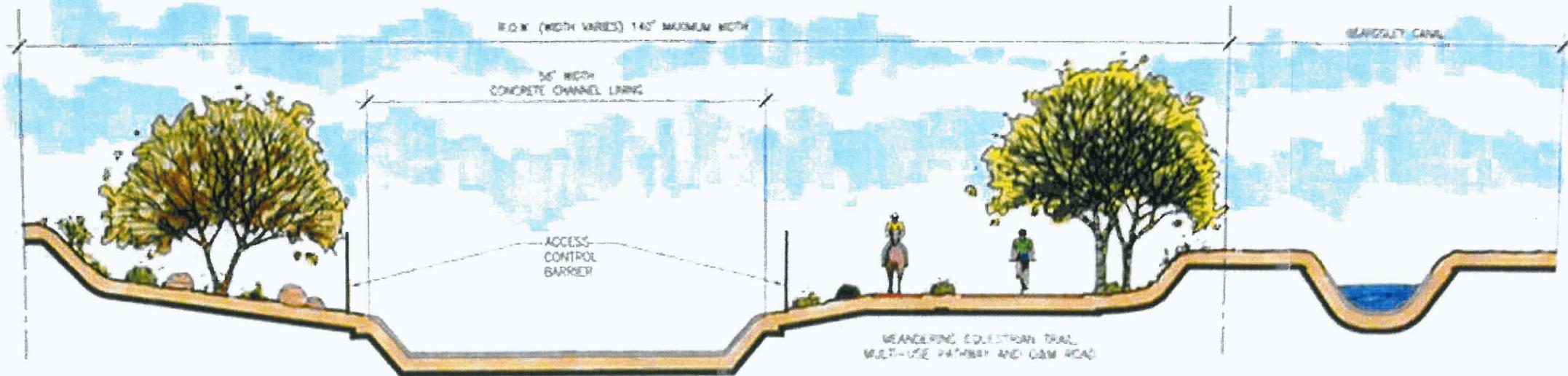
- Requires 28 acres of right-of-way/easements through Sonoran Ridge Estates and State Land Department. Impacts some lots through Sonoran Ridge Estates.
- Trail access limited to narrow corridor along west side of Beardsley Canal.
- Requires a large concrete channel along the corridor.
- Requires average effort for the maintenance.
- Significant area of natural desert disturbed.
- Creates significant construction impact to the neighborhood.
- Second highest cost.

PROJECT COST

\$13 million

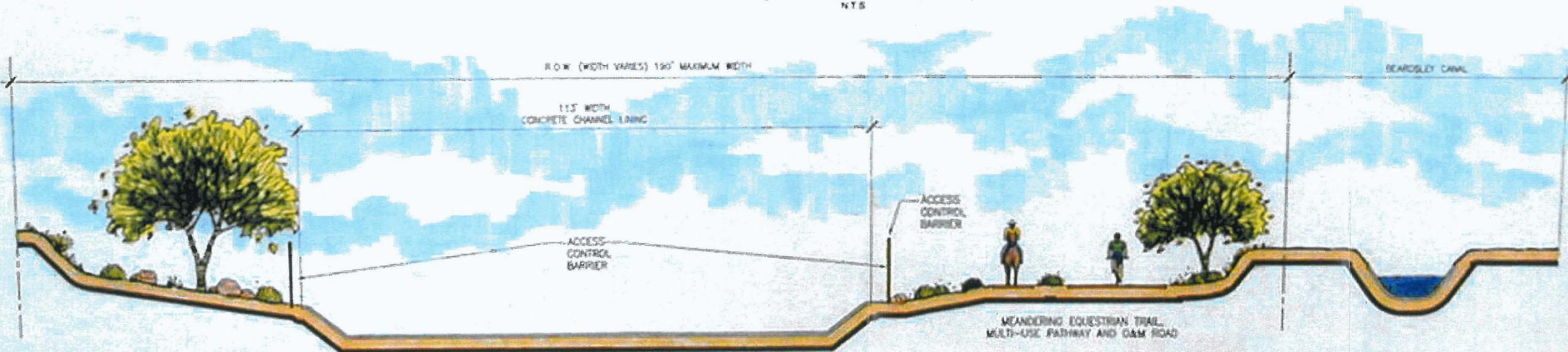
NOTE: ALL REVEGETATION PLANTING SHOWN DEPICTS PROJECTED GROWTH OF TWENTY YEARS POST CONSTRUCTION.

ALTERNATIVE 2 CONCRETE CHANNEL WITH NATIVE DESERTSCAPED OVERBANKS



TYPICAL SECTION VIEW

CHANNEL WEST OF BEARDSLEY CANAL (NORTH OF CHOLLA WASH)
(VIEW IS LOOKING NORTH)
N.T.S.



TYPICAL SECTION VIEW

CHANNEL WEST OF BEARDSLEY CANAL (SOUTH OF CHOLLA WASH)
(VIEW IS LOOKING NORTH)
N.T.S.

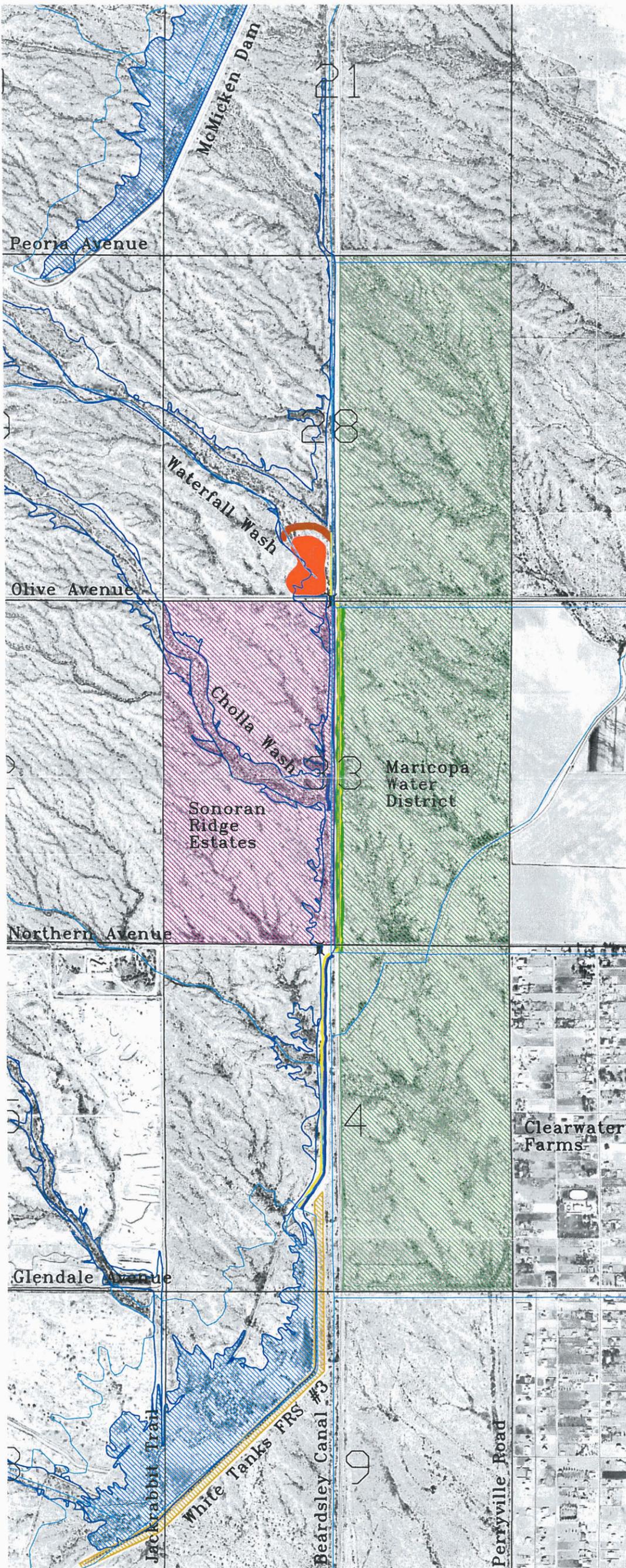
McCloskey • Peltz, Inc.
LANDSCAPE ARCHITECTS

WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists, and Land Surveyors

NORTH INLET CHANNEL
MARICOPA COUNTY
ARIZONA



ALTERNATIVE 3 DETENTION BASIN NEAR OLIVE



LEGEND

- OPEN SPACE
- TRAILS
- DETENTION BASIN
- BURIED BANK PROTECTION
- CULVERTS

ALTERNATIVE 3 DESCRIPTION

This alternative consists of capturing a breakout flow and directing it to a detention basin at Olive Avenue. Alternative 3 also includes native desertscape trails from the White Tanks Flood Retarding Structure #3 to Olive Avenue and culverts at both Northern and Olive Avenues. The natural wash will remain undisturbed on the west side of the Beardsley Canal between Olive and Northern Avenues.

VISUAL CHARACTERISTICS

- Ten-acre site containing a curvilinear shaped detention basin with varied perimeter slopes surrounded by a variable width buffer area. Related armored inlet channel and overflow control embankment blended with the surrounding natural desert in terms of color, texture and form.
- Design and grading will attempt to re-naturalize disturbed areas to be reflective of the topography and character of nearby natural washes.
- Designed to provide opportunities for future recreational trail linkages and a potential trailhead area.
- Revegetation and/or restoration will be accomplished using native seed mixes and select tree plantings.
- The native desertscape palette includes native Sonoran desert plant species patterned and arranged to reflect the density and patterns found in the washes and foothills of the White Tank Mountains.
- Buried embankment protection at the confluence with Cholla Wash and south of Northern Avenue re-naturalized with native seed mixes.

OPPORTUNITIES

- Provides 100-year flood protection to the properties east of Beardsley Canal by preventing flow breakouts.
- Provides native desertscape open space corridor including equestrian and pedestrian trails from the White Tanks Flood Retarding Structure #3 to Olive Avenue.
- Provides a 100-year crossing across the wash at both Northern and Olive Avenues.
- No impact on Sonoran Ridge Estates.
- Requires least effort for the maintenance. Creates a desirable open space corridor for Maricopa Water District from Northern Avenue to Olive Avenue.
- Keeps the wash in its natural setting along Sonoran Ridge Estates.
- Creates second lowest construction impact to the neighborhood.
- Least area of natural desert disturbed.
- Second lowest cost.

CONSTRAINTS

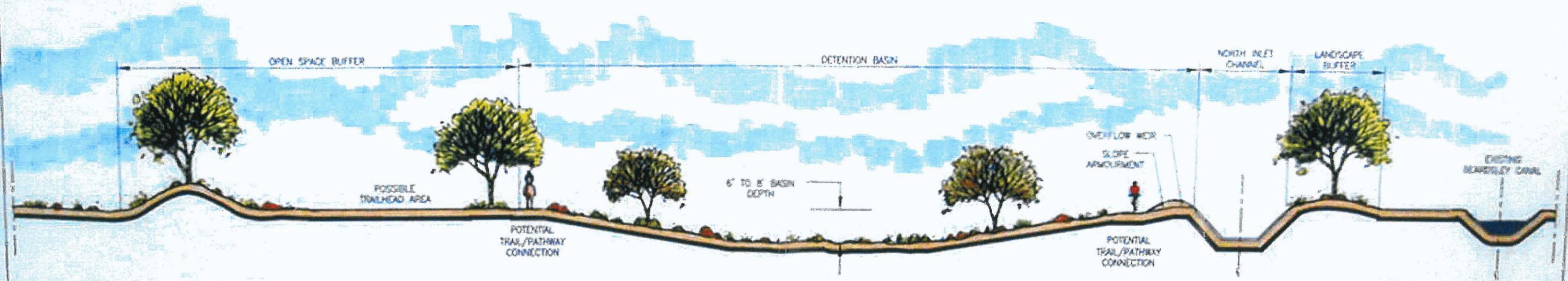
- 21 acres of right-of-way is required through Maricopa Water District and State Land Department.
- Native desertscape trails on east side of canal from Olive Avenue to Northern Avenue would have to be constructed by others.

PROJECT COST

\$4 million

NOTE: ALL REVEGETATION
PLANTING SHOWN DEPICTS
PROJECTED GROWTH OF TWENTY
YEARS POST CONSTRUCTION.

ALTERNATIVE 3 DETENTION BASIN NORTH OF OLIVE AVENUE



TYPICAL DETENTION BASIN SECTION VIEW
DETENTION BASIN NORTH OF OLIVE AVENUE
(VIEW IS LOOKING NORTH)
N.E.S.

McCloskey • Peltz, Inc.
LANDSCAPE ARCHITECTS

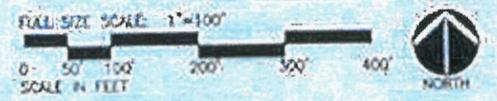
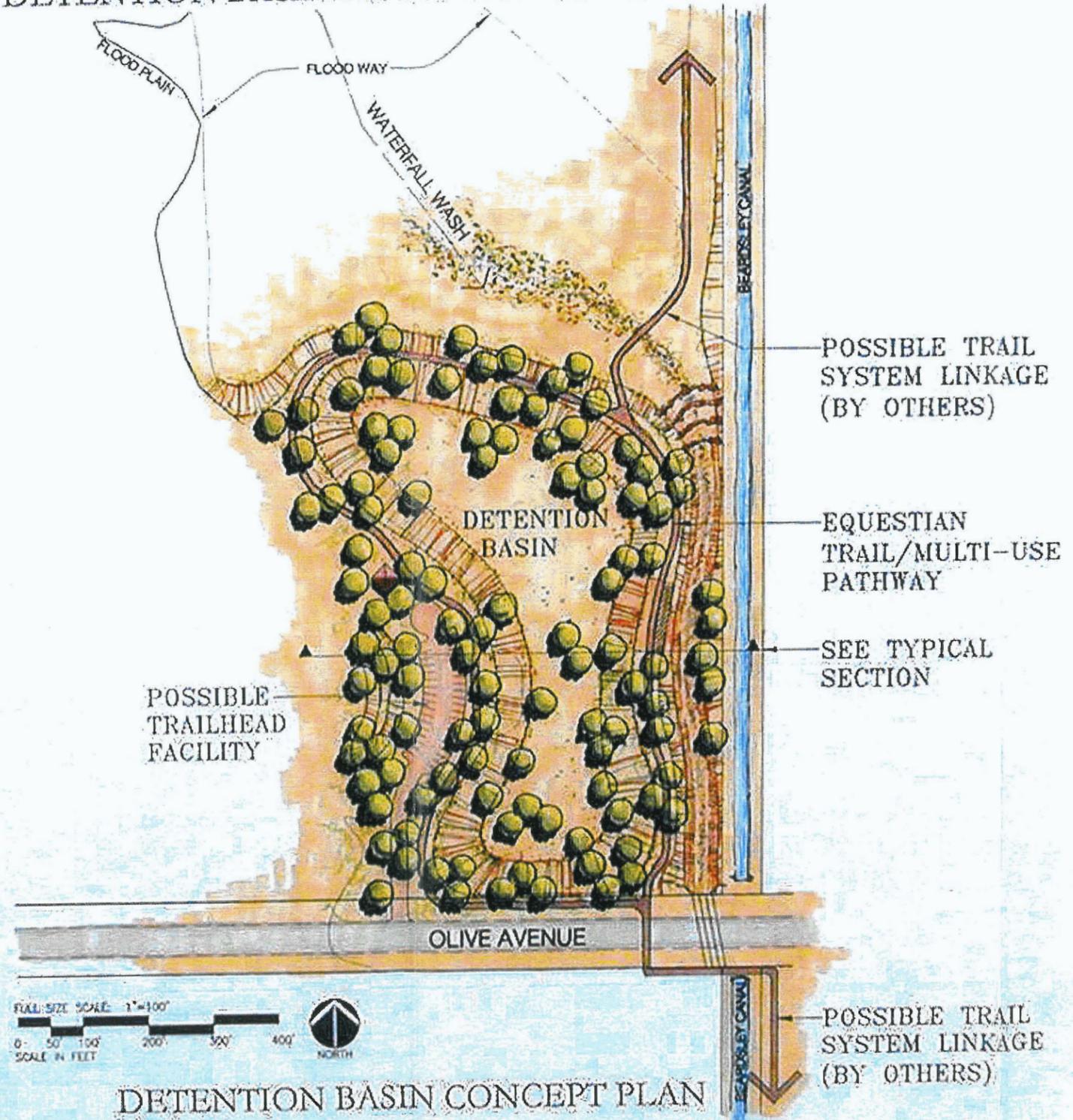
WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists, and Land Surveyors

NORTH INLET CHANNEL
MARICOPA COUNTY
ARIZONA



ALTERNATIVE 3
DETENTION BASIN NORTH OF OLIVE AVENUE

NOTE: ALL REVEGETATION
PLANTING SHOWN DEPICTS
PROJECTED GROWTH OF TWENTY
YEARS POST CONSTRUCTION.



DETENTION BASIN CONCEPT PLAN

NORTH INLET CHANNEL
MARICOPA COUNTY
ARIZONA

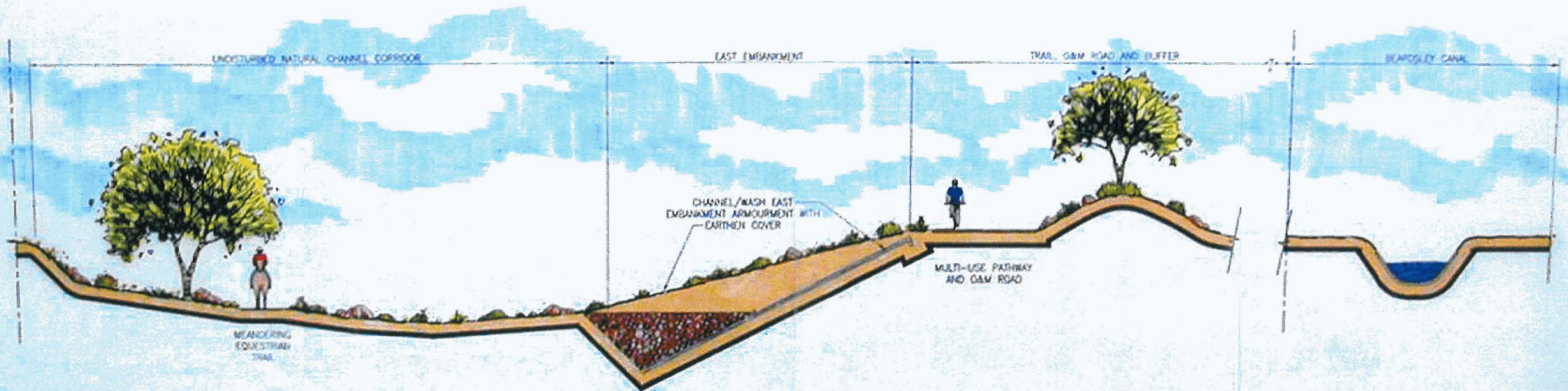
McCloskey • Peltz, Inc.
LANDSCAPE ARCHITECTS

WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists, and Land Surveyors



NOTE: ALL REVEGETATION
PLANTING SHOWN DEPICTS
PROJECTED GROWTH OF TWENTY
YEARS POST CONSTRUCTION.

ALTERNATIVE 3 CHANNEL EMBANKMENT PROTECTION SOUTH OF NORTHERN AVENUE



TYPICAL SECTION VIEW
CHANNEL EAST EMBANKMENT ARMOURMENT (SOUTH OF NORTHERN AVENUE)
(VIEW IS LOOKING NORTH)
N.T.S.

McCloskey + Peltz, Inc.
LANDSCAPE ARCHITECTS

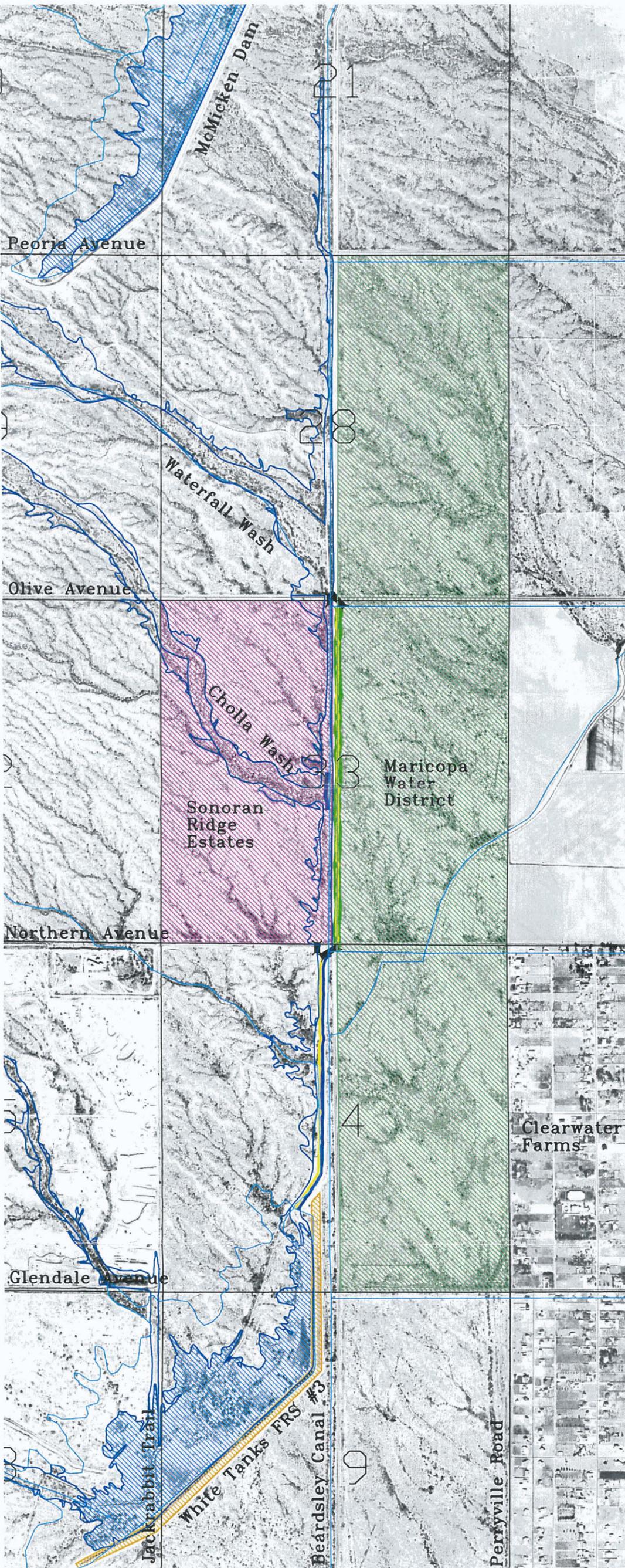
WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists, and Land Surveyors

NORTH INLET CHANNEL
MARICOPA COUNTY
ARIZONA



ALTERNATIVE 4

ADDITIONAL CHANNEL ON EAST SIDE OF BEARDSLEY CANAL



LEGEND

- NATIVE DESERTSCAPED CHANNEL & TRAILS
- TRAILS
- BURIED BANK PROTECTION
- ⌘ CULVERTS

ALTERNATIVE 4 DESCRIPTION

This alternative consists of capturing breakout flow and directing it to an additional native desertscape earthen channel on the east side of the Beardsley Canal from Olive to Northern Avenues. Alternative 4 also includes trails from the White Tanks Flood Retarding Structure #3 to Olive Avenue and culverts at both Northern and Olive Avenues. The natural wash will remain undisturbed on the west side of the Beardsley Canal between Olive and Northern Avenues.

VISUAL CHARACTERISTICS

- Variable width native desertscape earthen channel parallel to the east side of the existing Beardsley Canal. Native desertscape earthen channel is significantly smaller than the west side channel in Alternative 1. No changes made to the visual characteristic of the existing wash on the west side of the Beardsley Canal.
- Design and grading will attempt to re-naturalize the channel corridor to be reflective of the topography and character of nearby natural washes.
- Designed to provide opportunities for future recreational trail linkages.
- Revegetation and/or restoration will be accomplished using native seed mixes and select tree plantings.
- The native desertscape palette includes native Sonoran desert plant species patterned and arranged to reflect the density and patterns found in the washes and foothills of the White Tank Mountains.
- Buried embankment protection at the confluence with Cholla Wash and south of Northern Avenue re-naturalized with native seed mixes.

OPPORTUNITIES

- Provides 100-year flood protection to the properties east of Beardsley Canal by preventing flow breakouts.
- Provides native desertscape open space corridor including equestrian and pedestrian trails from the White Tanks Flood Retarding Structure #3 to Olive Avenue.
- Provides a 100-year crossing across the wash at both Northern and Olive Avenues.
- No impact on Sonoran Ridge Estates or the State Land Department.
- Requires least effort for the maintenance.
- Provides flexibility to potentially divert flow along Northern Avenue Diversion to the Agua Fria River.
- Creates desirable open space corridor for Maricopa Water District from Northern Avenue to Olive Avenue.
- Creates lowest construction impact to the neighborhood.
- Small area of natural desert disturbed.
- Least cost.

CONSTRAINTS

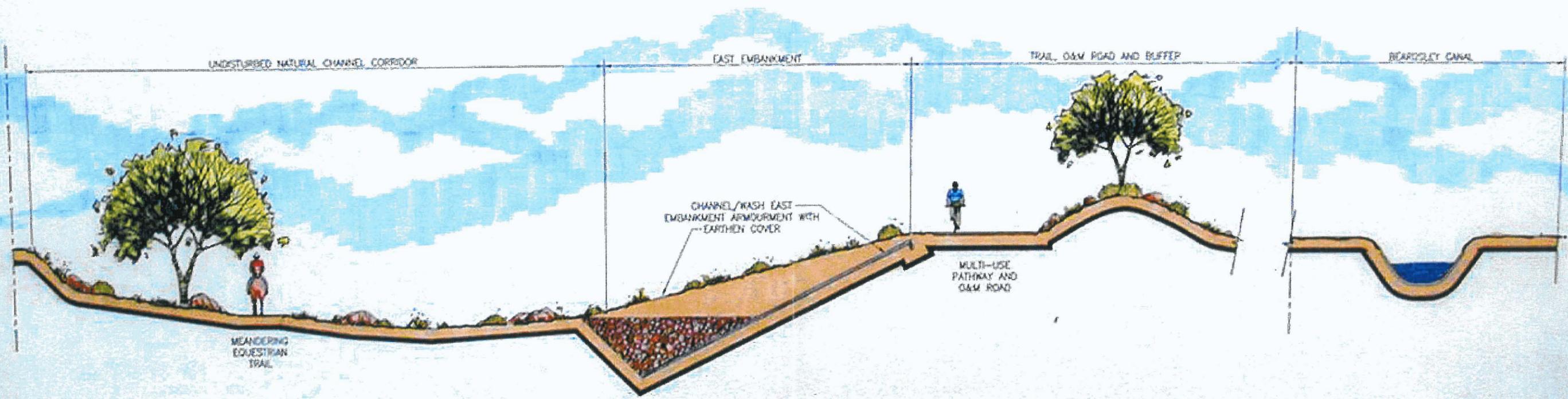
- 19.5 acres of right-of-way is required through Maricopa Water District.

PROJECT COST

\$3.5 million

NOTE: ALL REVEGETATION
PLANTING SHOWN DEPICTS
PROJECTED GROWTH OF TWENTY
YEARS POST CONSTRUCTION.

ALTERNATIVE 4 CHANNEL EMBANKMENT PROTECTION SOUTH OF NORTHERN AVENUE



TYPICAL SECTION VIEW
CHANNEL EAST EMBANKMENT ARMOURMENT (SOUTH OF NORTHERN AVENUE)
(VIEW IS LOOKING NORTH)
S.T.S.

McCloskey + Peltz, Inc.
LANDSCAPE ARCHITECTS

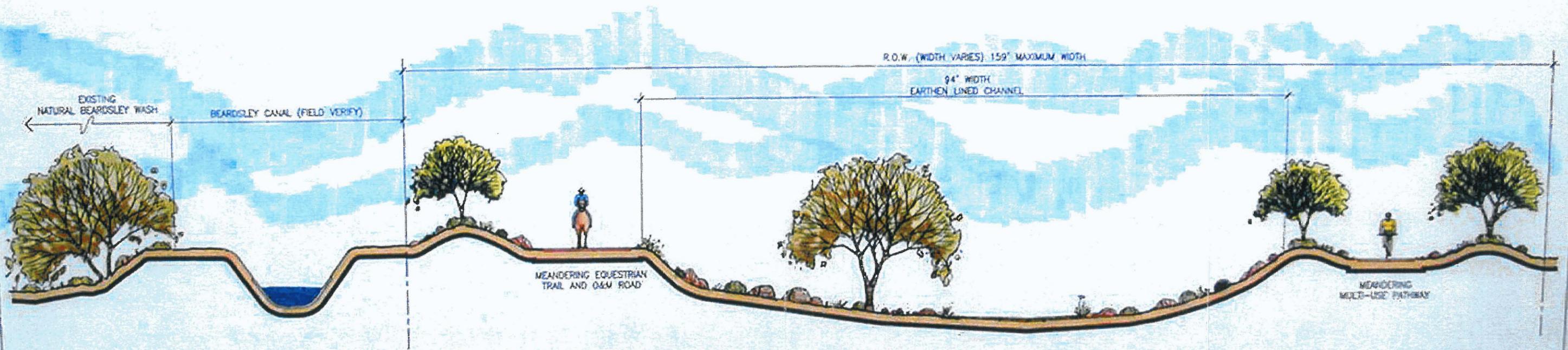
WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists, and Land Surveyors

NORTH INLET CHANNEL
MARICOPA COUNTY
ARIZONA



NOTE: ALL REVEGETATION
PLANTING SHOWN DEPICTS
PROJECTED GROWTH OF TWENTY
YEARS POST CONSTRUCTION.

ALTERNATIVE 4 ADDITIONAL CHANNEL ON EAST SIDE OF BEARDSLEY CANAL



TYPICAL SECTION VIEW

ADDITIONAL CHANNEL EAST OF BEARDSLEY CANAL (BETWEEN NORTHERN & OLIVE)
(VIEW IS LOOKING NORTH)
N.T.S.

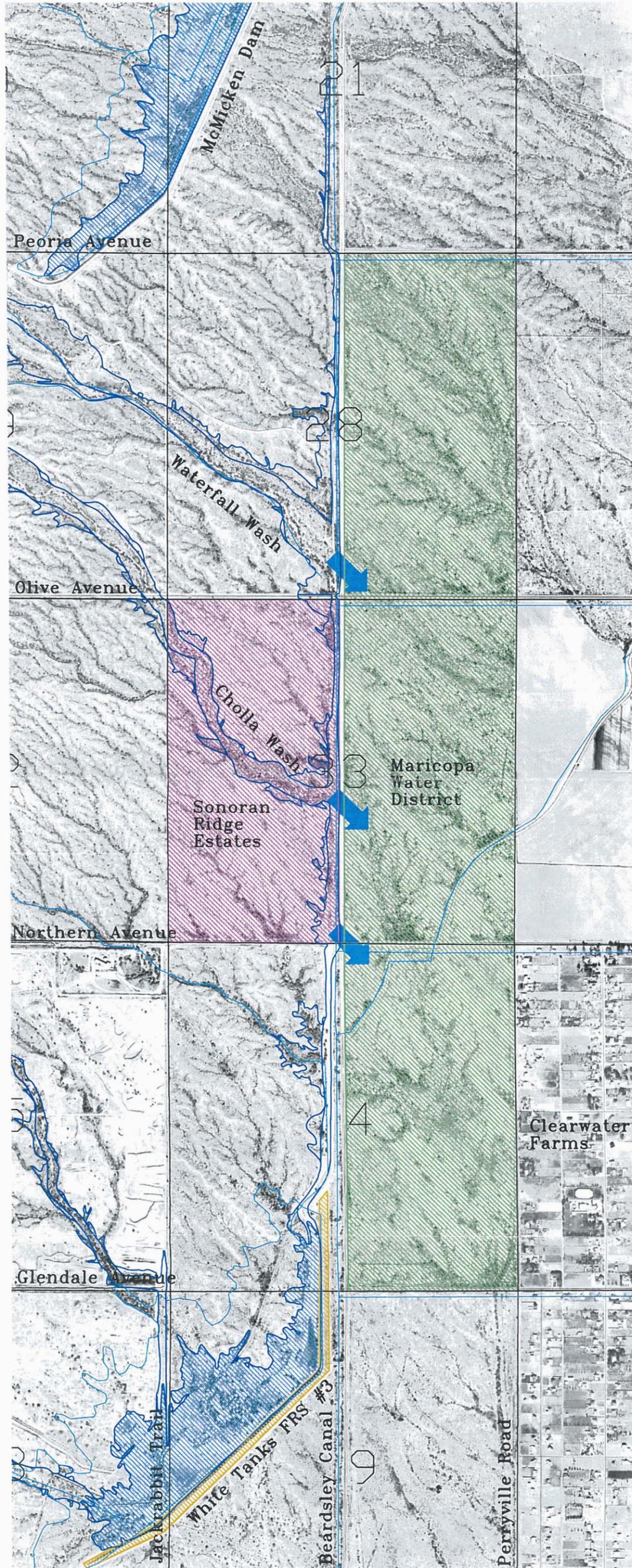
McCloskey + Peltz, Inc.
LANDSCAPE ARCHITECTS

WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists, and Land Surveyors

NORTH INLET CHANNEL
MARICOPA COUNTY
ARIZONA



ALTERNATIVE 5 NO ACTION



LEGEND

 FLOW BREAKOUT

ALTERNATIVE 5 DESCRIPTION

This alternative consists of leaving the Beardsley Canal Wash as is with no improvements to the wash or surface road crossings.

VISUAL CHARACTERISTICS

- No changes made to the existing visual characteristic of the wash corridor along the west side of Beardsley Canal.

OPPORTUNITIES

- No improvement cost.
- No construction impact.
- Wash remains in its natural setting.
- No right-of-way required.

CONSTRAINTS

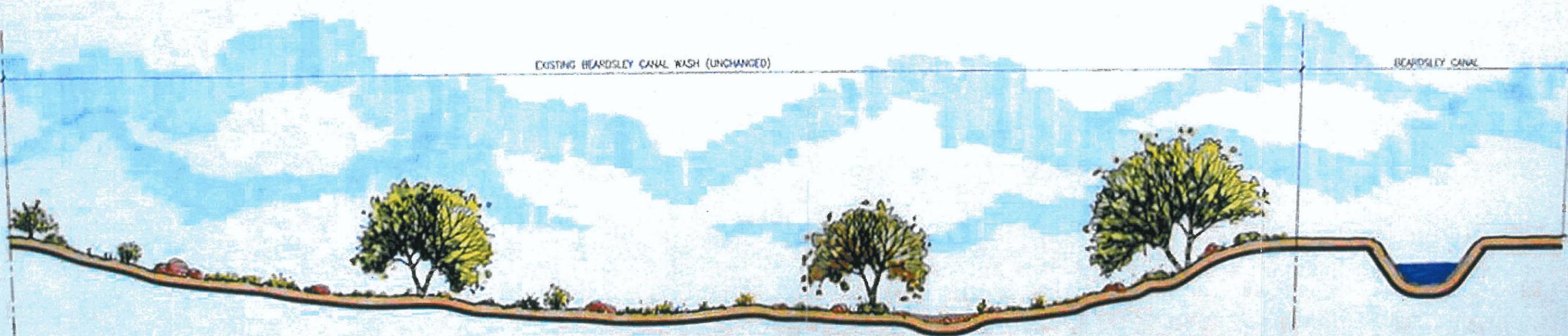
- Does not provide 100-year flood protection to the properties east of Beardsley Canal by preventing flow breakouts at Olive Avenue, Cholla Wash, and Northern Avenue.
- Does not provide 100-year crossing across the wash at Northern or Olive Avenues.
- Possible loss of open space corridor to future development.
- Does not provide a trail system along the project alignment.
- Flood insurance would be needed for homes threatened by 100-year floodplain east of Beardsley Canal.
- Significant maintenance cost may occur to fix the canal breakout areas after a major storm.

PROJECT COST

\$0

NOTE: VEGETATION SHOWN
DEPICTS VARIED CONDITIONS
FOUND OVER THE LENGTH OF
THE EXISTING WASH.

ALTERNATIVE 5 NO ACTION



TYPICAL SECTION VIEW
(NO CHANGES TO THE EXISTING WASH CONDITIONS)
(VIEW IS LOOKING NORTH)
N.T.S.

McCloskey • Peltz, Inc.
LANDSCAPE ARCHITECTS

WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists, and Land Surveyors

NORTH INLET CHANNEL
MARICOPA COUNTY
ARIZONA





McCloskey • Peltz, Inc.
LANDSCAPE ARCHITECTS

WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists, and Land Surveyors

**POTENTIAL CHANNEL CHARACTER SKETCH
CHANNEL EAST OF BEARDSLEY CANAL FROM
NORTHERN AVENUE TO OLIVE AVENUE
MARICOPA COUNTY
ARIZONA**

NOTE: ALL REVEGETATION PLANTING SHOWN DEPICTS PROJECTED GROWTH OF TWENTY YEARS POST CONSTRUCTION



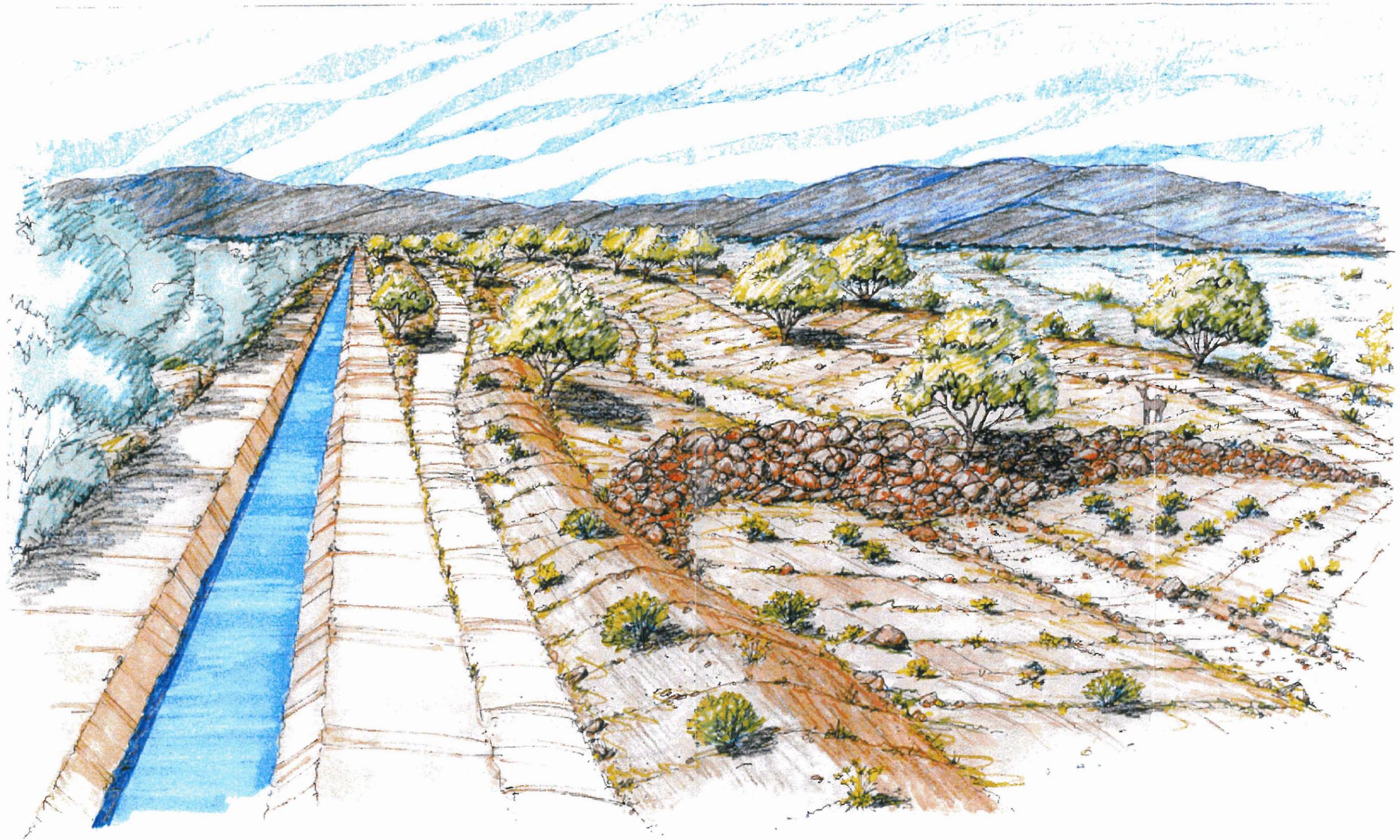


**TYPICAL EXISTING CONDITION PHOTO
CHANNEL EAST OF BEARDSLEY CANAL FROM
NORTHERN AVENUE TO OLIVE AVENUE
MARICOPA COUNTY
ARIZONA**

McCloskey ♦ Peltz, Inc.
LANDSCAPE ARCHITECTS

WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists and Land Surveyors





McCloskey + Peltz, Inc.
LANDSCAPE ARCHITECTS

WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists, and Land Surveyors

GRADE DROP STRUCTURE SKETCH
CHANNEL EAST OF BEARDSLEY CANAL FROM
NORTHERN AVENUE TO OLIVE AVENUE
MARICOPA COUNTY
ARIZONA

NOTE: ALL REVEGETATION PLANTING SHOWN DE P.R. IS PROJECTED GROWTH OF TWENTY YEARS POST CONSTRUCTION.





McCloskey • Peltz, Inc.
LANDSCAPE ARCHITECTS

WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists, and Land Surveyors

DRAINAGE STRUCTURE AESTHETIC ENHANCEMENT
CHANNEL EAST OF BEARDSLEY CANAL FROM
NORTHERN AVENUE TO OLIVE AVENUE
MARICOPA COUNTY
ARIZONA



APPENDIX B

**SUMMARY OF HEC-1 MODEL OUTPUT
FOR NORTHERN AVENUE DIVERSION**

White Tanks FRS #3 Flow Summary - Without Olive Basin

Flows along Northern Ave. with Diversion "DI188" for Peak Flow and Online Basins @ Loop 303 and Reems Rd.

Location	Hydrograph	Q100(cfs)							
	Name	L33PE5F1	L33PE5F2	L33PE5F3	L33PE5F4	L33PE5F5	L33PE5F6	L33PE5F7	L33PE5F8
Div. Flow to E. Northern Ave.	DI188	0	140	330	519	1000	1500	2000	1400
Near Perryville Rd.	!NR1	256	375	557	748	1299	1829	2347	1703
At Citrus Rd.	!NR2	1313	1374	1440	1539	1951	2465	3000	2294
At Cotton Lane	!NR3	2281	2308	2345	2408	2743	3182	3710	3060
At Loop 303 (Flow from West)	!NR4	2382	2406	2442	2504	2826	3266	3803	3155
Total Flow to Basin 2 at Loop 303	NR-LP	4214	4221	4243	4281	4406	4635	5015	4557
Outflow from Basin Routing	SRNRLP	1209	1211	1216	1223	1249	1297	1366	1312
At Reems Road (Flow from West)	!NR6	906	907	911	916	935	971	1026	981
Inflow to W. Basin at Reems Rd.	1I194B	1494	1494	1495	1495	1495	1497	1502	1497
Outflow from Basin Routing	SRRMNR	988	989	989	990	994	1010	1036	1016
Inflow to E. Basin at Reems Rd.	CP194B	1110	1111	1113	1116	1126	1146	1175	1155
Outflow from Basin Routing	SR194B	461	461	461	462	465	469	476	471
Flow to Agua Fria River	CP205	2191	2191	2191	2191	2191	2191	2191	2191

White Tanks FRS #3 Flow Summary - With Olive Basin

Flows along Northern Ave. with Diversion "DI188" for Peak Flow and Online Basins @ Loop 303 and Reems Rd.

Location	Hydrograph Name	Q100(cfs) L33PE5G1	Q100(cfs) L33PE5G2	Q100(cfs) L33PE5G3	Q100(cfs) L33PE5G4	Q100(cfs) L33PE5G5	Q100(cfs) L33PE5G6	Q100(cfs) L33PE5G7
Div. Flow to E. Northern Ave.	DI188	0	135	325	514	1000	1500	2000
Near Perryville Rd.	!NR1	256	356	537	730	1283	1806	2320
At Citrus Rd.	!NR2	1313	1363	1426	1512	1909	2391	2907
At Cotton Lane	!NR3	2281	2307	2346	2403	2718	3151	3681
At Loop 303 (Flow from West)	!NR4	2382	2406	2443	2500	2814	3245	3776
Total Flow to Basin 2 at Loop 303	NR-LP	4214	4224	4246	4276	4393	4612	4972
Outflow from Basin Routing	SRNRLP	1209	1212	1216	1223	1249	1249	1361
At Reems Road (Flow from West)	!NR6	906	907	911	916	935	970	1023
Inflow to W. Basin at Reems Rd.	1I194B	1494	1494	1495	1495	1495	1498	1503
Outflow from Basin Routing	SRRMNR	988	989	989	990	996	1012	1039
Inflow to E. Basin at Reems Rd.	CP194B	1110	1111	1113	1116	1126	1145	1174
Outflow from Basin Routing	SR194B	461	461	462	462	465	469	476
Flow to Agua Fria River	CP205	2191	2191	2191	2191	2191	2191	2191

White Tanks FRS #3 Flow Summary - With Olive Basin

Flows along Northern Ave. with Diversion "DI188" for Base Flow and Online Basins @ Loop 303 and Reems Rd.

Location	Hydrograph	Q100(cfs)						
	Name	L33PE5H1	L33PE5H2	L33PE5H3	L33PE5H4	L33PE5H5	L33PE5H6	L33PE5H7
Div. Flow to E. Northern Ave.	DI188	0	100	200	300	400	500	800
Near Perryville Rd.	!NR1	256	356	455	553	652	747	999
At Citrus Rd.	!NR2	1313	1391	1477	1570	1666	1763	2056
At Cotton Lane	!NR3	2281	2365	2457	2553	2653	2752	3052
At Loop 303 (Flow from West)	!NR4	2382	2466	2558	2654	2754	2853	3153
Total Flow to Basin 2 at Loop 303	NR-LP	4214	4290	4379	4474	4570	4666	4960
Outflow from Basin Routing	SRNRLP	1209	1326	1397	1468	1539	1609	1796
At Reems Road (Flow from West)	!NR6	906	996	1048	1102	1155	1206	1347
Inflow to W. Basin at Reems Rd.	1I194B	1494	1533	1541	1547	1554	1560	1647
Outflow from Basin Routing	SRRMNR	988	1062	1108	1147	1181	1211	1289
Inflow to E. Basin at Reems Rd.	CP194B	1110	1184	1230	1269	1303	1334	1412
Outflow from Basin Routing	SR194B	461	484	495	504	512	519	537
Flow to Agua Fria River	CP205	2191	2193	2193	2193	2193	2193	2193

White Tanks FRS #3 Flow Summary - With Olive Basin							
Flows along Northern Ave. with Diversion "DI188" for Base Flow and Offline Basins @ Loop 303 and Reems Rd.							
Location	Hydrograph	Q100(cfs)	Q100(cfs)	Q100(cfs)	Q100(cfs)	Q100(cfs)	Q100(cfs)
	Name	L33PE5I1	L33PE5I5	L33PE5I6	L33PE5I7	L33PE5I8	L33PE5IF*
Div. Flow to E. Northern Ave.	DI188	0	600	700	800	1000	614**
Near Perryville Rd.	!NR1	256	838	906	999	1128	848
At Citrus Rd.	!NR2	1313	1859	1958	2056	2253	1597
At Cotton Lane	!NR3	2281	2850	2952	3052	3253	2452
At Loop 303 (Flow from West)	!NR4	2382	2951	3053	3153	3354	2543
Total Flow to Basin 2 at Loop 303	NR-LP	4214	4764	4862	4960	5157	4300
Bypass Flow	BY_B2	100	400	450	500	600	400
Flow Diverted into Basin	IN_B2	4114	4364	4412	4460	4557	3900
Bleedoff Flow	OUT_B2	116	130	128	125	121	104
Total Outflow After the Basin	SRNRLP	216	530	578	625	721	504
At Reems Road (Flow from West)	!NR6	553	792	830	868	944	780
Inflow to W. Basin at Reems Rd.	!I194B	1495	1729	1767	1805	1881	1720
Bypass Flow	BY_BW	300	500	550	600	650	500
Flow Diverted into Basin	IN_BW	1195	1229	1217	1205	1231	1220
Bleedoff Flow	OUT_BW	111	122	114	104	106	110
Total Outflow After the Basin	SRRMNR	411	622	664	704	756	610
Inflow to E. Basin at Reems Rd.	CP194B	688	887	937	986	1036	886
Outflow from Basin Routing	SR194B	285	355	365	374	387	340
Flow to Agua Fria River	CP205	2222	2245	2249	2252	2256	2237
	Vol(DI188)=	0	224	240	258	288	10
* -- Without Olive Basin							
** -- Scalping Diversion							



APPENDIX C

**NORTH INLET CHANNEL PRELIMINARY DESIGN
QUANTITIES AND COST ESTIMATE**

Preliminary Cost Estimate Summary - North Inlet Channel Alternatives

CONTRACT: FCD 2000 C 036

Construction Elements	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Excavation	\$4,104,412	\$817,100	\$357,178	\$296,436
Channel Lining	\$0	\$6,646,252	\$337,291	\$0
Railing	\$0	\$322,500	\$20,700	\$0
Overflow Structure	\$0	\$0	\$127,100	\$0
Slope Protection	\$0	\$0	\$972,188	\$921,788
Drop Structures	\$2,969,137	\$578,704	\$66,620	\$230,268
Culverts	\$369,939	\$369,939	\$418,587	\$544,447
Landscaping	\$1,231,956	\$171,763	\$213,494	\$193,853
Maintenance Rd.	\$150,500	\$150,500	\$83,580	\$72,100
Aesthetic Treatment	\$368,064	\$360,376	\$107,937	\$94,632
Construction subtotal:	\$9,194,009	\$9,417,133	\$2,704,675	\$2,353,523
12% Engineering & Construction Administration	\$1,103,281	\$1,130,056	\$324,561	\$282,423
20% Construction & Other Contingency	\$1,838,802	\$1,883,427	\$540,935	\$470,705
Construction Total:	\$12,136,092	\$12,430,616	\$3,570,170	\$3,106,650
Right of Way				
Right of Way	\$1,607,620	\$446,899	\$335,879	\$300,771
10% Administrative Costs	\$160,762	\$44,690	\$33,588	\$30,077
Right of Way Total:	\$1,768,382	\$491,589	\$369,467	\$330,848
PROJECT TOTAL (Rounded):	\$13,900,000	\$12,900,000	\$3,900,000	\$3,400,000
Operation & Maintenance				
50 Year Operation & Maintenance	\$3,592,083	\$581,375	\$807,885	\$742,051
LIFE CYCLE TOTAL (Rounded):	\$17,500,000	\$13,500,000	\$4,700,000	\$4,200,000

Alternative Descriptions:

Alternative 1 (Improve entire corridor with earth-lined channel) - 10,750 feet of kindler and gentler channel from Waterfall Wash to FRS #3 including pedestrian & equestrian trails, and a maintenance path. Right-of-way required is 90.9 acres.

Alternative 2 (Improve entire corridor with concrete-lined channel) - 10,750 feet of concrete channel from Waterfall Wash to FRS #3 with kindler and gentler features including trails and maintenance path. Right-of-way required is 27.9 acres.

Alternative 3 (Partial improvements with basin) - 600 cfs diversion to off-line detention basin at Olive, concrete-lined channel & maintenance path at confluence of Waterfall Wash to Olive, slope protection at Cholla Wash and south of Northern Avenue, upsized culverts at Olive and Northern, 9870 feet of trails from FRS #3 to end of improvements at Waterfall Wash. Right-of-way required is 21.0 acres.

Alternative 4 (Partial improvements with channel) - Diversion at Olive of 600 cfs to kindler and gentler channel with trails and maintenance path on the east side of Beardsley Canal between Olive and Northern, culvert for return flow at Northern, slope protection and trails south of Northern, and upsized culverts at Olive and Northern. Overall length of trails is 9180 feet. Right-of-way required is 19.3 acres.

- Notes:
1. These estimates are probable costs for preliminary analysis only.
 2. An additional cost of \$153,600 for 9.6 acres of property acquisition in the Sonoran Ridge development was added to the Alternative 1 R/W costs.
 3. The basin at Olive Avenue for Alternative 3 includes a 30% increase in excavation, landscaping and R/W to account for kindler and gentler features.

North Inlet Channel - Unit Costs

Item	Unit	Unit price
Excavation	C.Y.	\$3.25
Channel lining - reinforced concrete	C.Y.	\$310
Channel lining - colorized rein. concrete	C.Y.	\$340
Railing	L.F.	\$15
Overflow structure - reinforced concrete	C.Y.	\$310
8" slope protection - concrete	S.F.	\$4.80
6" slope protection - concrete	S.F.	\$3.60
5" slope protection - concrete	S.F.	\$3.00
Slope protection toe trench - riprap	C.Y.	\$45
Drop structure - reinforced concrete	C.Y.	\$310
Drop structure transition - riprap	C.Y.	\$45
Right of way	Ac	\$16,000
Landscaping	Ac	\$12,000
Hydroseeding	Ac	\$2,200
Equestrian Trail	S.F.	\$0.00
Maintenance Path	S.F.	\$1.00
Aesthetic features	%	4%
<hr/>		
Operation & Maintenance	Unit	Unit price
Concrete features	Ac/Yr	\$40
Earth features	Ac/Yr	\$531

- Note: 1. The aesthetic feature cost is a percentage of the overall project cost.
 2. O&M unit prices from Michael A. Meng.

White Tanks FRS #3, North Inlet Channel

White Tanks FRS #3 North Inlet Channel Preliminary Design, Quantities, and Cost Estimate Table		Alternative	Design Q100 (ft ³ /s)	Comp. Capacity (ft ³ /s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Length (ft)	Original Slope (ft/ft)	Design Invert Slope (ft/ft)	Total Vertical Drop (ft)	No. of Drops	Vertical Drop (ft)	Material Type	Manning's "n" Value	Bottom Width, W (ft)	Depth of Flow (ft)	Freeboard (ft)	Side slope (Z:1) Left	Side slope (Z:1) Right	Area (ft ²)	Perimeter (ft)	Flow Top Width (ft)	Hydraulic Depth (ft)	Froude Number	Type of Flow	Velocity (ft/s)	Channel Design Depth from depth + freeboard (ft)	Channel Top width (ft)	
Segment 0		OldAlt 1	550	550	1311.0	1273.2	5150	0.0073	0.0012	31.6	9	3.5	e	0.0300	10	4.55	2.0	6	6	169.7	65.3	84.0	2.6	0.35	Sub	3.24	7.0	94.0	
From north of Peoria to Waterfalls Wash Sta. 0+00 to Sta. 51+50		OldAlt 2	550	550	1312.0	1273.4	5150	0.0075	0.0070	2.5	3	0.8	s	0.0140	4	3.54	2.0	2	2	39.3	19.8	84.0	2.2	1.68	Sup	14.00	6.0	28.0	
Segment 1		Alternative 1	2837	2837	1273.2	1265.0	1600	0.0051	0.0005	7.4	2	3.7	e	0.0300	156	5.12	2.0	6	6	956.6	218.3	230.0	4.4	0.25	Sub	2.97	8.0	252.0	
From Waterfalls Wash to Olive Avenue Sta.51+50 to Sta. 67+50		Alternative 2	2837	2837	1273.4	1264.3	1600	0.0057	0.0035	3.5	1	3.5	s	0.0140	30	4.79	2.0	2	2	189.4	51.4	110.0	3.9	1.34	Sup	14.98	7.0	58.0	
		Alternative 3	2837	2837	1271.07	1270.78	240	0.0012	0.0012	0.0	0	0.0	s	0.0140	42	5.47	1.5	2	2	289.4	66.4	63.9	4.5	0.81	Sub	9.81	7.5	72.0	
		Alternative 3	2201	2201	1270.78	1270.24	450	0.0012	0.0012	0.0	0	0.0	s	0.0140	32	5.43	1.5	2	2	232.5	56.3	53.7	4.3	0.80	Sub	9.47	7.5	62.0	
		Alternative 3	Basin																										
		Alternative 4	Culvert under Olive Avenue - 600 cfs																										
		Alternative 4	Culvert under Olive Avenue - base minus 600 cfs																										
Segment 2		Alternative 1	3000	3000	1265.0	1235.6	2700	0.0109	0.0005	28.1	8	3.5	e	0.0300	156	5.29	2.0	6	6	992.9	220.3	230.0	4.5	0.25	Sub	3.02	8.0	252.0	
From Olive Avenue to Cholla Wash Sta. 67+50 to Sta. 94+50		Alternative 2	3000	3000	1264.3	1237.5	2700	0.0099	0.0035	17.4	5	3.5	s	0.0140	30	4.94	2.0	2	2	196.9	52.1	110.0	4.0	1.35	Sup	15.24	7.0	58.0	
		Alternative 3	Protection of east berm at Cholla Wash																										
		Alternative 4	Protection of east berm at Cholla Wash																										
Segment 3		Alternative 1	6387	6387	1235.6	1223.8	2550	0.0046	0.0005	10.5	3	3.5	e	0.0300	424	4.72	2.0	6	6	2135.9	481.4	498.0	4.4	0.25	Sub	2.99	7.0	508.0	
From Cholla Wash to Northern Avenue Sta. 94+50 to Sta. 120+00		Alternative 2	6387	6387	1237.5	1226.0	2550	0.0045	0.0031	3.6	1	3.6	s	0.0140	85	4.53	2.0	2	2	425.7	105.2	165.0	4.1	1.30	Sup	15.00	7.0	113.0	
		Alternative 3																											
		Alternative 4																											
Segment 4		Alternative 1	6387	6387	1223.8	1200.8	3900	0.0059	0.0005	21.1	6	3.5	e	0.0300	424	4.72	2.0	6	6	2135.9	481.4	498.0	4.4	0.25	Sub	2.99	7.0	508.0	
From Northern Avenue to FRS#3 Sta. 120+00 to Sta. 159+00		Alternative 2	6387	6387	1226.0	1203.5	3900	0.0058	0.0031	10.4	3	3.5	s	0.0140	85	4.53	2.0	2	2	425.7	105.2	165.0	4.1	1.30	Sup	15.00	7.0	113.0	
		Alternative 3	Protection of east berm - Northern to FRS# 3900																										
		Alternative 4	Protection of east berm - Northern to FRS# 3900																										
Segment 2-East		Alternative 3	600				5280																						
From Olive Avenue to Northern Avenue		Alternative 4	600	600	1263.0	1222.1	5150	0.0079	0.0009	36.1	10	3.6	e	0.0300	10	5.00	2.0	8	4	199.7	70.9	70.0	2.9	0.31	Sub	3.00	7.0	94.0	
Subtotals		Alternative 1	Earth-Lined Channel				10750				19																		
		Alternative 2	Concrete-Lined Channel				10750				10																		
		Alternative 3	Do Minimal A				9870				0																		
		Alternative 4	Do Minimal B				9050				10																		
		Notes:	1. The drop structure width is 70% of the channel top width. 2. The 10'x6' box culvert at Olive Ave. has already been designed by the developer, however, it is assumed that the culvert is inadequate for this design. 3. The landscape width accounts for the pedestrian & equestrian trails and the maintenance road. 4. The excavation for the concrete option is estimated as the excavation for earth option times the ratio between the flow area for the earth and concrete options. 5. The Alternative 3 - Segment 2, Basin row includes the Basin, overflow structure and directional dike north of Basin. 6. The District owns part of the right of way in Segment 5, and 60' of right of way in the other segments. 7. The channel next to the Basin will use colorized concrete which is assumed to be \$30/yard ³ more expensive. 8. The landscaping unit cost for Alternatives 3 & 4, Segment 4 only includes hydromulching. 9. The Basin R/W, landscaping and excavation quantities have been increased 30% for kindler and gentler features. 10. O&M costs have no contingencies applied. 11. The slope protection costs for Segment 2 are the average of 300' of 6" protection and 400' of 8" protection. 12. The right-of-way width between Olive and Northern accounts for an existing 60' drainage easement.																										

White Tanks FRS #3, North Inlet Channel

White Tanks FRS #3 North Inlet Channel Preliminary Design, Quantities, and Cost Estimate Table	Alternative	Channel Width Plus 60' extra RW	Excavation			Channel Lining			Railing			Overflow Structure			Slope Protection					Drop Structures		
			Excavated Volume (yd ³)	Unit Cost (\$/yd ³)	Total Excavation Cost	Channel Lining Concrete Volume (yd ³)	Unit Cost (\$/yd ³)	Total Channel Lining Cost	Length of railing along both sides of concrete channel (ft.)	Unit Cost (\$/ft.)	Total Railing Cost	Overflow Structure Concrete Volume (yd ³)	Unit Cost (\$/yd ³)	Total Overflow Structure Cost	Concrete Quantity (ft ²)	Concrete Unit Cost (\$/ft ²)	Riprap Quantity (yd ³)	Riprap Unit Cost (\$/yd ³)	Total Slope Protection Cost	Drop Structures (No.)	Width of Drop Structure (ft)	Concrete Quantity (yd ³)
Segment 0	OldAlt 1	154.0	156,320	\$0.00	\$0	0	\$0	\$0	0	\$0	\$0							\$0	9	59	870.8	
From north of Peoria to Waterfalls Wash Sta. 0+00 to Sta. 51+50	OldAlt 2	88.0	36,194	\$0.00	\$0	3,315	\$0	\$0	10,300	\$0	\$0							\$0	3	59	290.3	
Segment 1	Alternative 1	312.0	98,138	\$3.25	\$318,949	0	\$310	\$0	0	\$15	\$0							\$0	2	161	528.1	
From Waterfalls Wash to Olive Avenue	Alternative 2	118.0	19,430	\$3.25	\$63,147	2,050	\$310	\$635,580	3,200	\$15	\$48,000							\$0	1	77	126.3	
Sta. 51+50 to Sta. 67+50	Alternative 3	132.0	4,800	\$3.25	\$15,600	379	\$340	\$128,816	480	\$15	\$7,200							\$0	0	45	0.0	
	Alternative 3	122.0	7,750	\$3.25	\$25,187	613	\$340	\$208,475	900	\$15	\$13,500							\$0	0	38	0.0	
	Alternative 3		75,616	\$3.25	\$245,752	0	\$310	\$0	0	\$15	\$0	410	\$310	\$127,100	14000	\$3.60		\$50,400	-	-	194.0	
	Alternative 4				\$0	0	\$310	\$0	0	\$15	\$0							\$0	0	0	9.4	
	Alternative 4				\$0	0	\$310	\$0	0	\$15	\$0							\$0	0	0	0.0	
Segment 2	Alternative 1	312.0	166,917	\$3.25	\$542,480	0	\$310	\$0	0	\$15	\$0							\$0	8	161	2112.3	
From Olive Avenue to Cholla Wash	Alternative 2	118.0	33,099	\$3.25	\$107,570	3,460	\$310	\$1,072,541	5,400	\$15	\$81,000							\$0	5	77	631.4	
Sta. 67+50 to Sta. 94+50	Alternative 3		3,571	\$3.25	\$11,606	0	\$310	\$0	0	\$15	\$0				26750	\$4.29	2022	\$45	\$205,748	0	0	0.0
	Alternative 4		3,571	\$3.25	\$11,606	0	\$310	\$0	0	\$15	\$0				26750	\$4.29	2022	\$45	\$205,748	0	0	0.0
Segment 3	Alternative 1	568.0	505,362	\$3.25	\$1,642,427	0	\$310	\$0	0	\$15	\$0							\$0	3	349	1717.1	
From Cholla Wash to Northern Avenue	Alternative 2	173.0	100,727	\$3.25	\$327,364	6,298	\$310	\$1,952,284	5,100	\$15	\$76,500							\$0	1	116	190.2	
Sta. 94+50 to Sta. 120+00	Alternative 3				\$0	0	\$310	\$0	0	\$15	\$0							\$0	0	0	0.0	
	Alternative 4				\$0	0	\$310	\$0	0	\$15	\$0							\$0	0	0	0.0	
Segment 4	Alternative 1	568.0	492,479	\$3.25	\$1,600,557	0	\$310	\$0	0	\$15	\$0							\$0	6	349	3434.2	
From Northern Avenue to FRS#3	Alternative 2	173.0	98,159	\$3.25	\$319,018	9,632	\$310	\$2,985,847	7,800	\$15	\$117,000							\$0	3	116	570.7	
Sta. 120+00 to Sta. 159+00	Alternative 3		18,164	\$3.25	\$59,033	0	\$310	\$0	0	\$15	\$0				121680	\$3.00	7800	\$45	\$716,040	0	0	0.0
	Alternative 4		18,164	\$3.25	\$59,033	0	\$310	\$0	0	\$15	\$0				121680	\$3.00	7800	\$45	\$716,040	0	0	0.0
Segment 2-East	Alternative 3	60.0			\$0	0	\$310	\$0	0	\$15	\$0							\$0	0	0	0.0	
From Olive Avenue to Northern Avenue	Alternative 4	154.0	69,476	\$3.25	\$225,797	0	\$310	\$0	0	\$15	\$0							\$0	10	35	49.7	
Subtotals	Alternative 1		1,262,896		\$4,104,412	0		\$0	0		\$0	0			0		0	\$0	19		7791.6	
	Alternative 2		251,415		\$817,100	21,440		\$6,646,252	21,500		\$322,500	0			0		0	\$0	10		1518.6	
	Alternative 3		109,901		\$357,178	992		\$337,291	1,380		\$20,700	410		\$127,100	162430		9822	\$972,188	0		194.0	
	Alternative 4		91,211		\$296,436	0		\$0	0		\$0	0			148430		9822	\$921,788	10		59.1	

White Tanks FRS #3, North Inlet Channel

White Tanks FRS #3 North Inlet Channel Preliminary Design, Quantities, and Cost Estimate Table	Alternative	p Structures				Landscaping					Culverts						Trails					Maintenance Road			
		Concrete Unit Cost (\$/yd ³)	Riprap Quantity (yd ³)	Riprap Unit Cost (\$/yd ³)	Total Drop Structures Cost	Channel Length (ft)	Landscape Width Required (ft)	Landscapeable Area (acre)	Landscaping Unit Cost (\$/acre)	Total Landscape Cost	Culvert Type	Culvert Size	Number of Barrels	Total Length of Crossings in Reach (ft)	Volume of Concrete per unit length (yd ³)	Unit Cost (\$/yd ³)	Total Culvert Cost	Pedestrian Trail (ft ²)	Pedestrian Trail Unit Cost (\$/ft ²)	Equestrian Trail (ft ²)	Equestrian Trail Unit Cost (\$/ft ²)	Total Trails Cost	Maintenance Road (ft ²)	Maintenance Road Unit Cost (\$/ft ²)	Total Maintenance Road Cost
Segment 0	OldAlt 1	\$0	1375.3	\$0	\$0	5150	100	11.8	\$0	\$0	Conc box	8x5	1	150	0.976	\$0	\$0	25750	\$0	30900	\$0	\$0	72100	\$0	\$0
From north of Peoria to Waterfalls Wash Sta. 0+00 to Sta. 51+50	OldAlt 2	\$0	458.4	\$0	\$0	5150	47	5.6	\$0	\$0	Conc box	8x5	1	150	0.976	\$0	\$0	25750	\$0	30900	\$0	\$0	72100	\$0	\$0
Segment 1	Alternative 1	\$310	834.0	\$45	\$201,234	1600	260	9.6	\$12,000	\$114,601	Conc box	10x6	5	100	5.234	\$310	\$162,254	8000		9600		\$0	22400	\$1.00	\$22,400
From Waterfalls Wash to Olive Avenue Sta. 51+50 to Sta. 67+50	Alternative 2	\$310	199.4	\$45	\$48,121	1600	61	2.2	\$12,000	\$26,887	Conc box	10x6	5	100	5.234	\$310	\$162,254	8000		9600		\$0	22400	\$1.00	\$22,400
	Alternative 3	\$310	0.0	\$45	\$0	240	35	0.2	\$12,000	\$2,314	-	-	0	0	0	\$0	\$0	1200		1440		\$0	3360	\$1.00	\$3,360
	Alternative 3	\$310	0.0	\$45	\$0	450	35	0.4	\$12,000	\$4,339	Conc box	10x6	5	100	5.234	\$310	\$162,254	2250		2700		\$0	6300	\$1.00	\$6,300
	Alternative 3	\$310	144.0	\$45	\$66,620	-	-	7.8	\$12,000	\$94,008	-	-	0	0	0	\$310	\$0					\$0			\$0
	Alternative 4	\$310	0.0	\$45	\$2,914	0	0	0.0	\$12,000	\$0	Conc box	10x6	1	200	1.262	\$310	\$78,244					\$0			\$0
	Alternative 4	\$310	0.0	\$45	\$0	0	0	0.0	\$12,000	\$0	Conc box	10x6	4	100	4.246	\$310	\$131,626					\$0			\$0
Segment 2	Alternative 1	\$310	3335.9	\$45	\$804,936	2700	260	16.1	\$12,000	\$193,388							\$0	13500		16200		\$0	37800	\$1.00	\$37,800
From Olive Avenue to Cholla Wash Sta. 67+50 to Sta. 94+50	Alternative 2	\$310	997.2	\$45	\$240,606	2700	61	3.8	\$12,000	\$45,372							\$0	13500		16200		\$0	37800	\$1.00	\$37,800
	Alternative 3	\$310	0.0	\$45	\$0	-	-	0.0	\$12,000	\$0							\$0					\$0			\$0
	Alternative 4	\$310	0.0	\$45	\$0	-	-	0.0	\$12,000	\$0							\$0					\$0			\$0
Segment 3	Alternative 1	\$310	2711.7	\$45	\$654,323	2550	520	30.4	\$12,000	\$365,289	Conc box	10x6	10	64	10.468	\$310	\$207,685	12750		15300		\$0	35700	\$1.00	\$35,700
From Cholla Wash to Northern Avenue Sta. 94+50 to Sta. 120+00	Alternative 2	\$310	300.4	\$45	\$72,494	2550	56	3.3	\$12,000	\$39,339	Conc box	10x6	10	64	10.468	\$310	\$207,685	12750		15300		\$0	35700	\$1.00	\$35,700
	Alternative 3	\$310	0.0	\$45	\$0	-	-	0.0	\$12,000	\$0	Conc box	10x7	12	64	12.920	\$310	\$256,333					\$0			\$0
	Alternative 4	\$310	0.0	\$45	\$0	-	-	0.0	\$12,000	\$0	Conc box	10x7	12	64	12.920	\$310	\$256,333					\$0			\$0
Segment 4	Alternative 1	\$310	5423.5	\$45	\$1,308,645	3900	520	46.6	\$12,000	\$558,678							\$0	19500		23400		\$0	54600	\$1.00	\$54,600
From Northern Avenue to FRS#3 Sta. 120+00 to Sta. 159+00	Alternative 2	\$310	901.3	\$45	\$217,483	3900	56	5.0	\$12,000	\$60,165							\$0	19500		23400		\$0	54600	\$1.00	\$54,600
	Alternative 3	\$310	0.0	\$45	\$0	3900	19	1.7	\$2,200	\$3,742							\$0	19500		23400		\$0			\$0
	Alternative 4	\$310	0.0	\$45	\$0	3900	19	1.7	\$2,200	\$3,742							\$0	19500		23400		\$0			\$0
Segment 2-East	Alternative 3	\$310	0.0	\$45	\$0	5280	75	9.1	\$12,000	\$109,091							\$0	26400		31680		\$0	73920	\$1.00	\$73,920
From Olive Avenue to Northern Avenue	Alternative 4	\$310	163.0	\$45	\$227,354	5150	134	15.8	\$12,000	\$190,110	Conc box	10x6	1	200	1.262	\$310	\$78,244	25750		30900		\$0	72100	\$1.00	\$72,100
Subtotals	Alternative 1		12305.1		\$2,969,137			103		\$1,231,956						\$369,939	53750		64500		\$0	150500		\$150,500	
	Alternative 2		2398.3		\$578,704			14		\$171,763						\$369,939	53750		64500		\$0	150500		\$150,500	
	Alternative 3		144.0		\$66,620			19		\$213,494						\$418,587	49350		59220		\$0	83580		\$83,580	
	Alternative 4		163.0		\$230,268			18		\$193,853						\$544,447	45250		54300		\$0	72100		\$72,100	

White Tanks FRS #3, North Inlet Channel

White Tanks FRS #3 North Inlet Channel Preliminary Design, Quantities, and Cost Estimate Table	Alternative	Aesthetic Features			Totals				Right of Way					50 Year O&M Costs					
		Hardscape Area (ft ²)	Project Subtotal without Landscape Cost (\$/ft ²)	Aesthetic Feature Maximum Cost	Subtotal Construction Cost	Engineering and Construction Administration Cost	Contingencies Cost	Total Segment Construction, Contingencies, O&M, and Aesthetic Features Costs	Right of Way Width (ft)	Right of Way (acre)	Unit Cost (\$/acre)	Subtotal Right of Way Cost	Administrative Costs	Total Right of Way Cost	Concrete Feature Area (acre)	Concrete Feature O&M unit cost (\$/acre/year)	Earth Channel & Detention Basin Area (acre)	Earth Channel & Detention Basin O&M unit cost (\$/acre/year)	Total Operation & Maintenance Cost
Segment 0	OldAlt 1	21506	\$0	\$0	\$0	\$0	\$0	\$0	125	14.8	\$0	\$0	\$0	\$0	0.5	\$0	14.3	\$0	\$0
From north of Peoria to Waterfalls Wash Sta. 0+00 to Sta. 51+50	OldAlt 2	151369	\$0	\$0	\$0	\$0	\$0	\$0	100	11.8	\$0	\$0	\$0	\$0	3.5	\$0	8.3	\$0	\$0
Segment 1	Alternative 1	13041	\$1,006,828	\$40,273	\$859,710	\$103,165	\$171,942	\$1,820,324	285	10.5	\$16,000	\$301,992	\$30,199	\$332,191	0.3	\$40	10.2	\$531	\$353,316
From Waterfalls Wash to Olive Avenue	Alternative 2	95919	\$1,013,780	\$40,551	\$1,046,941	\$125,633	\$209,388	\$1,580,153	140	5.1	\$16,000	\$82,277	\$8,228	\$90,505	2.2	\$40	2.9	\$531	\$107,686
Sta.51+50 to Sta. 67+50	Alternative 3	17280	\$154,123	\$6,165	\$163,455	\$19,615	\$32,691	\$230,464	72	0.4	\$16,000	\$6,347	\$635	\$6,982	0.4	\$40	0.2	\$531	\$7,721
	Alternative 3	27900	\$412,464	\$16,499	\$436,553	\$52,386	\$87,311	\$601,731	62	0.6	\$16,000	\$10,248	\$1,025	\$11,273	0.6	\$40	0.4	\$531	\$14,207
	Alternative 3	17325	\$615,216	\$24,609	\$608,489	\$73,019	\$121,698	\$1,213,710	350x750'	7.8	\$16,000	\$125,344	\$12,534	\$137,879	0.4	\$40	7.8	\$531	\$272,626
	Alternative 4	0	\$81,158	\$3,246	\$84,404	\$10,129	\$16,881	\$111,414	0	0.0	\$16,000	\$0	\$0	\$0	0.0	\$40	0.0	\$531	\$0
	Alternative 4	0	\$131,626	\$5,265	\$136,891	\$16,427	\$27,378	\$180,696	0	0.0	\$16,000	\$0	\$0	\$0	0.0	\$40	0.0	\$531	\$0
Segment 2	Alternative 1	52164	\$1,626,975	\$65,079	\$1,643,683	\$197,242	\$328,737	\$2,997,418	225	13.9	\$16,000	\$241,759	\$24,176	\$265,935	1.2	\$40	16.1	\$531	\$561,822
From Olive Avenue to Cholla Wash	Alternative 2	172193	\$1,537,856	\$61,514	\$1,646,403	\$197,568	\$329,281	\$2,401,927	80	5.0	\$16,000	\$79,339	\$7,934	\$87,273	4.0	\$40	3.8	\$531	\$141,402
Sta. 67+50 to Sta. 94+50	Alternative 3	0	\$217,353	\$8,694	\$226,047	\$27,126	\$45,209	\$298,383	0	0.0	\$16,000	\$0	\$0	\$0	0.0	\$40	0.0	\$531	\$0
	Alternative 4	0	\$217,353	\$8,694	\$226,047	\$27,126	\$45,209	\$298,383	0	0.0	\$16,000	\$0	\$0	\$0	0.0	\$40	0.0	\$531	\$0
Segment 3	Alternative 1	42404	\$2,994,404	\$119,776	\$3,025,200	\$363,024	\$605,040	\$5,550,815	485	28.4	\$16,000	\$454,270	\$45,427	\$499,697	1.0	\$40	30.4	\$531	\$1,057,854
From Cholla Wash to Northern Avenue	Alternative 2	292848	\$2,717,290	\$108,692	\$2,820,058	\$338,407	\$564,012	\$3,987,621	130	7.6	\$16,000	\$121,763	\$12,176	\$133,939	6.7	\$40	3.3	\$531	\$131,206
Sta. 94+50 to Sta. 120+00	Alternative 3	0	\$256,333	\$10,253	\$266,586	\$31,990	\$53,317	\$351,894	0	0.0	\$16,000	\$0	\$0	\$0	0.0	\$40	0.0	\$531	\$0
	Alternative 4	0	\$256,333	\$10,253	\$266,586	\$31,990	\$53,317	\$351,894	0	0.0	\$16,000	\$0	\$0	\$0	0.0	\$40	0.0	\$531	\$0
Segment 4	Alternative 1	84807	\$3,573,402	\$142,936	\$3,665,416	\$439,850	\$733,083	\$7,128,000		38.1	\$16,000	\$609,600	\$60,960	\$670,560	1.9	\$40	46.6	\$531	\$1,619,091
From Northern Avenue to FRS#3	Alternative 2	454794	\$3,740,467	\$149,619	\$3,903,731	\$468,448	\$780,746	\$5,533,879		10.2	\$16,000	\$163,520	\$16,352	\$179,872	10.4	\$40	5.0	\$531	\$201,082
Sta. 120+00 to Sta. 159+00	Alternative 3	0	\$775,073	\$31,003	\$809,818	\$97,178	\$161,964	\$1,162,076	0	0.0	\$16,000	\$0	\$0	\$0	0.0	\$40	2.7	\$531	\$93,116
	Alternative 4	0	\$775,073	\$31,003	\$809,818	\$97,178	\$161,964	\$1,162,076	0	0.0	\$16,000	\$0	\$0	\$0	0.0	\$40	2.7	\$531	\$93,116
Segment 2-East	Alternative 3	0	\$267,859	\$10,714	\$193,725	\$23,247	\$38,745	\$889,265	100	12.1	\$16,000	\$193,939	\$19,394	\$213,333	0.0	\$40	12.1	\$531	\$420,215
From Olive Avenue to Northern Avenue	Alternative 4	3745	\$904,266	\$36,171	\$829,776	\$99,573	\$165,955	\$2,075,087	159	18.8	\$16,000	\$300,771	\$30,077	\$330,848	0.1	\$40	18.7	\$531	\$648,935
Subtotals	Alternative 1	192416	\$9,201,608.77	\$368,064	\$9,194,009	\$1,103,281	\$1,838,802	\$17,496,557		90.9		\$1,607,620	\$160,762	\$1,768,382	4.4		103.3		\$3,592,083
	Alternative 2	1015753	\$9,009,393.86	\$360,376	\$9,417,133	\$1,130,056	\$1,883,427	\$13,503,580		27.9		\$446,899	\$44,690	\$491,589	23.3		15.0		\$581,375
	Alternative 3	62505	\$2,698,422.01	\$107,937	\$2,704,675	\$324,561	\$540,935	\$4,747,523		21.0		\$335,879	\$33,588	\$369,467	1.4		23.2		\$807,885
	Alternative 4	3745	\$2,365,809.32	\$94,632	\$2,353,523	\$282,423	\$470,705	\$4,179,550		18.8		\$300,771	\$30,077	\$330,848	0.1		21.4		\$742,051

APPENDIX D

**NORTHERN AVENUE DIVERSION PRELIMINARY DESIGN
QUANTITIES AND COST ESTIMATE**

Preliminary Cost Estimate Summary - Northern Avenue Diversion Alternatives

CONTRACT: FCD 2000 C 036

Alternative	Description	Cost to Divert Flow Along Northern	Acre-Foot Diverted	Cost Reduction at FRS #3 Basin as Result of Diversion	Net Cost of Diversion Alternative
Baseline Model (Modified)	URS Preferred Recommended Alternative, on-line basins L & R modified to act as <u>off-line</u> basins	\$0.0 M	0	\$0.0 M	\$0.0 M
Northern Alternative 1	Divert 600 cfs base flow from the North Inlet Channel. Use 2 off-line basins L & R.	\$2.8 M	224	\$1.9 M	\$0.9 M
Northern Alternative 2	Divert 700 cfs base flow from the North Inlet Channel. Use 2 off-line basins L & R.	\$3.4 M	240	\$2.1 M	\$1.3 M
Northern Alternative 3	Divert 800 cfs base flow from the North Inlet Channel. Use 2 off-line basins L & R.	\$3.8 M	258	\$2.2 M	\$1.6 M
Northern Alternative 4	Divert 1000 cfs base flow from the North Inlet Channel. Use 2 off-line basins L & R.	\$4.5 M	288	\$2.5 M	\$2.0 M
Northern Alternative 5	Scalp 600 cfs peak from the North Inlet Channel. Use 2 off-line basins L & R.	\$2.1 M	10	\$0.1 M	\$2.0 M

Notes: 1. These cost estimates should only be used for comparison purposes.

2. The cost of excavation from the Level II Draft Phase II Alternatives Analysis Report for the Loop 303 ADMP Update by URS, September, 2001, is \$8600 per ac-ft.

Northern Avenue Diversion - Unit Costs

<u>Item</u>	<u>Unit</u>	<u>Unit price</u>
Excavation	C.Y.	\$3.25
Grouted riprap (drop structure)	C.Y.	\$130
Landscaping	Ac	\$2,500
Right of way	Ac	\$40,000
72" diameter RCP	Ft	\$345
Headwalls & apron	C.Y.	varies
Aesthetics & multi-use	S.F.	\$1.30
Detention basin excavation	C.Y.	\$5.00

Note: The culvert cost does not include headwall and apron costs

White Tanks FRS #3, Northern Avenue

White Tanks FRS #3 Northern Avenue Diversion Preliminary Design, Quantities, and Cost Estimate Table																									Excavation		
I.D.	Design Q100 (ft ³ /s)	Comp. Capacity (ft ³ /s)	Length (ft)	Original Slope (ft/ft)	Design Invert Slope (ft/ft)	Total Vertical Drop (ft)	No. of Drops	Vertical Drop (ft)	Manning's "n" Value	Bottom Width, W (ft)	Depth of Flow (ft)	Freeboard (ft)	Side slope (Z:1) Left	Side slope (Z:1) Right	Area (ft ²)	Perimeter (ft.)	Flow Top Width (ft)	Hydraulic Depth (ft)	Froude Number	Velocity (ft/s)	Channel Design Depth from depth + freeboard (ft)	Channel Topwidth (ft)	Channel Width Plus 60' extra RW	Excavated Volume (yd ³)	Unit Cost (\$/yd ³)	Total Excavation Cost	
URS - Alt. 3 (Baseline-Modified)	Above NR1	256	256	1720	0.0049	0.0049	0	0.0	0.0300	5	2.68	2.0	6	6	56.3	37.6	37.1	1.5	0.65	4.54	5.0	65.0	125.0	0	\$3.25	\$0	
MODIFIED BY WOOD/PATEL TO INCLUDE OFF-LINE BASINS	NR1 to NR2	1313	1313	6200	0.0056	0.0040	9.9	3	3.3	0.0300	38	3.65	2.0	6	218.7	82.4	81.8	2.7	0.65	6.00	6.0	110.0	170.0	101,956	\$3.25	\$331,356	
	NR2 to NR3	2281	2281	5280	0.0064	0.0030	18.0	4	4.5	0.0300	64	4.25	2.0	6	380.3	115.7	115.0	3.3	0.58	6.00	7.0	148.0	208.0	145,102	\$3.25	\$471,582	
Model: L33PE5I1	NR3 to NR4	2382	2382	2640	0.0045	0.0030	4.0	2	2.0	0.0300	70	4.18	2.0	6	397.2	120.8	120.1	3.3	0.58	6.00	7.0	154.0	214.0	76,658	\$3.25	\$249,138	
	NR4 to NR5	361	361	2640	0.0042	0.0042	0.0	0	0.0	0.0300	5	3.19	2.0	6	77.2	43.9	43.3	1.8	0.62	4.68	6.0	77.0	137.0	24,053	\$3.25	\$78,173	
	NR5 to NR6	553	553	5280	0.0038	0.0038	0.0	0	0.0	0.0300	5	3.89	2.0	6	110.2	52.3	51.7	2.1	0.61	5.02	6.0	77.0	137.0	48,107	\$3.25	\$156,347	
Wood/Patel - Alternative 1	Above NR1	838	838	1720	0.0049	0.0049	0	0	0.0300	19	3.50	2.0	6	6	139.8	61.5	61.0	2.3	0.70	5.99	6.0	91.0	151.0	21,022	\$3.25	\$68,322	
600 cfs base flow from Beardsley	NR1 to NR2	1859	1859	6200	0.0056	0.0040	9.9	3	3.3	0.0300	78	3.19	2.0	6	309.7	116.8	116.3	2.7	0.65	6.00	6.0	150.0	210.0	157,067	\$3.25	\$510,467	
Two off-line basins	NR2 to NR3	2850	2850	5280	0.0064	0.0030	18.0	4	4.5	0.0300	96	3.96	2.0	6	474.7	144.2	143.6	3.3	0.58	6.00	6.0	168.0	228.0	154,880	\$3.25	\$503,360	
Model: L33PE5I5	NR3 to NR4	2951	2951	2640	0.0045	0.0030	4.0	2	2.0	0.0300	102	3.92	2.0	6	492.0	149.7	149.0	3.3	0.58	6.00	6.0	174.0	234.0	80,960	\$3.25	\$263,120	
	NR4 to NR5	591	591	2640	0.0042	0.0042	0.0	0	0.0	0.0300	5	3.92	2.0	6	111.6	52.6	52.0	2.1	0.64	5.30	6.0	77.0	137.0	24,053	\$3.25	\$78,173	
	NR5 to NR6	792	792	5280	0.0038	0.0038	0.0	0	0.0300	5	4.50	2.0	6	6	144.2	59.8	59.0	2.4	0.62	5.49	7.0	89.0	149.0	64,338	\$3.25	\$209,098	
Wood/Patel - Alternative 2	Above NR1	906	906	1720	0.0049	0.0049	0	0	0.0300	27	3.25	2.0	6	6	151.2	66.6	66.0	2.3	0.70	5.99	6.0	99.0	159.0	24,080	\$3.25	\$78,260	
700 cfs base flow from Beardsley	NR1 to NR2	1958	1958	6200	0.0056	0.0040	9.9	3	3.3	0.0300	85	3.14	2.0	6	326.5	123.2	122.7	2.7	0.65	6.00	6.0	157.0	217.0	166,711	\$3.25	\$541,811	
Two off-line basins	NR2 to NR3	2952	2952	5280	0.0064	0.0030	18.0	4	4.5	0.0300	102	3.92	2.0	6	492.1	149.7	149.0	3.3	0.58	6.00	6.0	174.0	234.0	161,920	\$3.25	\$526,240	
Model: L33PE5I6	NR3 to NR4	3053	3053	2640	0.0045	0.0030	4.0	2	2.0	0.0300	107	3.90	2.0	6	508.5	154.4	153.8	3.3	0.58	6.00	6.0	179.0	239.0	83,893	\$3.25	\$272,653	
	NR4 to NR5	628	628	2640	0.0042	0.0042	0.0	0	0.0	0.0300	5	4.01	2.0	6	116.8	53.8	53.2	2.2	0.64	5.38	7.0	89.0	149.0	32,169	\$3.25	\$104,549	
	NR5 to NR6	830	830	5280	0.0038	0.0038	0.0	0	0.0300	5	4.59	2.0	6	6	149.4	60.8	60.1	2.5	0.62	5.56	7.0	89.0	149.0	64,338	\$3.25	\$209,098	
Wood/Patel - Alternative 3	Above NR1	999	999	1720	0.0049	0.0049	0	0	0.0300	36	3.06	2.0	6	6	166.6	73.3	72.8	2.3	0.70	6.00	6.0	108.0	168.0	27,520	\$3.25	\$89,440	
800 cfs base flow from Beardsley	NR1 to NR2	2056	2056	6200	0.0056	0.0040	9.9	3	3.3	0.0300	92	3.10	2.0	6	343.2	129.7	129.2	2.7	0.65	5.99	6.0	164.0	224.0	176,356	\$3.25	\$573,156	
Two off-line basins	NR2 to NR3	3052	3052	5280	0.0064	0.0030	18.0	4	4.5	0.0300	107	3.90	2.0	6	508.4	154.4	153.8	3.3	0.58	6.00	6.0	179.0	239.0	167,787	\$3.25	\$545,307	
Model: L33PE5I7	NR3 to NR4	3153	3153	2640	0.0045	0.0030	4.0	2	2.0	0.0300	113	3.86	2.0	6	525.8	160.0	159.3	3.3	0.58	6.00	6.0	185.0	245.0	87,413	\$3.25	\$284,093	
	NR4 to NR5	666	666	2640	0.0042	0.0042	0.0	0	0.0	0.0300	5	4.11	2.0	6	122.0	55.0	54.3	2.2	0.64	5.46	7.0	89.0	149.0	32,169	\$3.25	\$104,549	
	NR5 to NR6	868	868	5280	0.0038	0.0038	0.0	0	0.0300	5	4.67	2.0	6	6	154.5	61.9	61.1	2.5	0.62	5.62	7.0	89.0	149.0	64,338	\$3.25	\$209,098	
Wood/Patel - Alternative 4	Above NR1	1128	1128	1720	0.0049	0.0049	0	0	0.0300	47	2.91	2.0	6	6	187.9	82.4	82.0	2.3	0.70	6.00	5.0	107.0	167.0	24,526	\$3.25	\$79,709	
1000 cfs base flow from Beardsley	NR1 to NR2	2253	2253	6200	0.0056	0.0040	9.9	3	3.3	0.0300	105	3.05	2.0	6	376.0	142.1	141.6	2.7	0.65	5.99	6.0	177.0	237.0	194,267	\$3.25	\$631,367	
Two off-line basins	NR2 to NR3	3253	3253	5280	0.0064	0.0030	18.0	4	4.5	0.0300	118	3.84	2.0	6	542.0	164.7	164.1	3.3	0.58	6.00	6.0	190.0	250.0	180,693	\$3.25	\$587,253	
Model: L33PE5I8	NR3 to NR4	3354	3354	2640	0.0045	0.0030	4.0	2	2.0	0.0300	124	3.81	2.0	6	559.5	170.3	169.7	3.3	0.58	5.99	6.0	196.0	256.0	93,867	\$3.25	\$305,067	
	NR4 to NR5	741	741	2640	0.0042	0.0042	0.0	0	0.0	0.0300	5	4.30	2.0	6	132.2	57.3	56.5	2.3	0.65	5.61	7.0	89.0	149.0	32,169	\$3.25	\$104,549	
	NR5 to NR6	944	944	5280	0.0038	0.0038	0.0	0	0.0300	5	4.84	2.0	6	6	164.5	63.8	63.0	2.6	0.63	5.74	7.0	89.0	149.0	64,338	\$3.25	\$209,098	
Wood/Patel - Alternative 5	Above NR1	848	848	1720	0.0049	0.0049	0	0	0.0300	20	3.47	2.0	6	6	141.4	62.2	61.6	2.3	0.70	6.00	6.0	92.0	152.0	21,404	\$3.25	\$69,564	
600 cfs scalped peak from Beardsley	NR1 to NR2	1597	1597	6200	0.0056	0.0040	9.9	3	3.3	0.0300	60	3.33	2.0	6	266.3	100.5	100.0	2.7	0.65	6.00	6.0	132.0	192.0	132,267	\$3.25	\$429,867	
Two off-line basins	NR2 to NR3	2452	2452	5280	0.0064	0.0030	18.0	4	4.5	0.0300	74	4.14	2.0	6	408.8	124.3	123.6	3.3	0.58	6.00	7.0	158.0	218.0	158,791	\$3.25	\$516,071	
No basin at Olive Avenue	NR3 to NR4	2543	2543	2640	0.0045	0.0030	4.0	2	2.0	0.0300	79	4.09	2.0	6	423.7	128.8	128.1	3.3	0.58	6.00	7.0	163.0	223.0	82,818	\$3.25	\$269,158	
Model: L33PE5I9	NR4 to NR5	583	583	2640	0.0042	0.0042	0.0	0	0.0	0.0300	5	3.89	2.0	6	110.4	52.4	51.7	2.1	0.64	5.28	6.0	77.0	137.0	24,053	\$3.25	\$78,173	
	NR5 to NR6	780	780	5280	0.0038	0.0038	0.0	0	0.0300	5	4.48	2.0	6	6	142.6	59.5	58.7	2.4	0.62	5.47	7.0	89.0	149.0	64,338	\$3.25	\$209,098	
Notes:	1. The detention basin area assumes an additional 30' of width on all edges for aesthetics																										
	2. It was assumed that the detention basins have square footprints.																										
	3. The distance between NR1 and NR2 is 6200' in the Loop 303 Report. NR1 is located at the minor canal crossing west of the Beardsley Canal, however, W/P sketches show NR1 at Perryville.																										

White Tanks FRS #3, Northern Avenue

White Tanks FRS #3 Northern Avenue Diversion Preliminary Design, Quantities, and Cost Estimate Table		Drop Structures							Landscaping					Right of Way			Culverts					Aesthetics & Multi-use			
		I.D.	Drop Structures (No.)	Depth at bottom slope of 10:1 & n=0.042 (Y1)	Length of Stilling basin	Length of Drop	Drop Structure Grouted Riprap Volume (yd³)	Unit Cost (\$/yd³)	Total Drop Structures Cost	Channel Length (ft)	Landscape Width Required (ft)	Landscape Area Required (acre)	Landscaping Unit Cost (\$/acre)	Total Landscape Cost	Right of Way (acre)	Unit Cost (\$/acre)	Total Right of Way Cost	Number of Culvert crossings	Number of 72" diameter RCP Barrels	Total Length of Crossings in Reach (ft)	Unit Cost (\$/ft)	Headwall & Apron Cost	Total Culvert Cost	Landscape Aesthetics & Multi-Use Area (ft²)	Unit Cost (\$/ft²)
URS - Alt. 3 (Baseline-Modified)		Above NR1	0				\$130	\$0	0	125	0.0	\$2,500	\$0	0.0	\$40,000	\$0	1	2	75	\$345	\$12,870	\$38,745	0	\$1.30	\$0
MODIFIED BY WOOD/PATEL TO INCLUDE OFF-LINE BASINS		NR1 to NR2	3	1.8	19	34	\$130	\$84,211	6200	170	24.2	\$2,500	\$60,491	24.2	\$40,000	\$967,860	1	7	75	\$345	\$30,683	\$56,558	1054000	\$1.30	\$1,370,200
Model: L33PE5I1		NR2 to NR3	4	1.9	20	45	\$130	\$185,274	5280	208	25.2	\$2,500	\$63,030	25.2	\$40,000	\$1,008,485	1	12	75	\$345	\$48,495	\$74,370	1098240	\$1.30	\$1,427,712
		NR3 to NR4	2	1.9	19	20	\$130	\$57,836	2640	214	64.2	\$2,500	\$160,525	64.2	\$40,000	\$2,568,408	2	13	225	\$345	\$104,115	\$181,740	2796996	\$1.30	\$3,636,095
		NR4 to NR5	0				\$130	\$0	2640	137	8.3	\$2,500	\$20,758	8.3	\$40,000	\$332,121	1	2	75	\$345	\$12,870	\$38,745	361680	\$1.30	\$470,184
		NR5 to NR6	0				\$130	\$0	5280	137	51.8	\$2,500	\$129,619	51.8	\$40,000	\$2,073,904	1	3	75	\$345	\$16,433	\$42,308	2258481	\$1.30	\$2,936,025
Wood/Patel - Alternative 1		Above NR1	0				\$130	\$0	1720	151	6.0	\$2,500	\$14,906	6.0	\$40,000	\$238,494	1	5	75	\$345	\$23,558	\$49,433	259720	\$1.30	\$337,636
600 cfs base flow from Beardsley		NR1 to NR2	3	1.5	16	34	\$130	\$108,333	6200	210	29.9	\$2,500	\$74,725	29.9	\$40,000	\$1,195,592	1	10	75	\$345	\$41,370	\$67,245	1302000	\$1.30	\$1,692,600
Two off-line basins		NR2 to NR3	4	1.8	18	45	\$130	\$203,840	5280	228	27.6	\$2,500	\$69,091	27.6	\$40,000	\$1,105,455	1	15	75	\$345	\$59,183	\$85,058	1203840	\$1.30	\$1,564,992
Model: L33PE5I5		NR3 to NR4	2	1.7	18	20	\$130	\$63,671	2640	234	65.4	\$2,500	\$163,556	65.4	\$40,000	\$2,616,893	2	16	225	\$345	\$125,490	\$203,115	2849796	\$1.30	\$3,704,735
		NR4 to NR5	0				\$130	\$0	2640	137	8.3	\$2,500	\$20,758	8.3	\$40,000	\$332,121	1	4	75	\$345	\$19,995	\$45,870	361680	\$1.30	\$470,184
		NR5 to NR6	0				\$130	\$0	5280	149	53.3	\$2,500	\$133,255	53.3	\$40,000	\$2,132,085	1	5	75	\$345	\$23,558	\$49,433	2321841	\$1.30	\$3,018,393
Wood/Patel - Alternative 2		Above NR1	0				\$130	\$0	1720	159	6.3	\$2,500	\$15,696	6.3	\$40,000	\$251,129	1	5	75	\$345	\$23,558	\$49,433	273480	\$1.30	\$355,524
700 cfs base flow from Beardsley		NR1 to NR2	3	1.5	16	34	\$130	\$113,389	6200	217	30.9	\$2,500	\$77,215	30.9	\$40,000	\$1,235,445	1	11	75	\$345	\$44,933	\$70,808	1345400	\$1.30	\$1,749,020
Two off-line basins		NR2 to NR3	4	1.7	18	45	\$130	\$211,120	5280	234	28.4	\$2,500	\$70,909	28.4	\$40,000	\$1,134,545	1	16	75	\$345	\$62,745	\$88,620	1235520	\$1.30	\$1,606,176
Model: L33PE5I6		NR3 to NR4	2	1.7	18	20	\$130	\$65,501	2640	239	65.7	\$2,500	\$164,313	65.7	\$40,000	\$2,629,014	2	16	225	\$345	\$125,490	\$203,115	2862996	\$1.30	\$3,721,895
		NR4 to NR5	0				\$130	\$0	2640	149	9.0	\$2,500	\$22,576	9.0	\$40,000	\$361,212	1	4	75	\$345	\$19,995	\$45,870	393360	\$1.30	\$511,368
		NR5 to NR6	0				\$130	\$0	5280	149	53.3	\$2,500	\$133,255	53.3	\$40,000	\$2,132,085	1	5	75	\$345	\$23,558	\$49,433	2321841	\$1.30	\$3,018,393
Wood/Patel - Alternative 3		Above NR1	0				\$130	\$0	1720	168	6.6	\$2,500	\$16,584	6.6	\$40,000	\$265,344	1	6	75	\$345	\$27,120	\$52,995	288960	\$1.30	\$375,648
800 cfs base flow from Beardsley		NR1 to NR2	3	1.5	15	34	\$130	\$116,076	6200	224	31.9	\$2,500	\$79,706	31.9	\$40,000	\$1,275,298	1	11	75	\$345	\$44,933	\$70,808	1388800	\$1.30	\$1,805,440
Two off-line basins		NR2 to NR3	4	1.7	18	45	\$130	\$217,187	5280	239	29.0	\$2,500	\$72,424	29.0	\$40,000	\$1,158,788	1	16	75	\$345	\$62,745	\$88,620	1261920	\$1.30	\$1,640,496
Model: L33PE5I7		NR3 to NR4	2	1.7	17	20	\$130	\$65,915	2640	245	66.1	\$2,500	\$165,222	66.1	\$40,000	\$2,643,559	2	17	225	\$345	\$132,615	\$210,240	2878836	\$1.30	\$3,742,487
		NR4 to NR5	0				\$130	\$0	2640	149	9.0	\$2,500	\$22,576	9.0	\$40,000	\$361,212	1	4	75	\$345	\$19,995	\$45,870	393360	\$1.30	\$511,368
		NR5 to NR6	0				\$130	\$0	5280	149	53.3	\$2,500	\$133,255	53.3	\$40,000	\$2,132,085	1	5	75	\$345	\$23,558	\$49,433	2321841	\$1.30	\$3,018,393
Wood/Patel - Alternative 4		Above NR1	0				\$130	\$0	1720	167	6.6	\$2,500	\$16,485	6.6	\$40,000	\$263,765	1	6	75	\$345	\$27,120	\$52,995	287240	\$1.30	\$373,412
1000 cfs base flow from Beardsley		NR1 to NR2	3	1.5	15	34	\$130	\$125,277	6200	237	33.7	\$2,500	\$84,332	33.7	\$40,000	\$1,349,311	1	12	75	\$345	\$48,495	\$74,370	1469400	\$1.30	\$1,910,220
Two off-line basins		NR2 to NR3	4	1.7	17	45	\$130	\$226,874	5280	250	30.3	\$2,500	\$75,758	30.3	\$40,000	\$1,212,121	1	17	75	\$345	\$66,308	\$92,183	1320000	\$1.30	\$1,716,000
Model: L33PE5I8		NR3 to NR4	2	1.7	17	20	\$130	\$69,834	2640	256	66.8	\$2,500	\$166,889	66.8	\$40,000	\$2,670,226	2	18	225	\$345	\$139,740	\$217,365	2907876	\$1.30	\$3,780,239
		NR4 to NR5	0				\$130	\$0	2640	149	9.0	\$2,500	\$22,576	9.0	\$40,000	\$361,212	1	4	75	\$345	\$19,995	\$45,870	393360	\$1.30	\$511,368
		NR5 to NR6	0				\$130	\$0	5280	149	53.3	\$2,500	\$133,255	53.3	\$40,000	\$2,132,085	1	5	75	\$345	\$23,558	\$49,433	2321841	\$1.30	\$3,018,393
Wood/Patel - Alternative 5		Above NR1	0				\$130	\$0	1720	152	6.0	\$2,500	\$15,005	6.0	\$40,000	\$240,073	1	5	75	\$345	\$23,558	\$49,433	261440	\$1.30	\$339,872
600 cfs scalped peak from Beardsley		NR1 to NR2	3	1.6	17	34	\$130	\$97,240	6200	192	27.3	\$2,500	\$68,320	27.3	\$40,000	\$1,093,113	1	9	75	\$345	\$37,808	\$63,683	1190400	\$1.30	\$1,547,520
Two off-line basins		NR2 to NR3	4	1.9	19	45	\$130	\$194,750	5280	218	26.4	\$2,500	\$66,061	26.4	\$40,000	\$1,056,970	1	13	75	\$345	\$52,058	\$77,933	1151040	\$1.30	\$1,496,352
No basin at Olive Avenue		NR3 to NR4	2	1.8	19	20	\$130	\$61,216	2640	223	64.8	\$2,500	\$161,889	64.8	\$40,000	\$2,590,226	2	14	225	\$345	\$111,240	\$188,865	2820756	\$1.30	\$3,666,983
Model: L33PE5IF		NR4 to NR5	0				\$130	\$0	2640	137	8.3	\$2,500	\$20,758	8.3	\$40,000	\$332,121	1	3	75	\$345	\$16,433	\$42,308	361680	\$1.30	\$470,184
		NR5 to NR6	0				\$130	\$0	5280	149	53.3	\$2,500	\$133,255	53.3	\$40,000	\$2,132,085	1	4	75	\$345	\$19,995	\$45,870	2321841	\$1.30	\$3,018,393

White Tanks FRS #3, Northern Avenue

White Tanks FRS #3 Northern Avenue Diversion Preliminary Design, Quantities, and Cost Estimate Table	I.D.	Detention basins							Totals		
		Detention basin Depth (ft)	Detention basin Side Width (ft)	Detention basin Side Slope (Z:1)	Detention basin Area (acre)	Detention basin Excavation (yd ³)	Unit Cost (\$/yd ³)	Total Detention basin Excavation Cost	Subtotal Construction Cost	Total Contingencies Cost	Total Construction and Contingencies Costs
URS - Alt. 3 (Baseline-Modified)	Above NR1						\$5.00	\$0	\$38,745	\$11,624	\$50,369
MODIFIED BY WOOD/PATEL TO	NR1 to NR2						\$5.00	\$0	\$2,870,676	\$861,203	\$3,731,879
INCLUDE OFF-LINE BASINS	NR2 to NR3						\$5.00	\$0	\$3,230,453	\$969,136	\$4,199,589
Model: L33PE5I1	NR3 to NR4	17	1434	4	51.2	1175832	\$5.00	\$5,879,158	\$12,732,900	\$3,819,870	\$16,552,769
	NR4 to NR5						\$5.00	\$0	\$939,981	\$281,994	\$1,221,975
	NR5 to NR6	9	1179	4	35.2	435627	\$5.00	\$2,178,135	\$7,516,337	\$2,254,901	\$9,771,238
									\$27,290,347	\$8,198,728	\$35,477,451
Wood/Patel - Alternative 1	Above NR1						\$5.00	\$0	\$708,791	\$212,637	\$921,428
600 cfs base flow from Beardsley	NR1 to NR2						\$5.00	\$0	\$3,648,962	\$1,094,689	\$4,743,650
Two off-line basins	NR2 to NR3						\$5.00	\$0	\$3,531,795	\$1,059,538	\$4,591,333
Model: L33PE5I5	NR3 to NR4	17	1434	4	51.2	1175832	\$5.00	\$5,879,158	\$12,894,248	\$3,868,274	\$16,762,522
	NR4 to NR5						\$5.00	\$0	\$947,106	\$284,132	\$1,231,238
	NR5 to NR6	9	1179	4	35.2	435627	\$5.00	\$2,178,135	\$7,720,399	\$2,316,120	\$10,036,519
									\$28,742,510	\$8,835,390	\$38,286,690
Wood/Patel - Alternative 2	Above NR1						\$5.00	\$0	\$750,042	\$225,012	\$975,054
700 cfs base flow from Beardsley	NR1 to NR2						\$5.00	\$0	\$3,787,688	\$1,136,306	\$4,923,995
Two off-line basins	NR2 to NR3						\$5.00	\$0	\$3,637,611	\$1,091,283	\$4,728,894
Model: L33PE5I6	NR3 to NR4	17	1434	4	51.2	1175832	\$5.00	\$5,879,158	\$12,935,649	\$3,880,695	\$16,816,344
	NR4 to NR5						\$5.00	\$0	\$1,045,575	\$313,672	\$1,359,247
	NR5 to NR6	9	1179	4	35.2	435627	\$5.00	\$2,178,135	\$7,720,399	\$2,316,120	\$10,036,519
									\$29,126,922	\$8,963,089	\$38,840,053
Wood/Patel - Alternative 3	Above NR1						\$5.00	\$0	\$800,011	\$240,003	\$1,040,015
800 cfs base flow from Beardsley	NR1 to NR2						\$5.00	\$0	\$3,920,483	\$1,176,145	\$5,096,628
Two off-line basins	NR2 to NR3						\$5.00	\$0	\$3,722,821	\$1,116,846	\$4,839,668
Model: L33PE5I7	NR3 to NR4	17	1434	4	51.2	1175832	\$5.00	\$5,879,158	\$12,990,675	\$3,897,202	\$16,887,877
	NR4 to NR5						\$5.00	\$0	\$1,045,575	\$313,672	\$1,359,247
	NR5 to NR6	9	1179	4	35.2	435627	\$5.00	\$2,178,135	\$7,720,399	\$2,316,120	\$10,036,519
									\$29,399,954	\$9,059,990	\$39,259,955
Wood/Patel - Alternative 4	Above NR1						\$5.00	\$0	\$786,366	\$235,910	\$1,022,276
1000 cfs base flow from Beardsley	NR1 to NR2						\$5.00	\$0	\$4,174,877	\$1,252,463	\$5,427,340
Two off-line basins	NR2 to NR3						\$5.00	\$0	\$3,910,189	\$1,173,057	\$5,083,245
Model: L33PE5I8	NR3 to NR4	17	1434	4	51.2	1175832	\$5.00	\$5,879,158	\$13,088,778	\$3,926,633	\$17,015,411
	NR4 to NR5						\$5.00	\$0	\$1,045,575	\$313,672	\$1,359,247
	NR5 to NR6	9	1179	4	35.2	435627	\$5.00	\$2,178,135	\$7,720,399	\$2,316,120	\$10,036,519
									\$29,939,817	\$9,217,855	\$39,944,039
Wood/Patel - Alternative 5	Above NR1						\$5.00	\$0	\$713,947	\$214,184	\$928,131
600 cfs scalped peak from Beardsley	NR1 to NR2						\$5.00	\$0	\$3,299,742	\$989,923	\$4,289,664
Two off-line basins	NR2 to NR3						\$5.00	\$0	\$3,408,136	\$1,022,441	\$4,430,576
No basin at Olive Avenue	NR3 to NR4	17	1434	4	51.2	1175832	\$5.00	\$5,879,158	\$12,817,494	\$3,845,248	\$16,662,743
Model: L33PE5IF	NR4 to NR5						\$5.00	\$0	\$943,544	\$283,063	\$1,226,607
	NR5 to NR6	9	1179	4	35.2	435627	\$5.00	\$2,178,135	\$7,716,837	\$2,315,051	\$10,031,888
									\$28,185,752	\$8,669,910	\$37,569,609

APPENDIX E

***POLICY FOR THE AESTHETIC TREATMENT
AND LANDSCAPING OF FLOOD CONTROL PROJECTS,
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY***

Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects

**Table 1
Landscaping Cost-Ceiling per Acre***

Landscapable Land

Structure Type	Urban	Suburban	Rural
Channel	\$50,000	\$40,000	\$12,000
Basin	\$50,000	\$40,000	\$12,000
Dam	\$20,000	\$20,000	\$12,000
Other	TBD	TBD	TBD

* Includes expenditures for plant materials, irrigation components, seeding, general system costs, and labor. General system costs may include labor, materials and equipment required to successfully and economically establish and maintain the plant materials and irrigation system, including: laying out and staking the location of all components, weed control and pre-emergent spraying, provision of soil amendments, soil preparation, tree staking and guy wiring, header installations, gravel or other types of mulches, and installation of landscape berms and boulders. Costs for structures in the other category will be determined on a case by case basis.

**Table 2
Project Aesthetic Feature Costs: Maximum Cost Guideline****

Project Cost	Urban	Suburban	Rural	Industrial
<\$1,000,000	10%	8%	7%	NA
\$1,000,000 to \$2,500,000	8%	6%	5%	4%
\$2,500,000 to \$10,000,000	6%	5%	4%	3%
>\$10,000,000	5%	4%	3%	2%

** Includes expenditures for enhancing the appearance of structural components of District flood control projects, including: walls, fences, under-crossings, inlet structures, outlet structures, drop structures, energy dissipaters, low flow features, and other components.

Tables 1 & 2 are intended to reflect aesthetic treatment maximum total costs that may be considered appropriate for flood control projects. They are not an allowance. Actual costs should be determined for each project based on the aesthetic treatment that is determined by the District to be appropriate. The District may share in these costs at the cost-share percentage rates established in project IGA's for overall project costs.

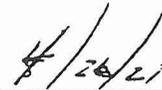
It is recognized that acquisition of additional rights of way may contribute to meeting the goals of the Policy. In addition to the costs established in Tables 1 & 2, the costs for right of way acquisition for landscape aesthetics purposes may be increased up to 30% of total right of way costs required for the project. The District may share in these costs at the cost-share percentage rates established in project IGA's for overall project costs.

The above Cost-Ceiling Charts are hereby updated, and may be applied retroactively to all Flood Control District projects currently under planning and design.

Approved By:



Michael S. Eilegood, P.E.
Chief Engineer and General Manager,
Flood Control District of Maricopa County



Date:

APPENDIX F

404 MAP

PRELIMINARY SECTION 404 DELINEATION

White Tanks FRS #3, North Inlet Channel
Pre-Design Study
Contract FCD 2000 C 036

LEGEND

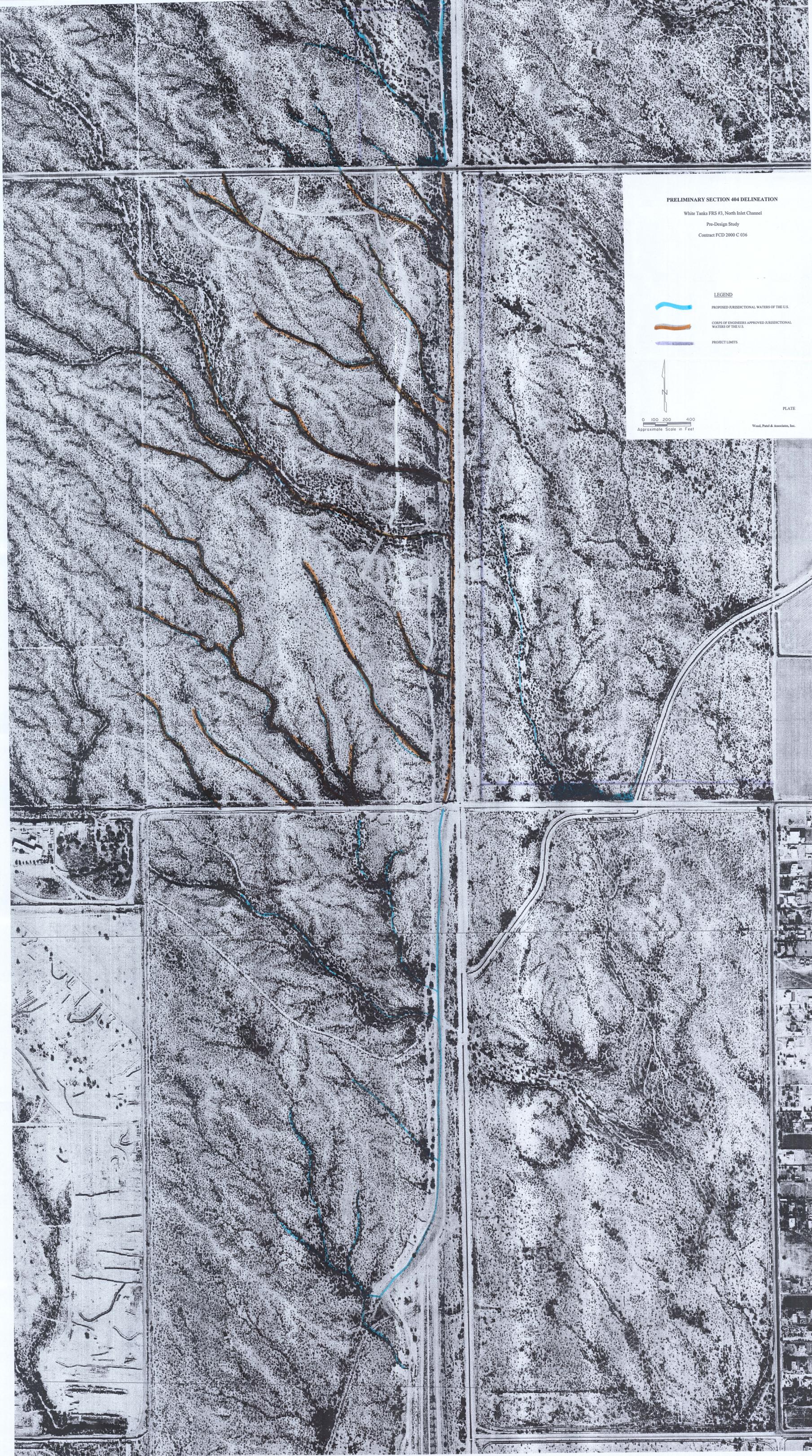
-  PROPOSED JURISDICTIONAL WATERS OF THE U.S.
-  CORPS OF ENGINEERS APPROVED JURISDICTIONAL WATERS OF THE U.S.
-  PROJECT LIMITS



0 100 200 400
Approximate Scale in Feet

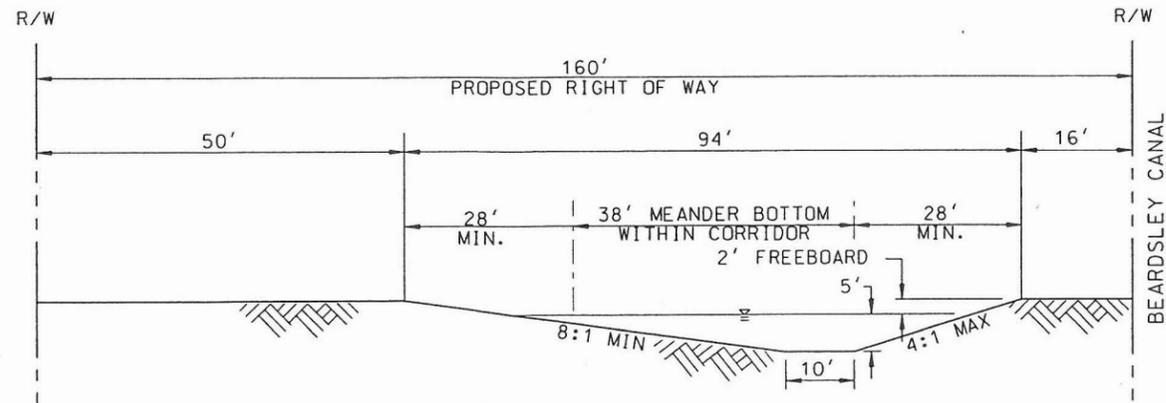
PLATE

Wood, Patel & Associates, Inc.

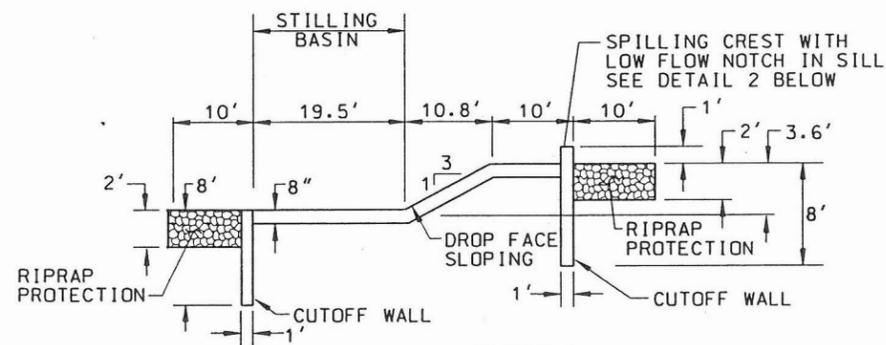


APPENDIX G

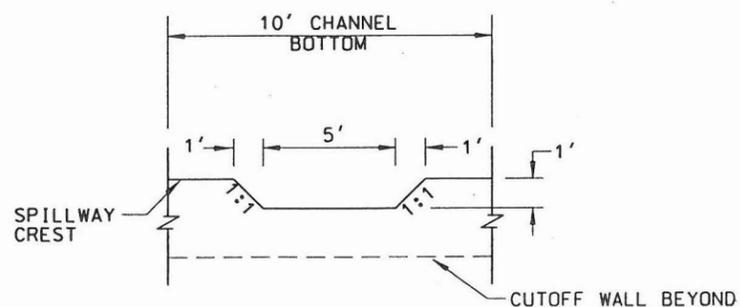
15% TO 30% DESIGN PLAN & PROFILE



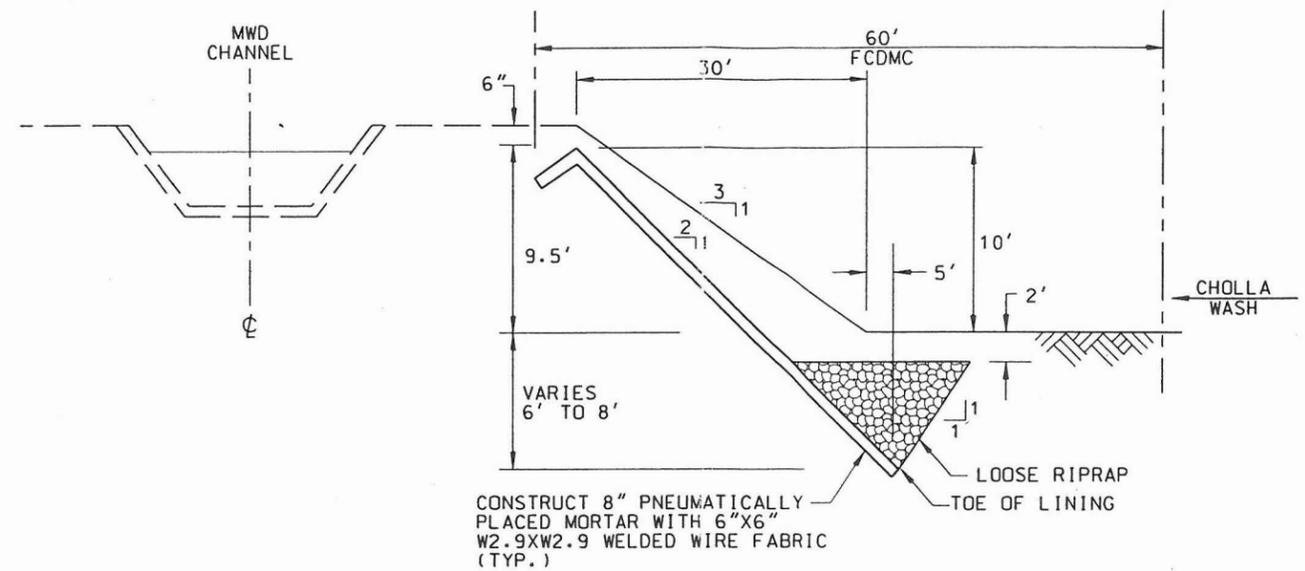
SECTION A-A
TYPICAL ADDITIONAL CHANNEL
ON EAST SIDE OF BEARDSLEY CANAL
NORTHERN AVE TO OLIVE AVE
(Looking Downstream)



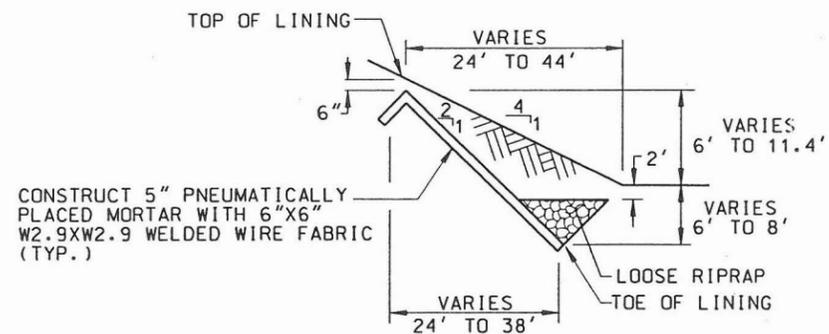
DETAIL 1
TYPICAL DROP STRUCTURE



DETAIL 2
LOW FLOW NOTCH IN
DROP STRUCTURE



SECTION B-B
BEARDSLEY CANAL WASH BANK PROTECTION
AT CHOLLA WASH CONFLUENCE
(Looking Downstream)



SECTION C-C
BEARDSLEY CANAL WASH BANK PROTECTION
SOUTH OF NORTHERN AVENUE
(LOOKING DOWNSTREAM)

NOTE:
THESE PLANS ARE PRELIMINARY AND ARE PROVIDED FOR PLANNING PURPOSES ONLY.
THE LOCATIONS OF ALL STRUCTURES, UTILITIES AND RIGHT-OF-WAY ARE APPROXIMATE
AND ARE BASED UPON RECORD DOCUMENTS. AERIAL TOPOGRAPHY WAS PRODUCED AT A
SCALE OF 1 INCH = 200 FEET WITH A 2 FOOT CONTOUR INTERVAL. MAPPING WAS
PREPARED BY KENNEY AERIAL MAPPING AND WAS PROVIDED BY THE FLOOD CONTROL
DISTRICT OF MARICOPA COUNTY.

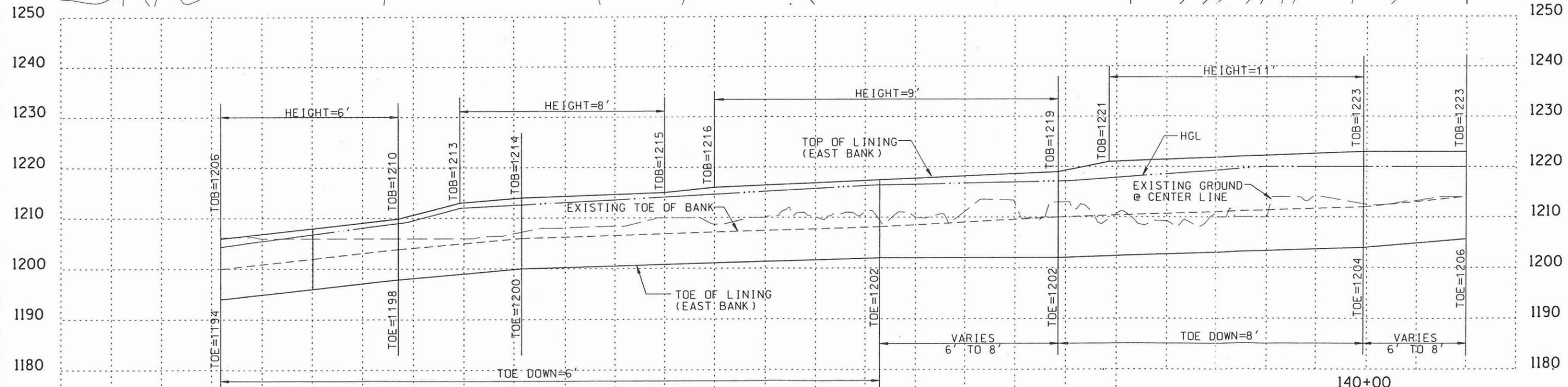
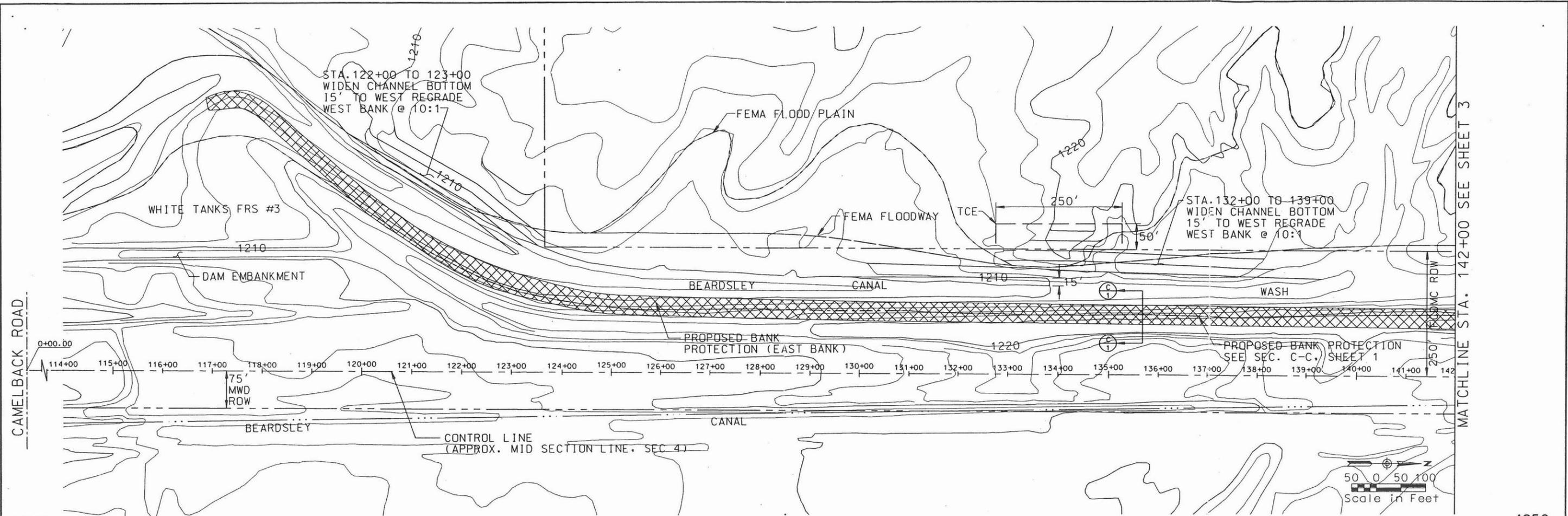


**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION**

DESIGNED	NAME	DATE	WOOD, PATEL & ASSOCIATES, INC. 2051 WEST NORTHERN, SUITE 100 PHOENIX, ARIZONA (602) 335-8500
J. TAILLON		6/02	
C. MCDANIEL		6/02	
J. SIMS		6/02	

FRS #3 NORTH INLET CHANNEL

SHEET
1 OF 5



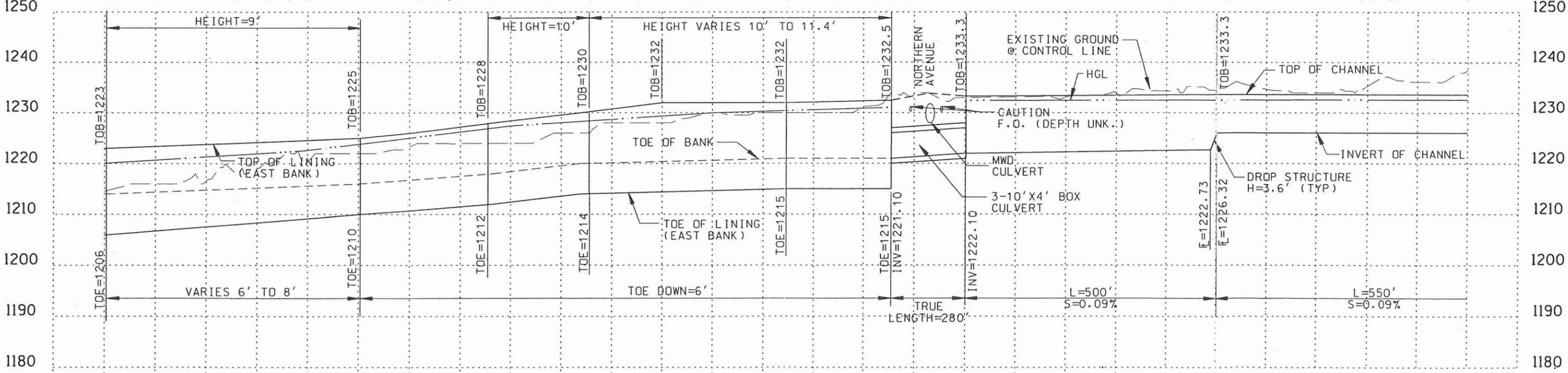
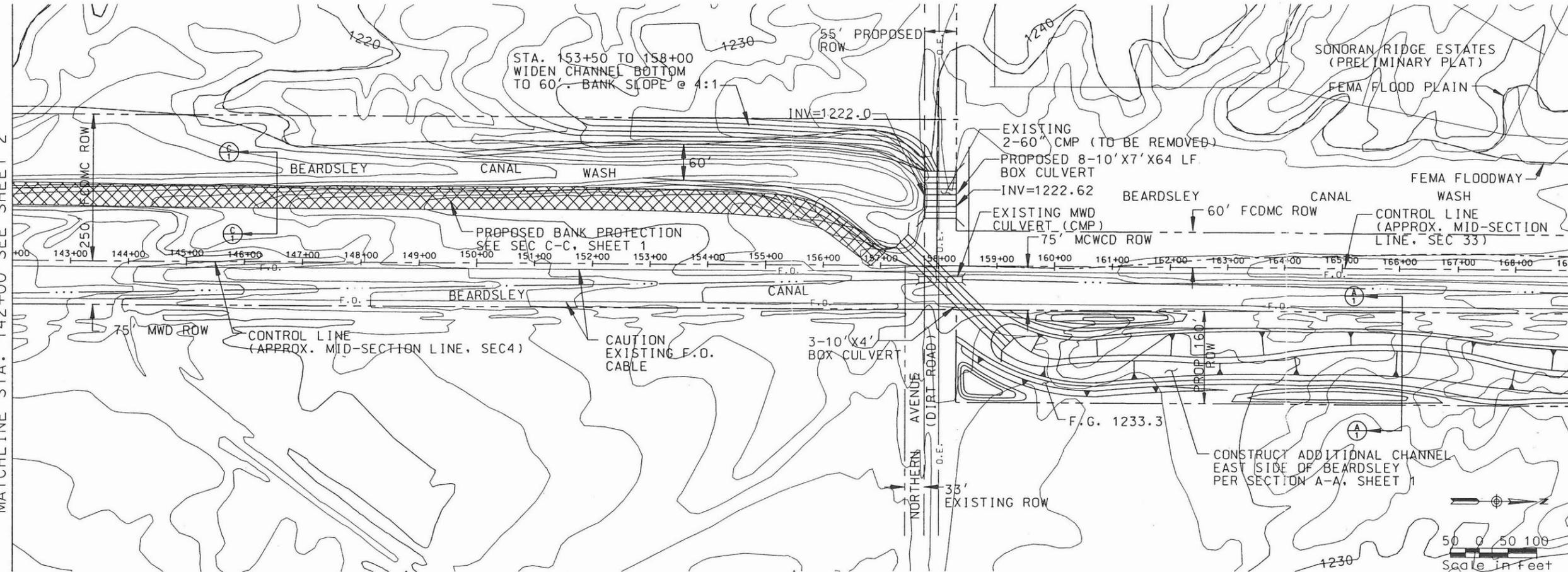
NOTE:
 THESE PLANS ARE PRELIMINARY AND ARE PROVIDED FOR PLANNING PURPOSES ONLY.
 THE LOCATIONS OF ALL STRUCTURES, UTILITIES AND RIGHT-OF-WAY ARE APPROXIMATE
 AND ARE BASED UPON RECORD DOCUMENTS. AERIAL TOPOGRAPHY WAS PRODUCED AT A
 SCALE OF 1 INCH = 200 FEET WITH A 2 FOOT CONTOUR INTERVAL. MAPPING WAS
 PREPARED BY KENNEY AERIAL MAPPING AND WAS PROVIDED BY THE FLOOD CONTROL
 DISTRICT OF MARICOPA COUNTY.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION		
DESIGNED	J. TAILLON	6/02
DRAWN	C. MCDANIEL	6/02
CHECKED	J. SIMS	6/02
WOOD, PATEL & ASSOCIATES, INC. 2051 WEST NORTHERN, SUITE 100 PHOENIX, ARIZONA (602) 335-8500		
FRS #3 NORTH INLET CHANNEL STA 115+00 TO STA 142+00		SHEET 2 OF 5

MATCHLINE STA: 142+00 SEE SHEET 2

MATCHLINE STA. 169+00 SEE SHEET 4



NOTE:
 THESE PLANS ARE PRELIMINARY AND ARE PROVIDED FOR PLANNING PURPOSES ONLY.
 THE LOCATIONS OF ALL STRUCTURES, UTILITIES AND RIGHT-OF-WAY ARE APPROXIMATE
 AND ARE BASED UPON RECORD DOCUMENTS. AERIAL TOPOGRAPHY WAS PRODUCED AT A
 SCALE OF 1 INCH = 200 FEET WITH A 2 FOOT CONTOUR INTERVAL. MAPPING WAS
 PREPARED BY KENNEY AERIAL MAPPING AND WAS PROVIDED BY THE FLOOD CONTROL
 DISTRICT OF MARICOPA COUNTY.

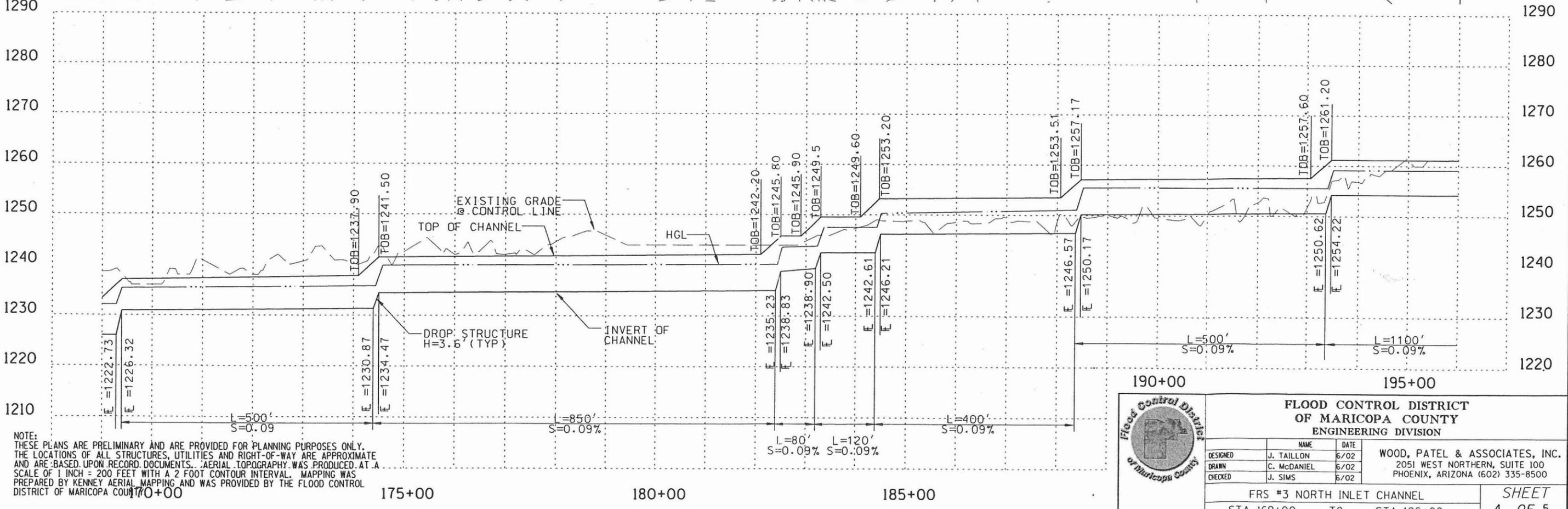


FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION		
DESIGNED	J. TAILLON	6/02
DRAWN	C. McDANIEL	6/02
CHECKED	J. SIMS	6/02
FRS #3 NORTH INLET CHANNEL		
STA 142+00 TO STA 169+00		
		SHEET 3 OF 5



MATCHLINE STA. 169+00 SEE SHEET 3

MATCHLINE STA. 196+00 SEE SHEET 5

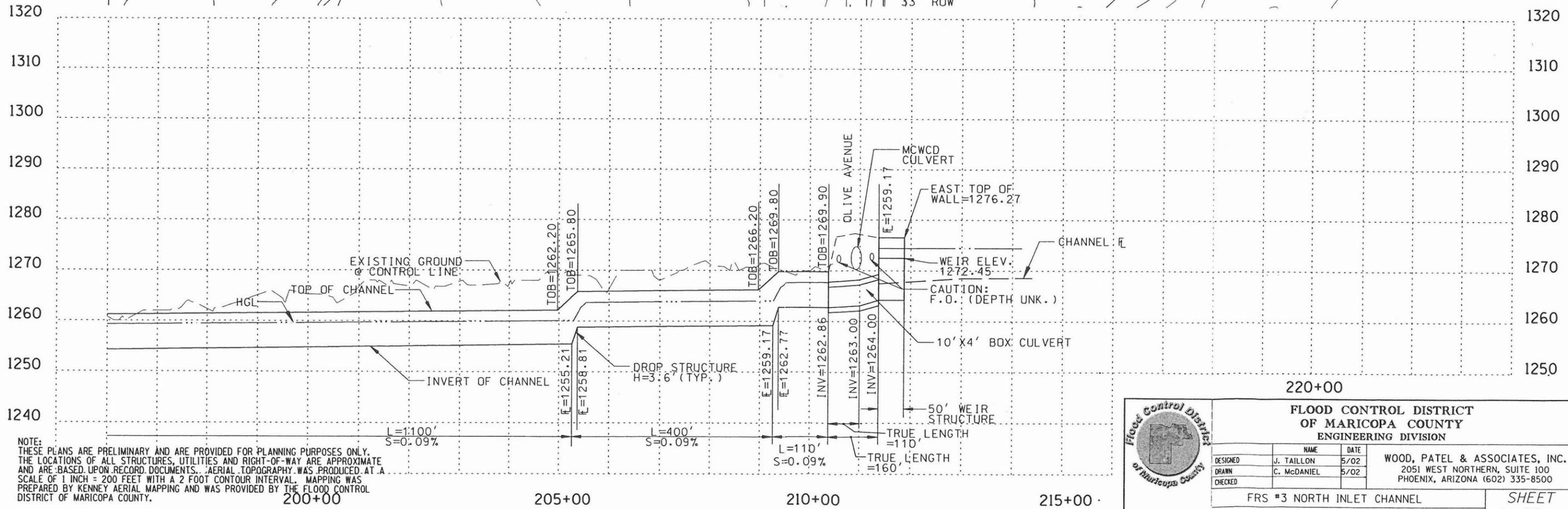
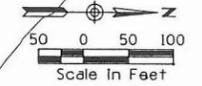
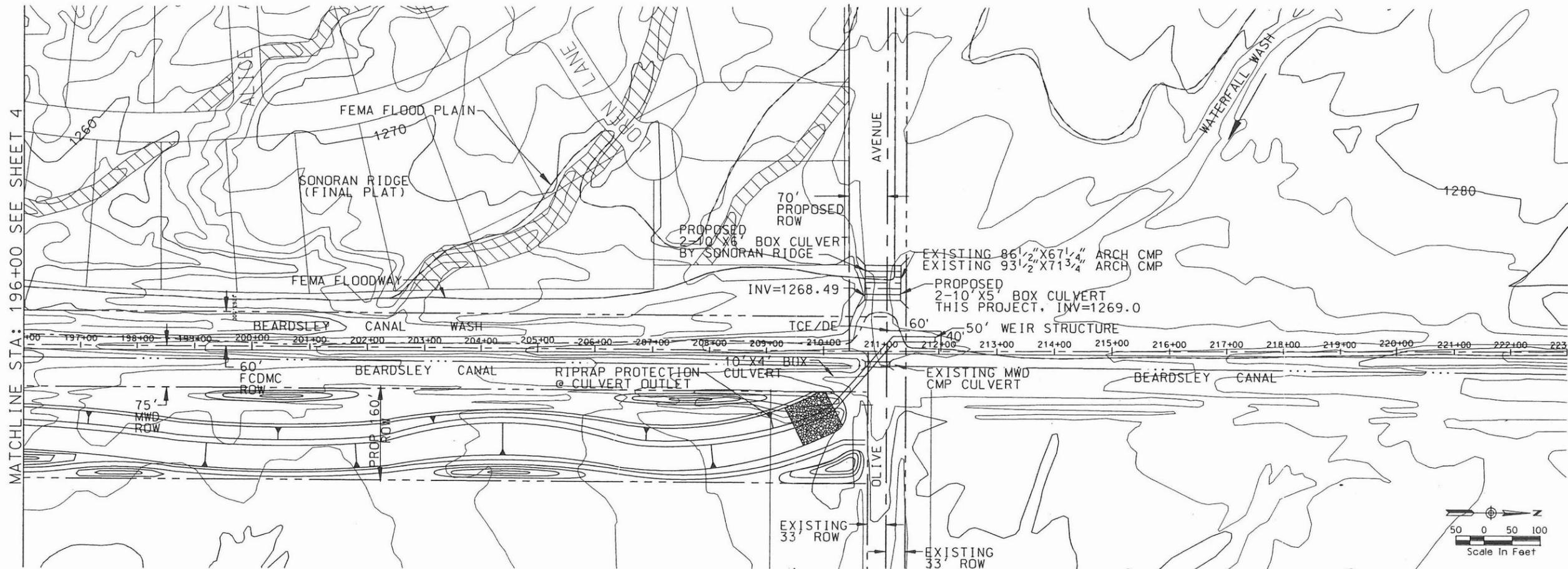


NOTE:
 THESE PLANS ARE PRELIMINARY AND ARE PROVIDED FOR PLANNING PURPOSES ONLY.
 THE LOCATIONS OF ALL STRUCTURES, UTILITIES AND RIGHT-OF-WAY ARE APPROXIMATE
 AND ARE BASED UPON RECORD DOCUMENTS. AERIAL TOPOGRAPHY WAS PRODUCED AT A
 SCALE OF 1 INCH = 200 FEET WITH A 2 FOOT CONTOUR INTERVAL. MAPPING WAS
 PREPARED BY KENNEY AERIAL MAPPING AND WAS PROVIDED BY THE FLOOD CONTROL
 DISTRICT OF MARICOPA COUNTY



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION		
DESIGNED	J. TAILLON	6/02
DRAWN	C. McDANIEL	6/02
CHECKED	J. SIMS	6/02
FRS #3 NORTH INLET CHANNEL		SHEET 4 OF 5
STA 169+00 TO STA 196+00		WOOD, PATEL & ASSOCIATES, INC. 2051 WEST NORTHERN, SUITE 100 PHOENIX, ARIZONA (602) 335-8500

MATCHLINE STA: 196+00 SEE SHEET 4



NOTE: THESE PLANS ARE PRELIMINARY AND ARE PROVIDED FOR PLANNING PURPOSES ONLY. THE LOCATIONS OF ALL STRUCTURES, UTILITIES AND RIGHT-OF-WAY ARE APPROXIMATE AND ARE BASED UPON RECORD DOCUMENTS. AERIAL TOPOGRAPHY WAS PRODUCED AT A SCALE OF 1 INCH = 200 FEET WITH A 2 FOOT CONTOUR INTERVAL. MAPPING WAS PREPARED BY KENNEY AERIAL MAPPING AND WAS PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION		
DESIGNED	NAME	DATE
DESIGNED	J. TAILLON	5/02
DRAWN	C. McDANIEL	5/02
CHECKED		
FRS #3 NORTH INLET CHANNEL		SHEET
STA 196+00	TO STA 223+00	5 OF 5

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

APPENDIX H
HEC-RAS MODEL OUTPUT

Project: Propchan.prj

Project Title: Proposed Channel

Project Directory: w:\2001Projects\011315.03-FRS 3 Inlet Channel\Hydraulics\Proposed Channel\

Project Plans

Plan (current)

Title: Imported Plan 01

Short ID: Imported Pla

File: w:\2001Projects\011315.03-FRS 3 Inlet Channel\Hydraulics\Proposed Channel\Propchan.p01

Geometry:

Title: Imported Geom 01

File: w:\2001Projects\011315.03-FRS 3 Inlet Channel\Hydraulics\Proposed Channel\Propchan.g01

Flow:

Title: Imported Flow 01

File: w:\2001Projects\011315.03-FRS 3 Inlet Channel\Hydraulics\Proposed Channel\Propchan.f01

Current Plan Statistics

Number of:

Rivers 1

Reaches 1

Cross Sections 71

User Input XSs 71

Interpolated 0

Culverts 2

Bridges 0

Mulitple Openings 0

Inline Weirs 0

Lateral Weirs 0

Lateral Rt Curv 0

Storage Areas 0

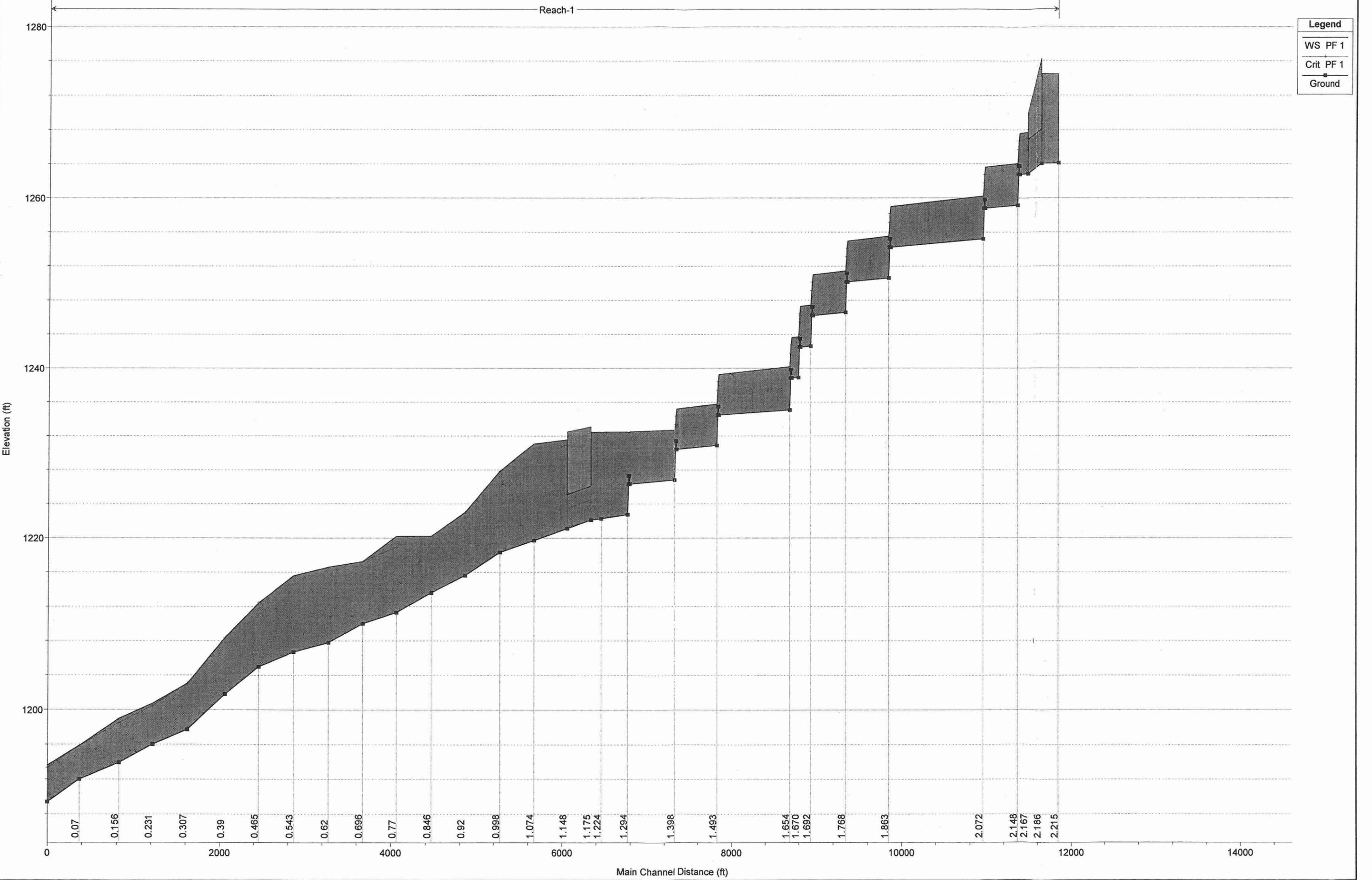
Hydr Connections 0

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

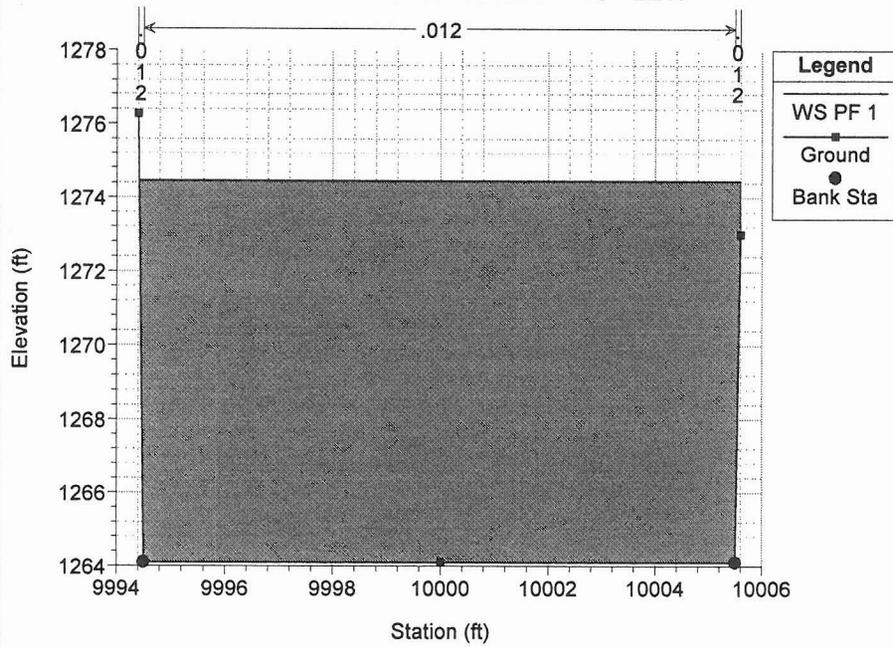
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	0	6423.00	1189.40	1193.61	1193.35	1195.05	0.005508	9.80	694.07	207.24	0.87
Reach-1	0.07	6423.00	1192.00	1195.88	1195.86	1197.37	0.007083	9.87	669.45	254.16	0.96
Reach-1	0.156	6423.00	1193.90	1198.98	1198.49	1199.79	0.003935	7.44	972.71	384.18	0.72
Reach-1	0.231	6423.00	1196.00	1200.73	1200.45	1201.63	0.005868	8.23	860.94	350.11	0.83
Reach-1	0.307	6423.00	1197.70	1203.03	1203.03	1204.37	0.005564	9.79	718.71	269.04	1.01
Reach-1	0.39	6423.00	1201.80	1208.38	1208.38	1210.63	0.007553	12.22	554.85	137.47	0.98
Reach-1	0.465	6423.00	1205.00	1212.44	1212.44	1214.72	0.006953	12.24	553.89	144.65	0.95
Reach-1	0.543	6423.00	1206.70	1215.58		1216.29	0.002107	7.97	1157.79	298.24	0.55
Reach-1	0.62	6423.00	1207.80	1216.60		1216.98	0.001253	6.15	1605.69	434.90	0.42
Reach-1	0.696	6423.00	1210.00	1217.25	1217.25	1219.55	0.006250	12.48	565.58	133.76	0.92
Reach-1	0.77	6423.00	1211.30	1220.20	1218.92	1220.71	0.001342	6.72	1506.42	473.89	0.44
Reach-1	0.846	6423.00	1213.60	1220.23		1222.03	0.005012	11.52	704.26	205.18	0.83
Reach-1	0.92	6423.00	1215.60	1223.00	1223.00	1225.07	0.006480	11.83	594.54	150.00	0.92
Reach-1	0.998	6423.00	1218.30	1227.86	1227.86	1230.78	0.005835	14.00	499.81	92.86	0.91
Reach-1	1.074	6423.00	1219.70	1231.07		1231.60	0.000652	6.15	1194.48	150.52	0.33
Reach-1	1.148	6423.00	1221.10	1231.55		1231.82	0.000405	4.76	1579.37	196.41	0.26
Reach-1	1.175	Culvert									
Reach-1	1.201	622.00	1222.10	1232.47	1224.17	1232.48	0.000022	0.82	762.11	114.97	0.06
Reach-1	1.224	622.00	1222.25	1232.47		1232.49	0.000064	1.23	504.29	89.82	0.09
Reach-1	1.294	622.00	1222.73	1232.49		1232.51	0.000074	1.29	481.98	88.81	0.10
Reach-1	1.295	622.00	1226.32	1232.45		1232.53	0.000375	2.17	287.14	83.61	0.21
Reach-1	1.296	622.00	1227.32	1232.41		1232.55	0.000908	3.01	206.36	71.08	0.31
Reach-1	1.297	622.00	1227.32	1232.42		1232.56	0.000904	3.01	206.71	71.14	0.31
Reach-1	1.298	622.00	1226.32	1232.49		1232.57	0.000364	2.14	290.46	84.09	0.20
Reach-1	1.398	622.00	1226.82	1232.70		1232.79	0.000459	2.34	266.30	80.57	0.23
Reach-1	1.399	622.00	1230.42	1233.37	1233.37	1234.27	0.011029	7.63	81.47	45.34	1.00
Reach-1	1.400	622.00	1231.42	1234.37	1234.37	1235.27	0.010957	7.62	81.67	45.39	1.00
Reach-1	1.401	622.00	1231.42	1234.71	1234.37	1235.34	0.006762	6.37	97.69	49.44	0.80
Reach-1	1.402	622.00	1230.42	1235.22		1235.40	0.001193	3.34	186.37	67.62	0.35
Reach-1	1.493	622.00	1230.87	1235.78		1235.94	0.001076	3.21	193.73	68.92	0.34
Reach-1	1.494	622.00	1234.47	1237.42	1237.42	1238.32	0.010995	7.63	81.57	45.36	1.00
Reach-1	1.495	622.00	1235.47	1238.42	1238.42	1239.32	0.010995	7.63	81.57	45.36	1.00
Reach-1	1.496	622.00	1235.47	1238.77		1239.39	0.006649	6.33	98.31	49.59	0.79
Reach-1	1.497	622.00	1234.47	1239.28		1239.45	0.001189	3.33	186.62	67.67	0.35
Reach-1	1.654	622.00	1235.06	1240.18		1240.32	0.000914	3.04	204.70	69.97	0.31
Reach-1	1.655	622.00	1238.83	1241.78	1241.78	1242.68	0.010995	7.63	81.57	45.36	1.00
Reach-1	1.656	622.00	1239.83	1242.78	1242.78	1243.68	0.010995	7.63	81.57	45.36	1.00
Reach-1	1.657	622.00	1239.83	1243.13		1243.75	0.006649	6.33	98.31	49.59	0.79
Reach-1	1.658	622.00	1238.83	1243.64		1243.81	0.001189	3.33	186.62	67.67	0.35
Reach-1	1.659	622.00	1238.90	1243.74		1243.91	0.001155	3.30	188.66	68.03	0.35
Reach-1	1.670	622.00	1242.50	1245.45	1245.45	1246.35	0.010995	7.63	81.57	45.36	1.00
Reach-1	1.671	622.00	1243.50	1246.45	1246.45	1247.35	0.010995	7.63	81.57	45.36	1.00
Reach-1	1.672	622.00	1243.50	1246.80		1247.42	0.006649	6.33	98.31	49.59	0.79
Reach-1	1.673	622.00	1242.50	1247.31		1247.48	0.001189	3.33	186.62	67.67	0.35
Reach-1	1.692	622.00	1242.61	1247.45		1247.62	0.001147	3.29	189.13	68.11	0.35
Reach-1	1.693	622.00	1246.21	1249.16	1249.16	1250.06	0.010995	7.63	81.57	45.36	1.00
Reach-1	1.694	622.00	1247.21	1250.16	1250.16	1251.06	0.010995	7.63	81.57	45.36	1.00
Reach-1	1.695	622.00	1247.21	1250.51		1251.13	0.006649	6.33	98.31	49.59	0.79
Reach-1	1.696	622.00	1246.21	1251.02		1251.19	0.001189	3.33	186.62	67.67	0.35
Reach-1	1.768	622.00	1246.57	1251.46		1251.62	0.001096	3.23	192.41	68.69	0.34
Reach-1	1.769	622.00	1250.17	1253.12	1253.12	1254.02	0.010995	7.63	81.57	45.36	1.00
Reach-1	1.770	622.00	1251.17	1254.12	1254.12	1255.02	0.010995	7.63	81.57	45.36	1.00
Reach-1	1.771	622.00	1251.17	1254.47		1255.09	0.006649	6.33	98.31	49.59	0.79
Reach-1	1.772	622.00	1250.17	1254.98		1255.15	0.001189	3.33	186.62	67.67	0.35
Reach-1	1.863	622.00	1250.62	1255.53		1255.69	0.001074	3.21	193.87	68.94	0.34
Reach-1	1.864	622.00	1254.22	1257.17	1257.17	1258.07	0.010995	7.63	81.57	45.36	1.00
Reach-1	1.865	622.00	1255.22	1258.17	1258.17	1259.07	0.010995	7.63	81.57	45.36	1.00
Reach-1	1.866	622.00	1255.22	1258.52		1259.14	0.006649	6.33	98.31	49.59	0.79
Reach-1	1.867	622.00	1254.22	1259.03		1259.20	0.001189	3.33	186.62	67.67	0.35
Reach-1	2.072	622.00	1255.21	1260.22		1260.37	0.000983	3.10	200.39	70.07	0.32
Reach-1	2.073	622.00	1258.81	1261.76	1261.76	1262.66	0.010995	7.63	81.57	45.36	1.00
Reach-1	2.074	622.00	1259.81	1262.76	1262.76	1263.66	0.010995	7.63	81.57	45.36	1.00
Reach-1	2.075	622.00	1259.81	1263.11		1263.73	0.006649	6.33	98.31	49.59	0.79
Reach-1	2.076	622.00	1258.81	1263.62		1263.79	0.001189	3.33	186.62	67.67	0.35
Reach-1	2.148	622.00	1259.17	1264.06		1264.22	0.001096	3.23	192.41	68.69	0.34
Reach-1	2.149	622.00	1262.77	1265.72	1265.72	1266.62	0.010995	7.63	81.57	45.36	1.00
Reach-1	2.150	622.00	1263.77	1266.72	1266.72	1267.62	0.010995	7.63	81.57	45.36	1.00
Reach-1	2.151	622.00	1263.77	1267.07		1267.69	0.006649	6.33	98.31	49.59	0.79
Reach-1	2.152	622.00	1262.77	1267.58		1267.75	0.001189	3.33	186.62	67.67	0.35
Reach-1	2.167	622.00	1262.86	1267.71		1267.86	0.001073	3.20	194.11	69.13	0.34
Reach-1	2.186	Culvert									
Reach-1	2.205	622.00	1264.00	1274.45	1268.62	1274.91	0.000084	5.41	115.99	11.18	0.29
Reach-1	2.215	622.00	1264.10	1274.46		1274.92	0.000086	5.46	115.01	11.18	0.30

Reach-1

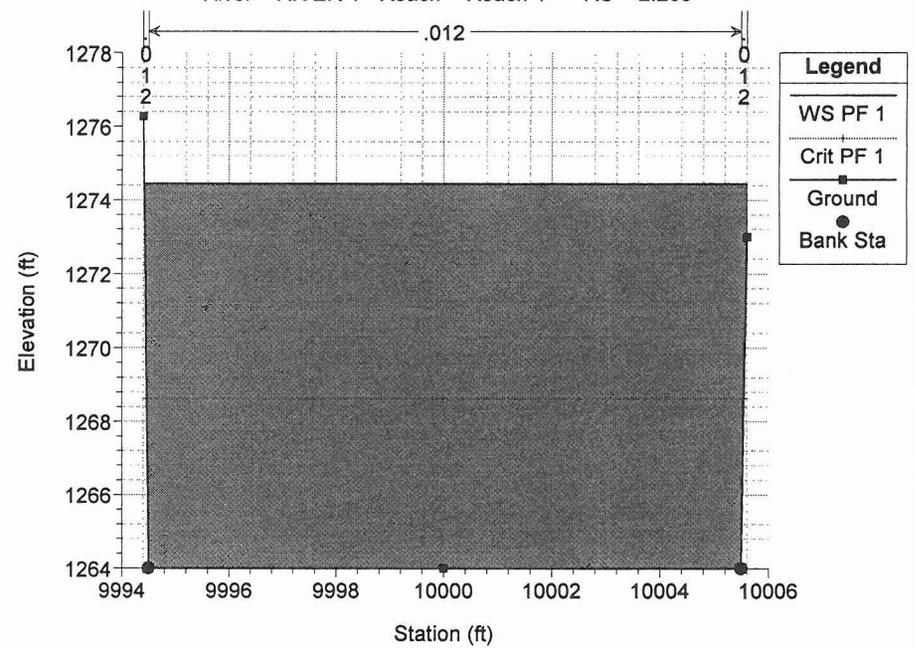
Legend	
WS PF 1	
Crit PF 1	
Ground	■



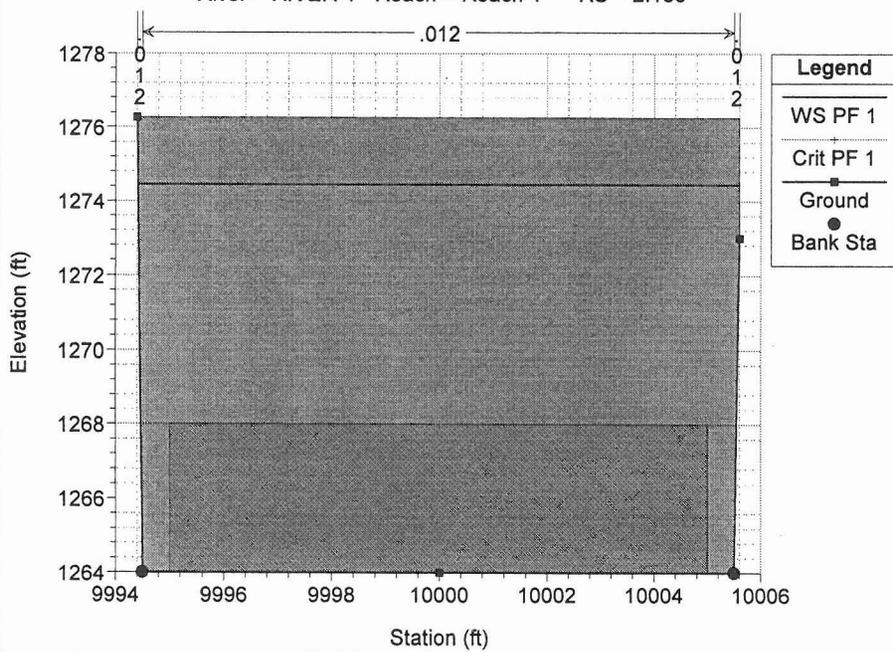
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 2.215



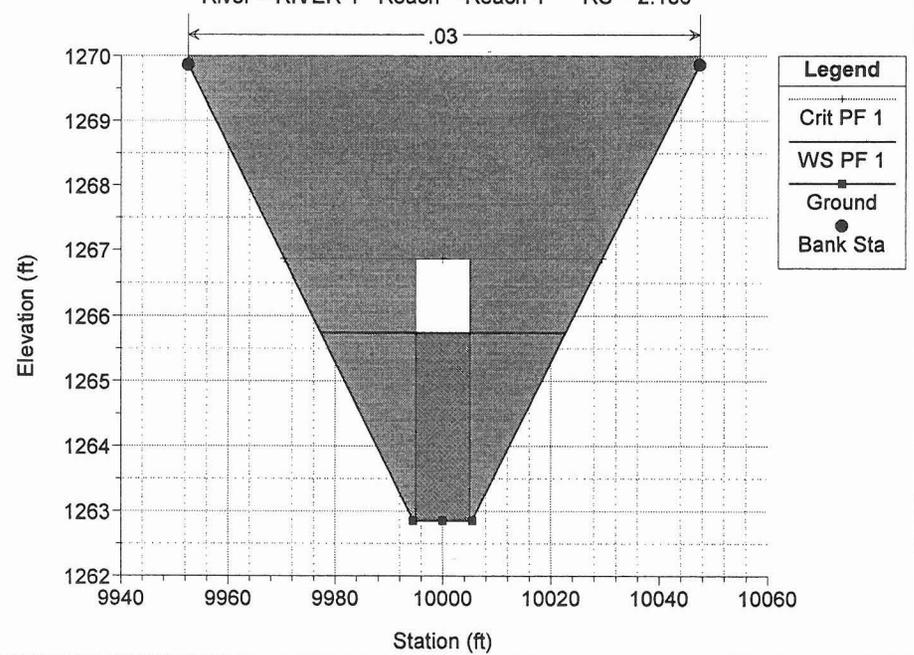
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 2.205



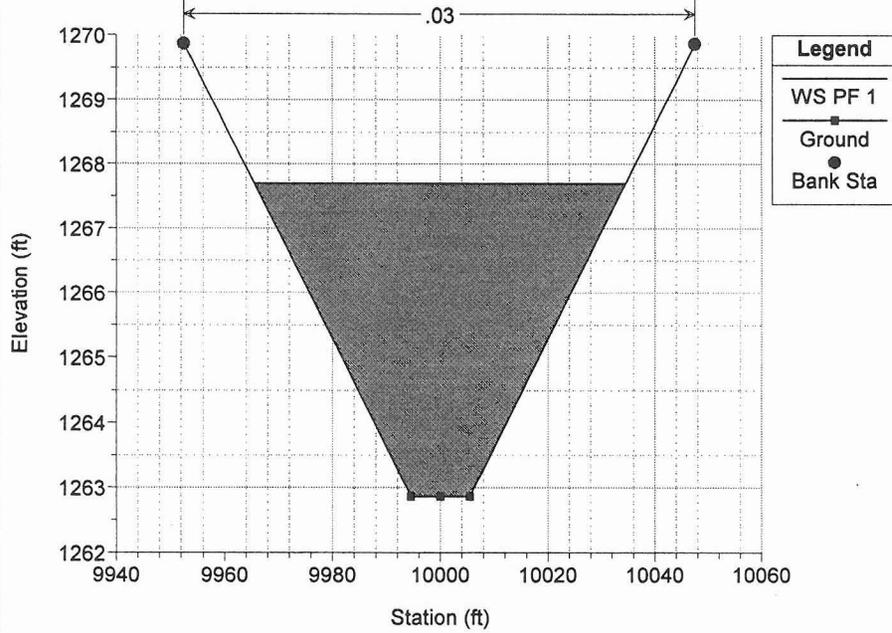
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 2.186



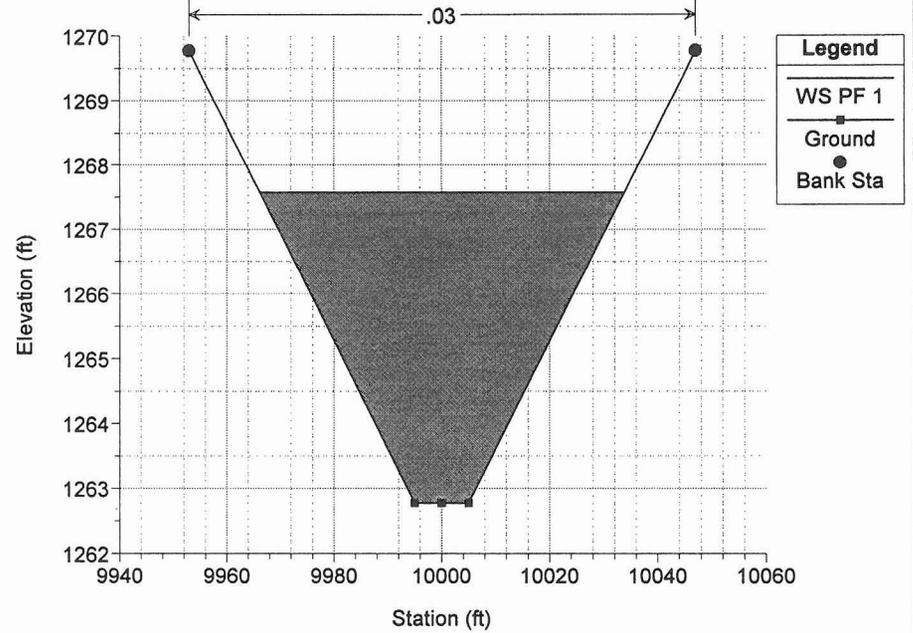
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 2.186



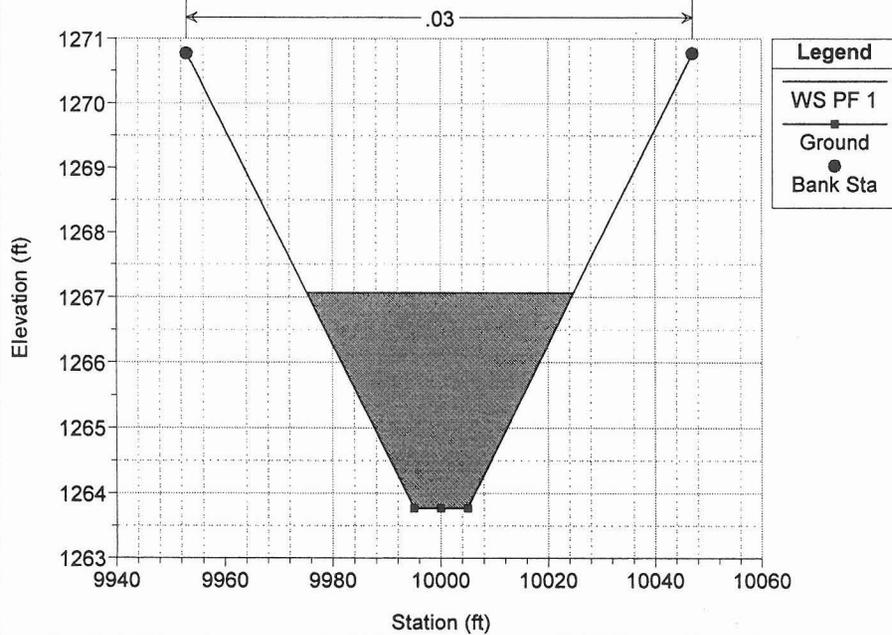
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 2.167



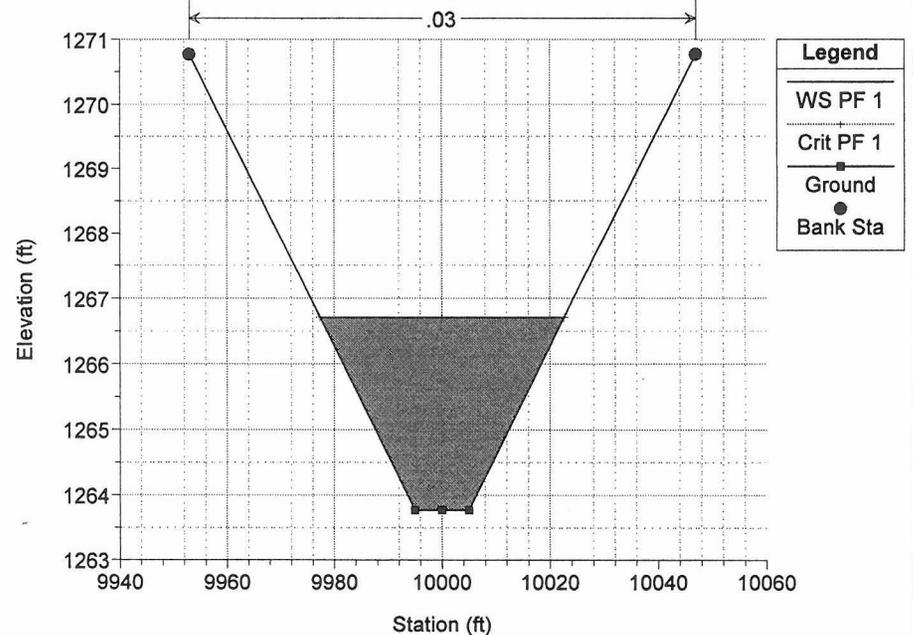
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 2.152



Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 2.151

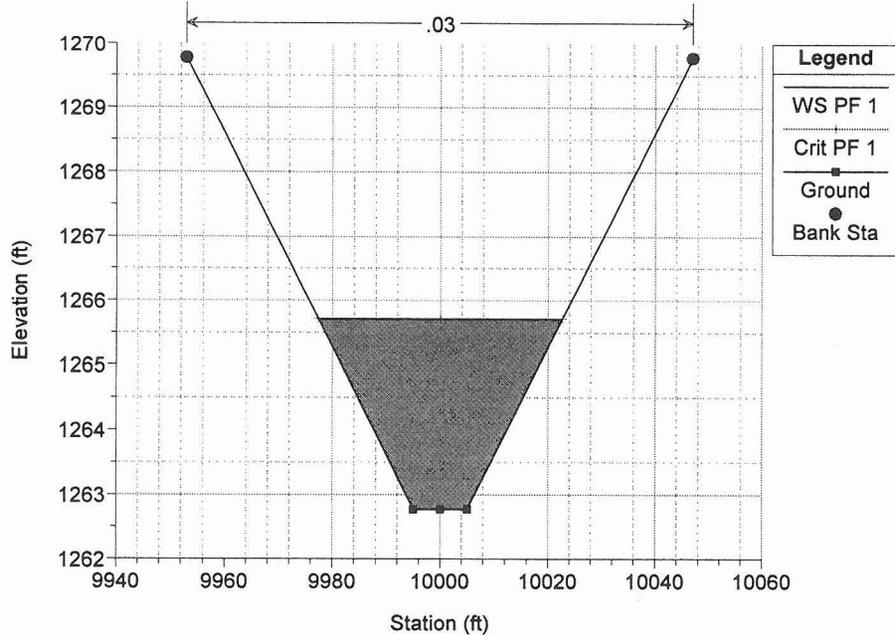


Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 2.150



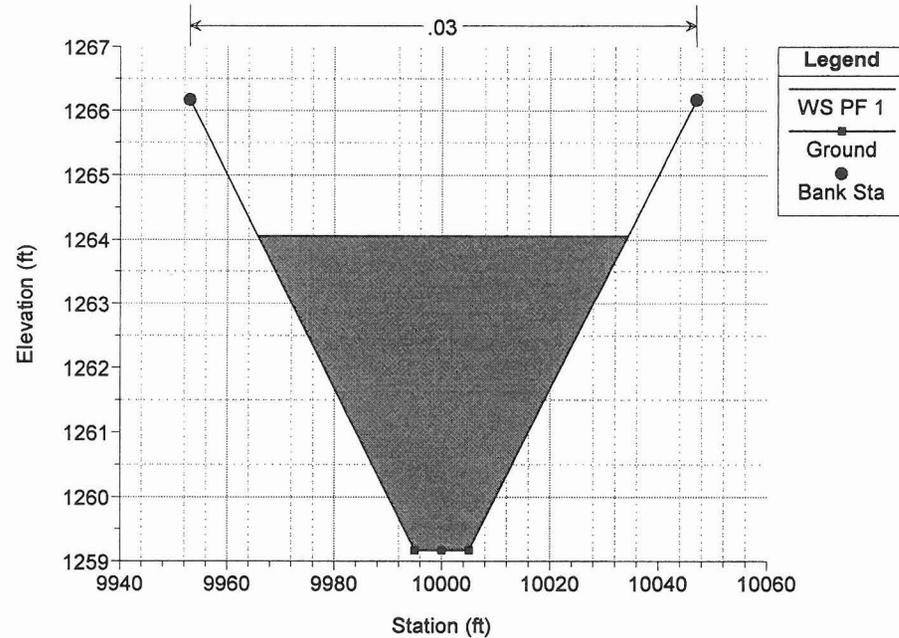
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 2.149



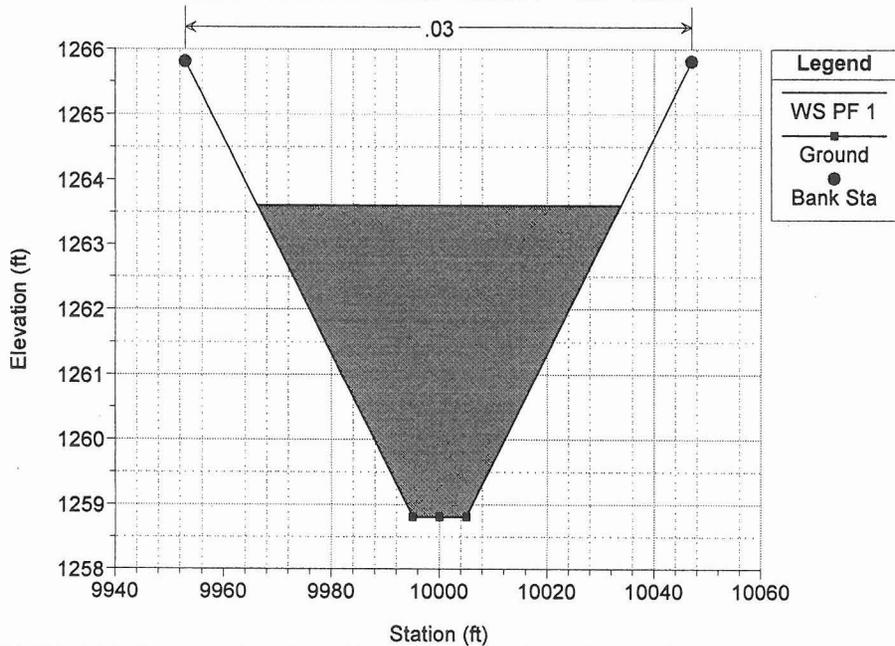
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 2.148



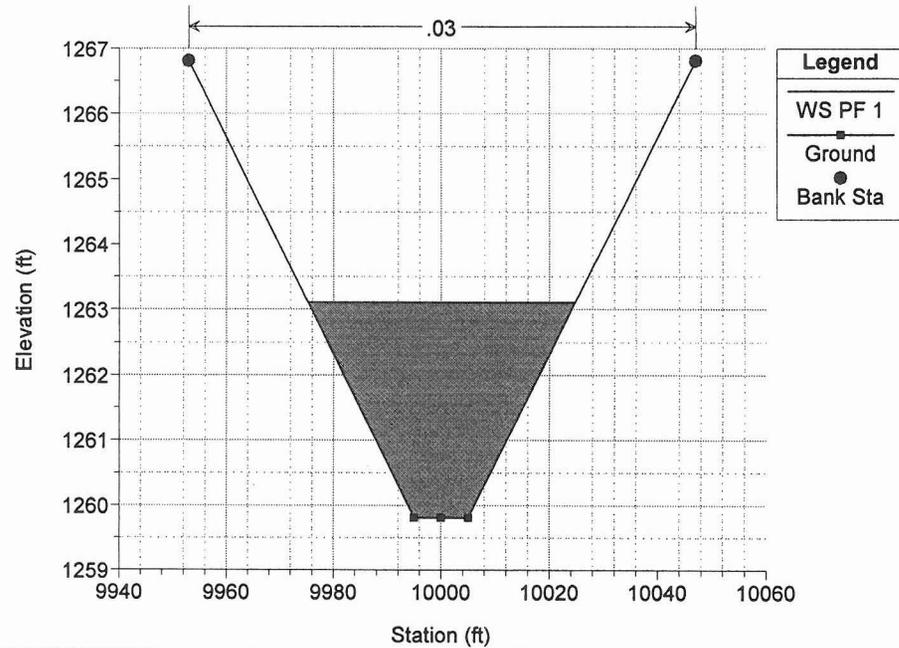
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 2.076



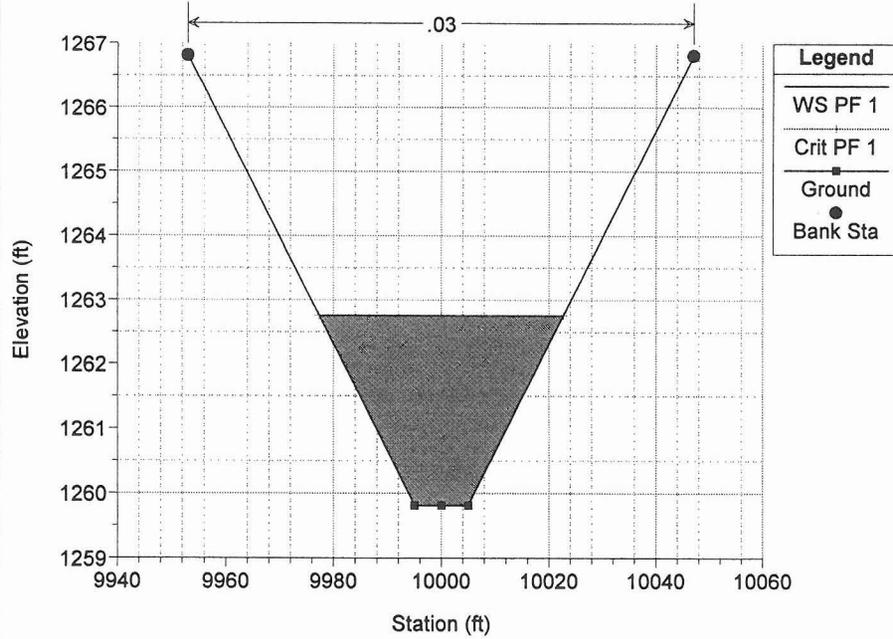
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 2.075



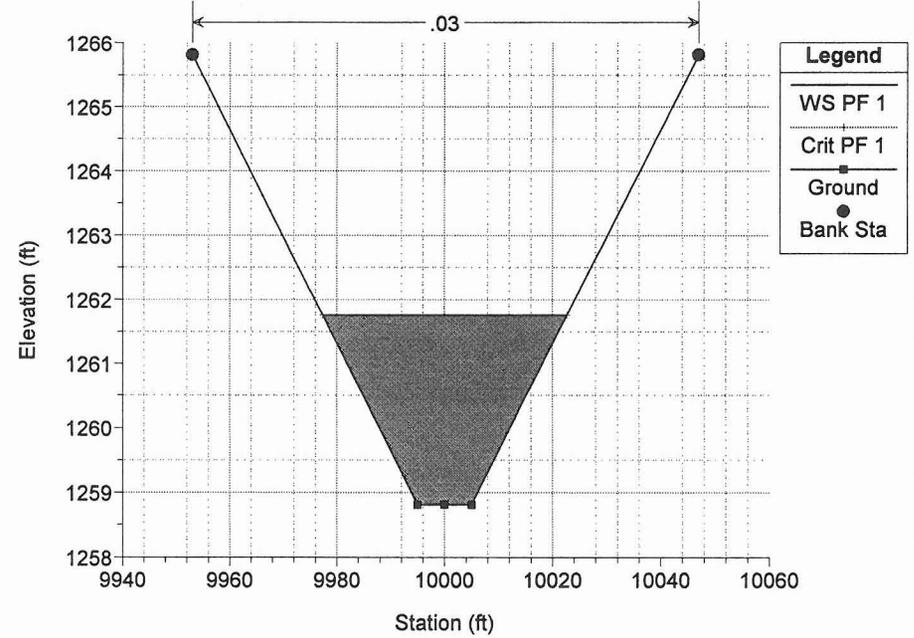
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 2.074



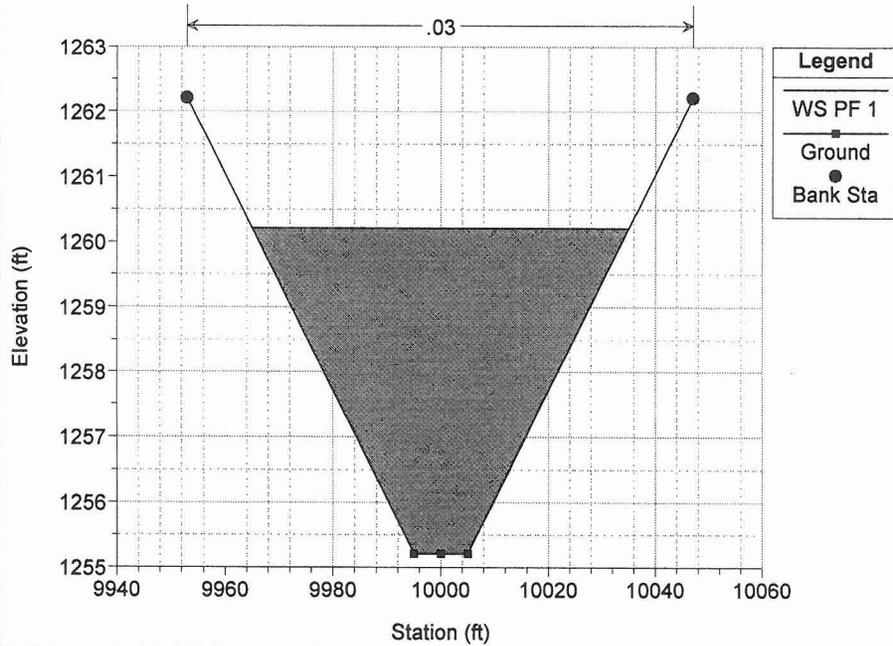
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 2.073



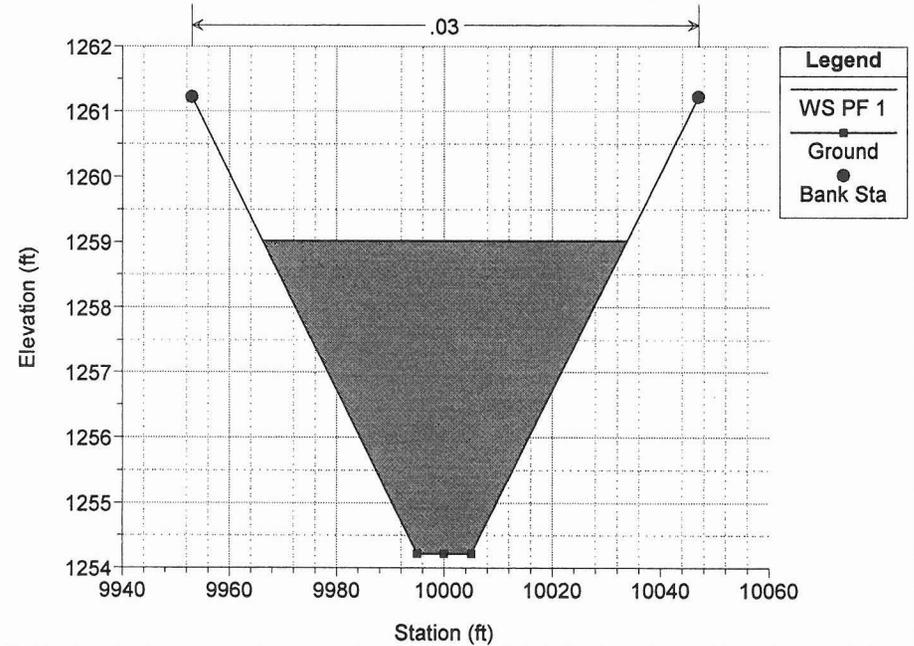
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 2.072



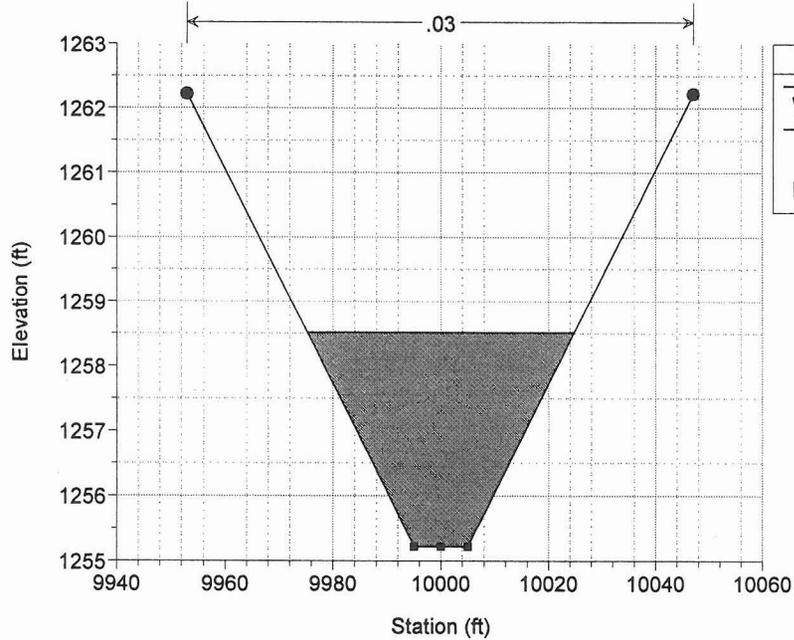
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.867



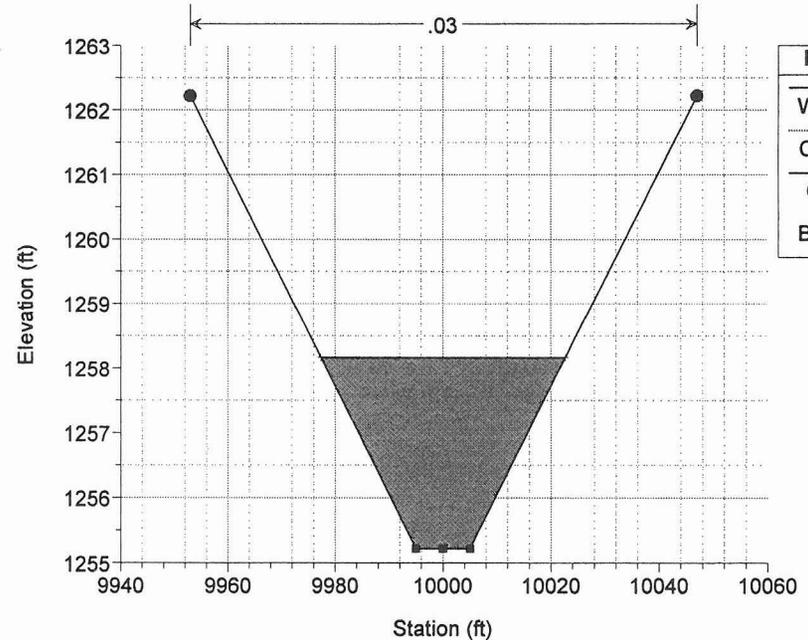
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.866



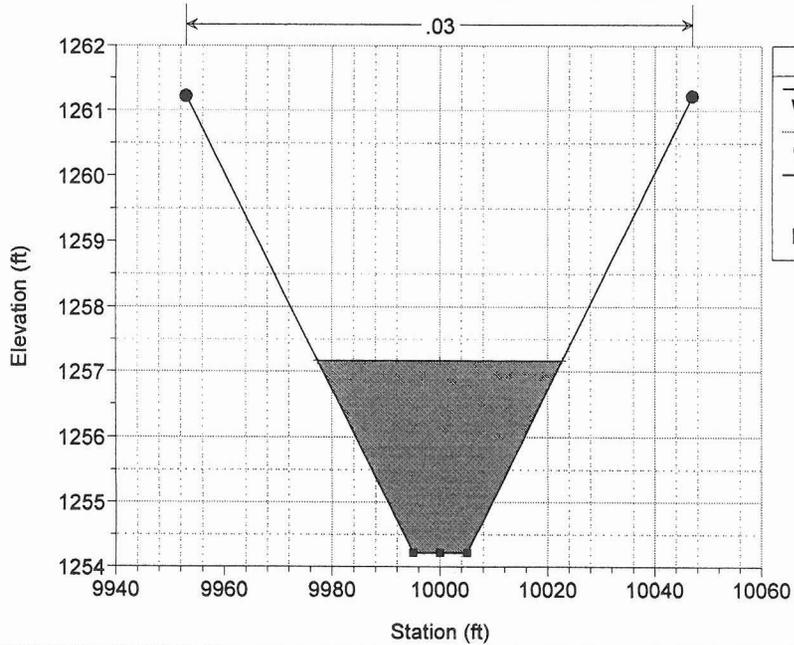
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.865



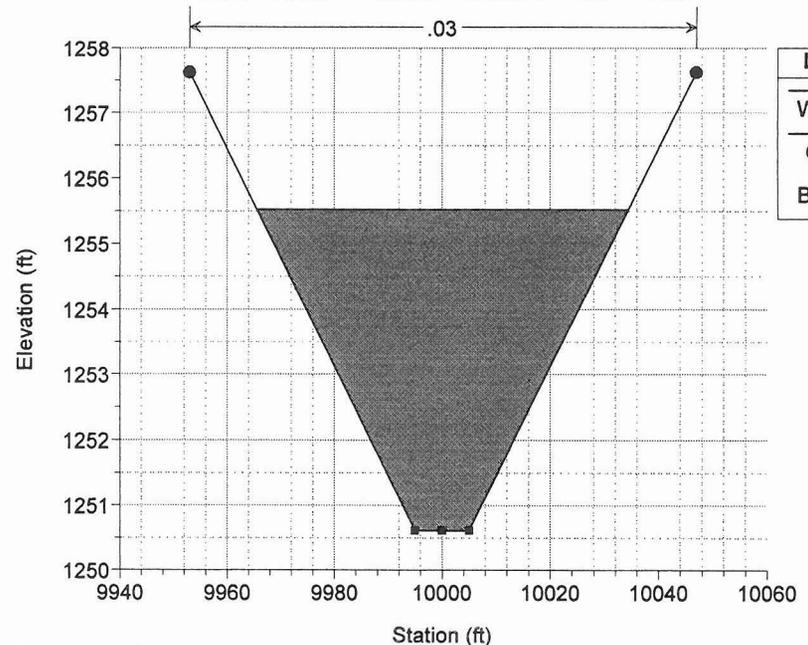
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.864

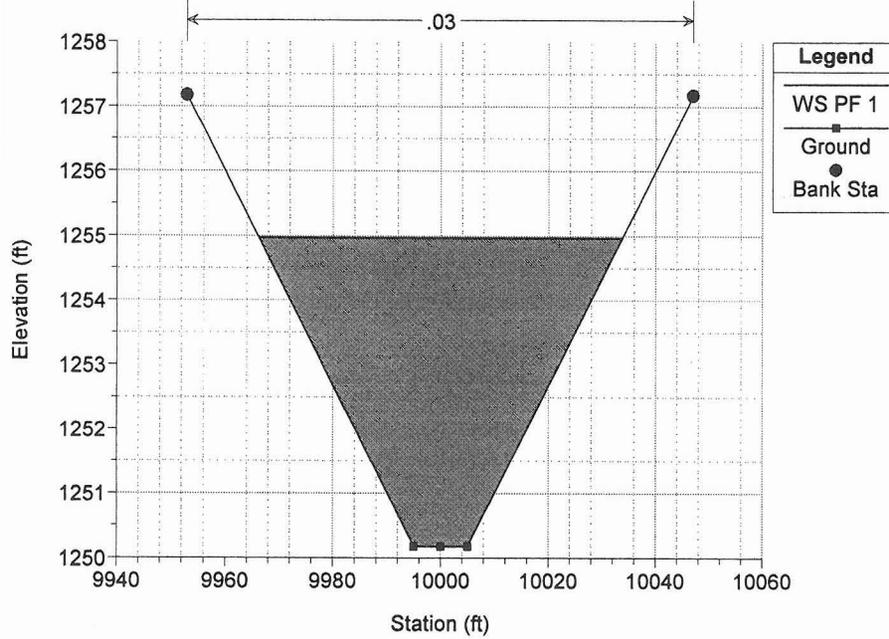


Proposed Channel Plan: Imported Plan 01

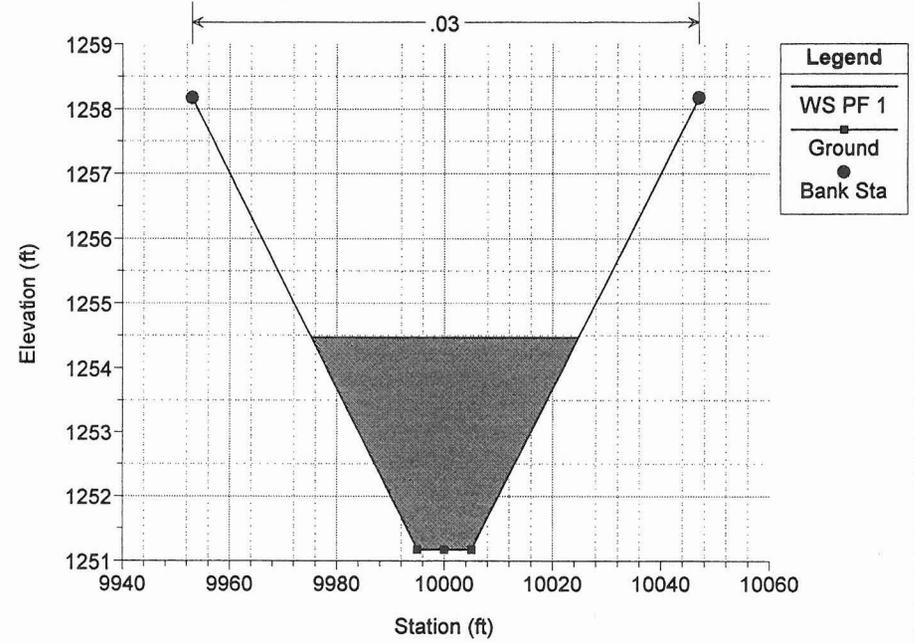
River = RIVER-1 Reach = Reach-1 RS = 1.863



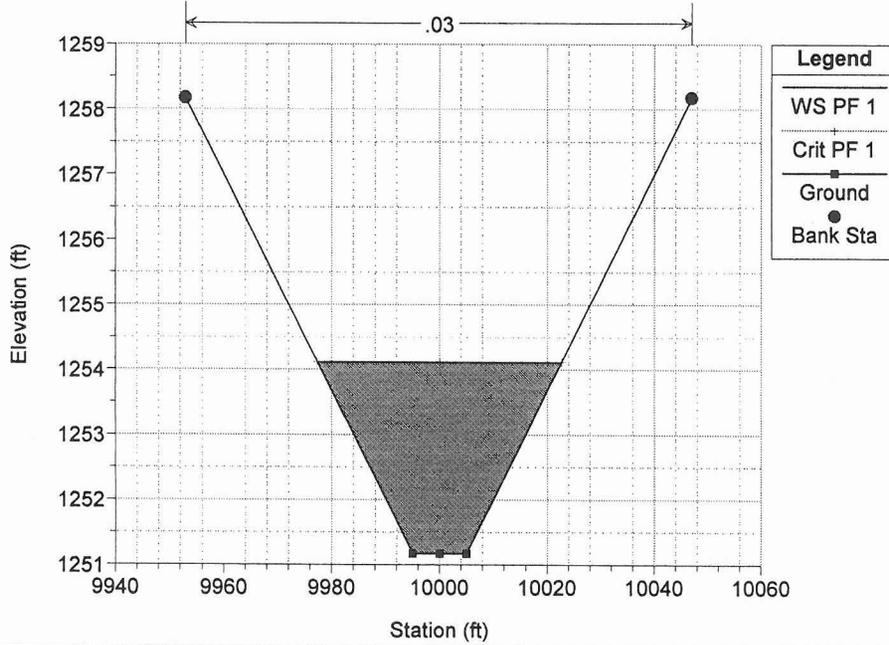
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.772



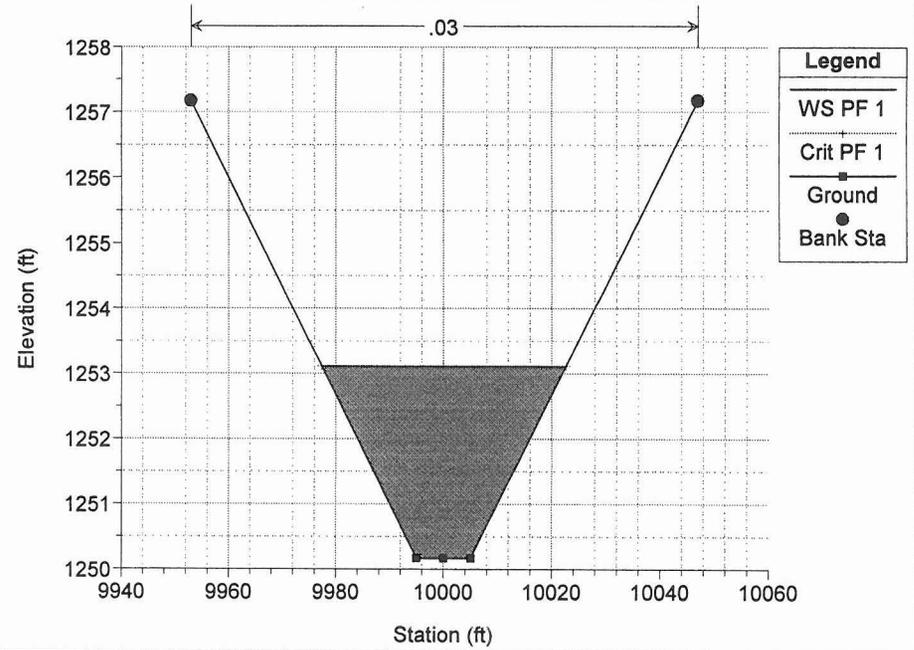
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.771



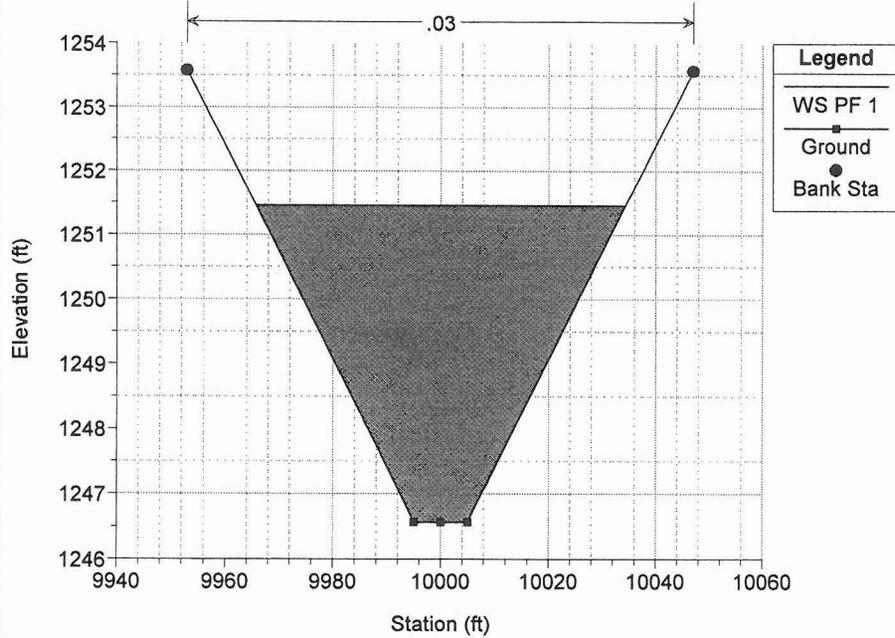
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.770



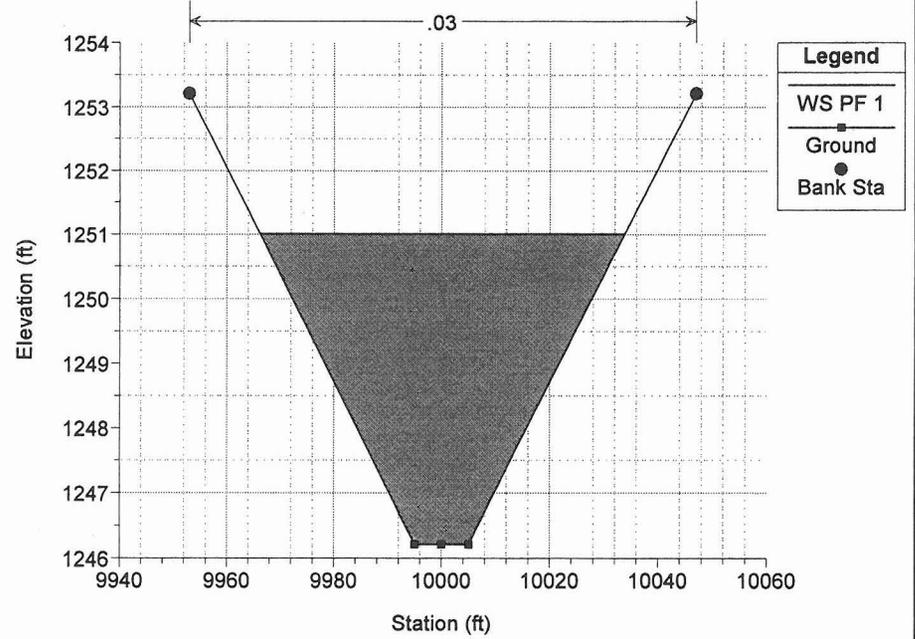
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.769



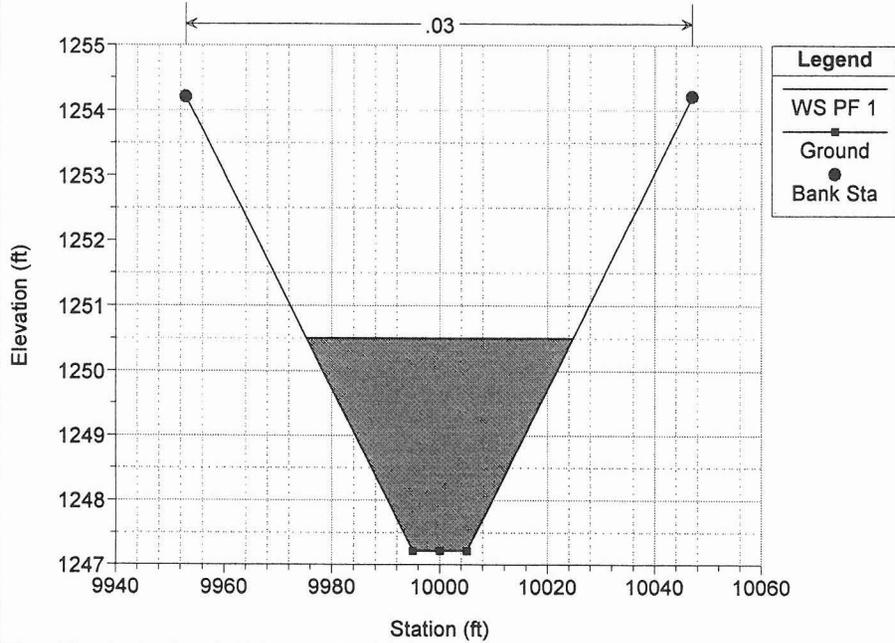
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.768



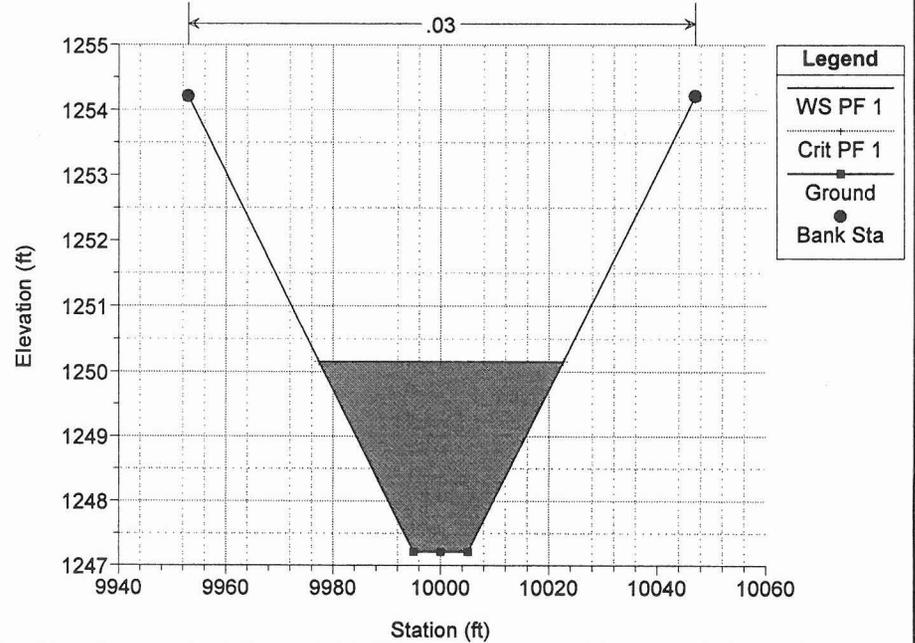
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.696



Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.695

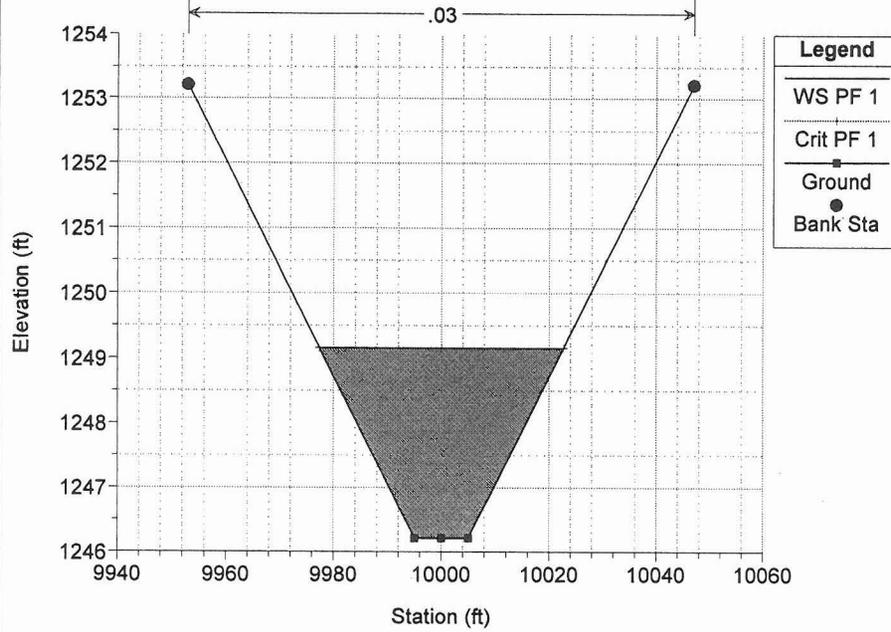


Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.694



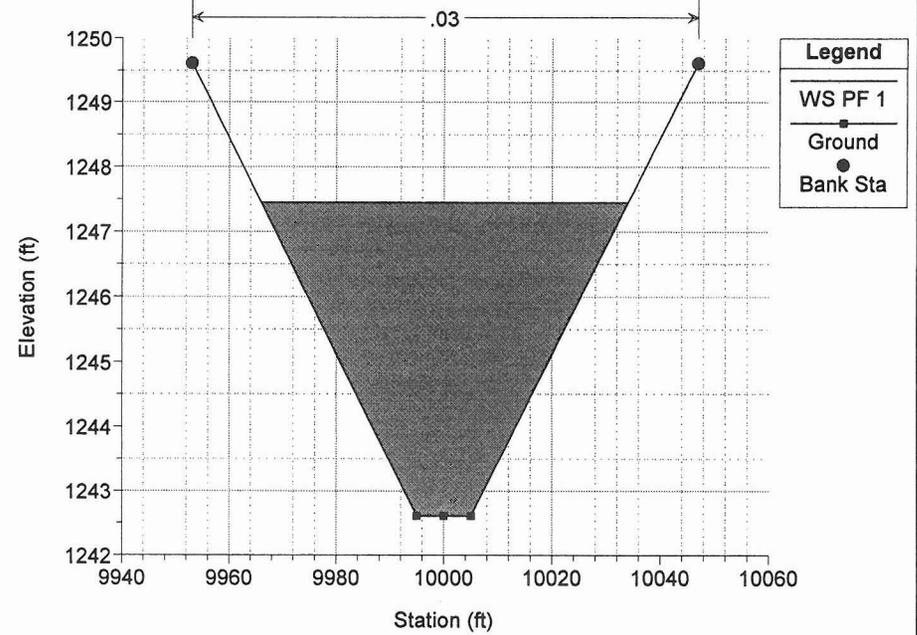
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.693



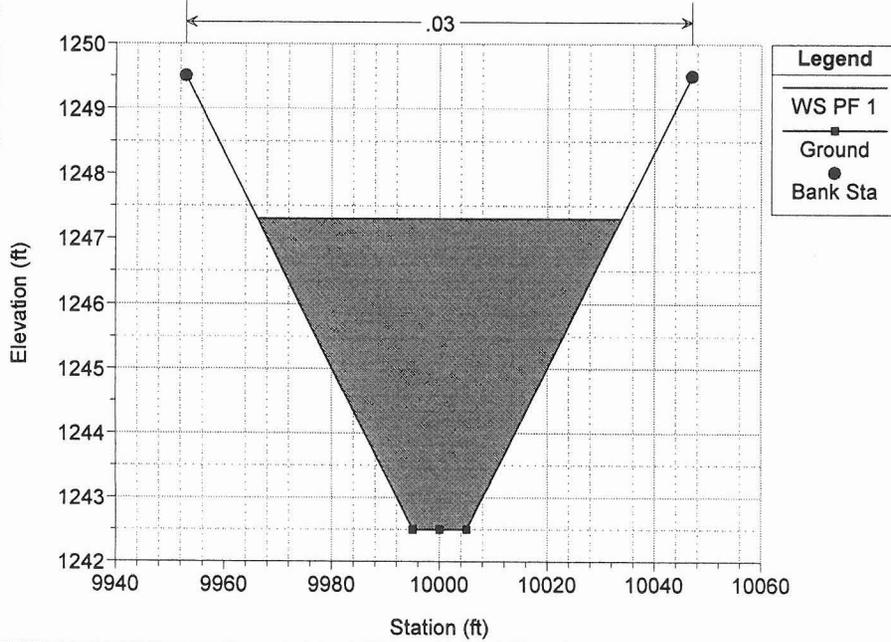
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.692



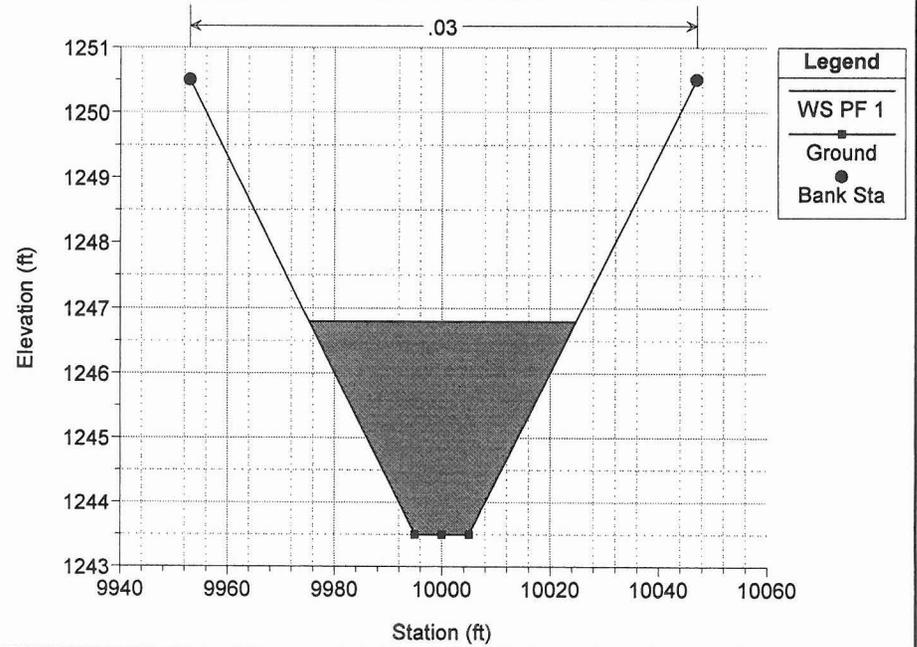
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.673

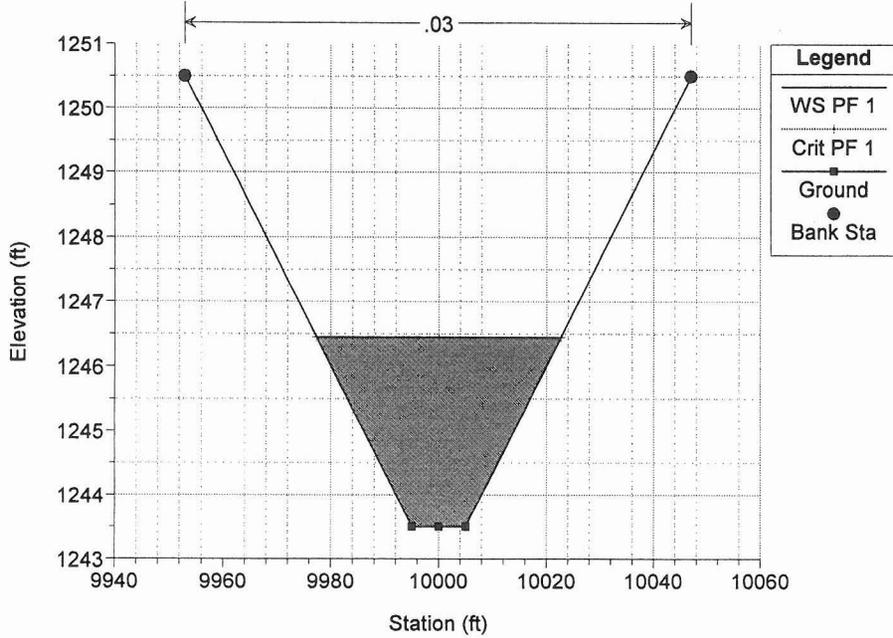


Proposed Channel Plan: Imported Plan 01

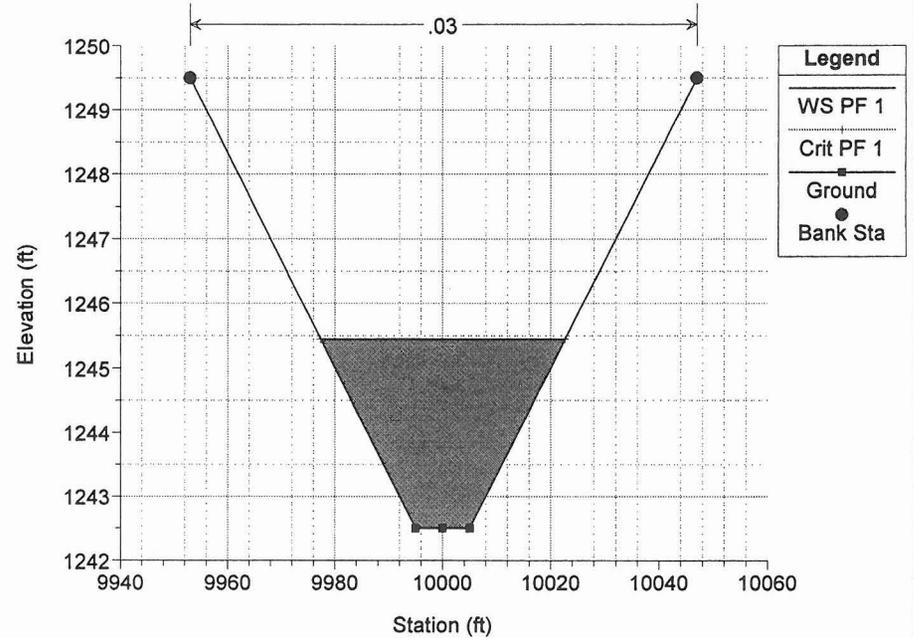
River = RIVER-1 Reach = Reach-1 RS = 1.672



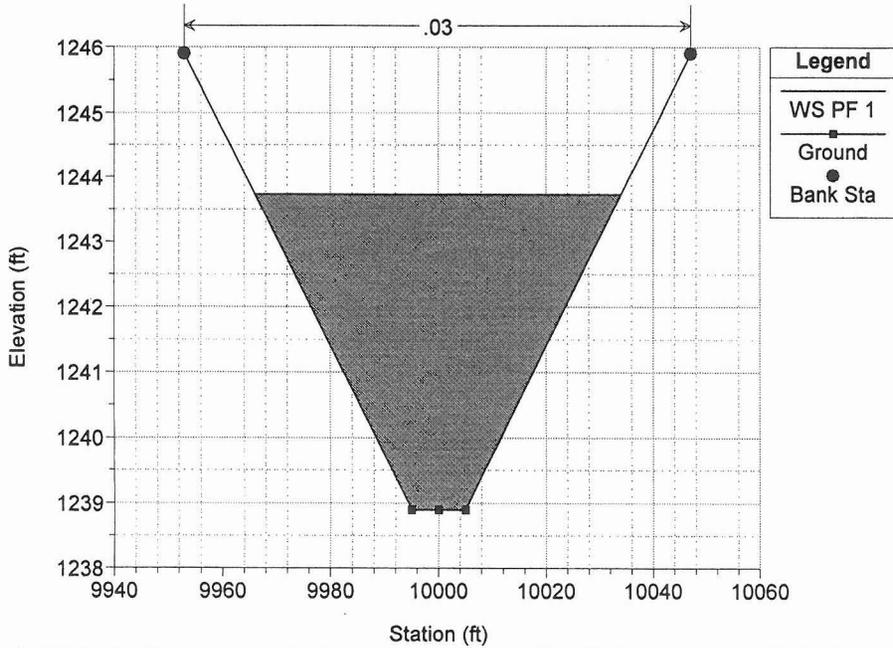
Proposed Channel Plan: Imported Plan 01
River = RIVER-1 Reach = Reach-1 RS = 1.671



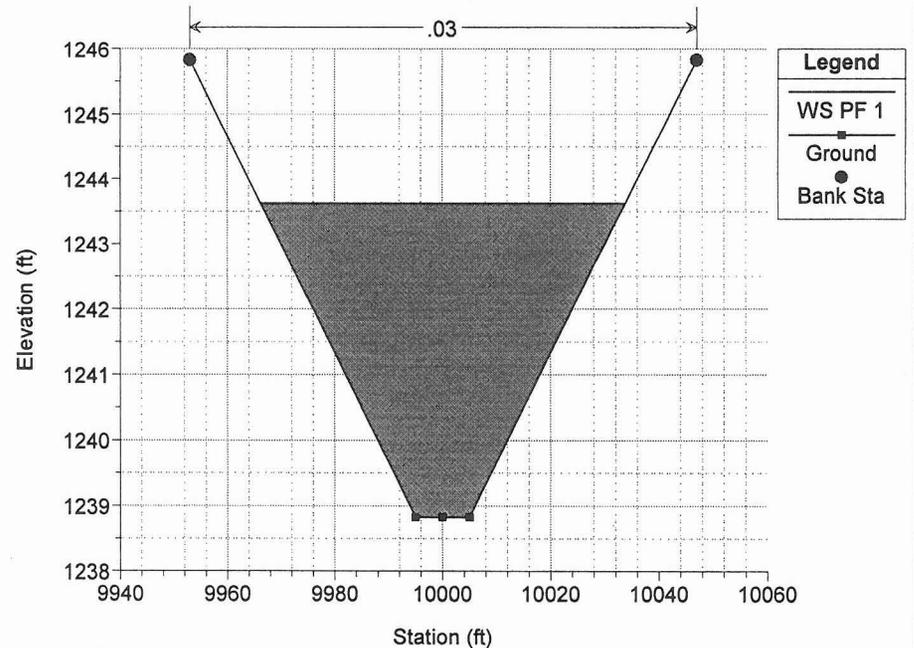
Proposed Channel Plan: Imported Plan 01
River = RIVER-1 Reach = Reach-1 RS = 1.670



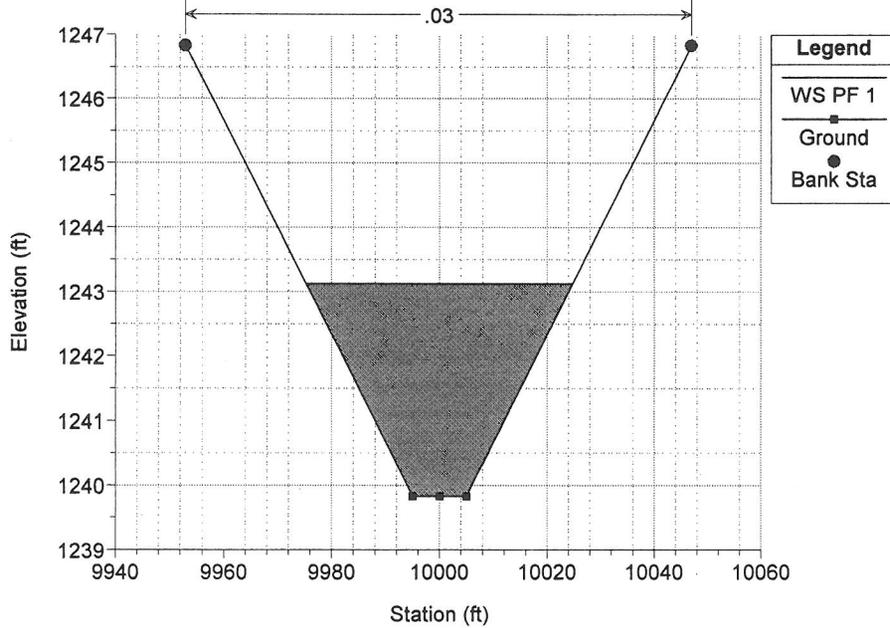
Proposed Channel Plan: Imported Plan 01
River = RIVER-1 Reach = Reach-1 RS = 1.669



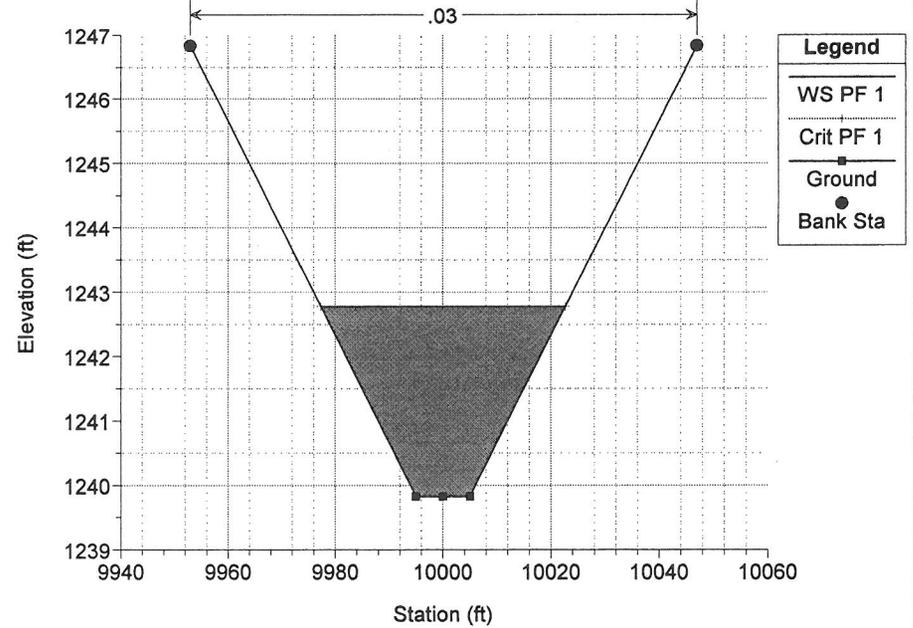
Proposed Channel Plan: Imported Plan 01
River = RIVER-1 Reach = Reach-1 RS = 1.658



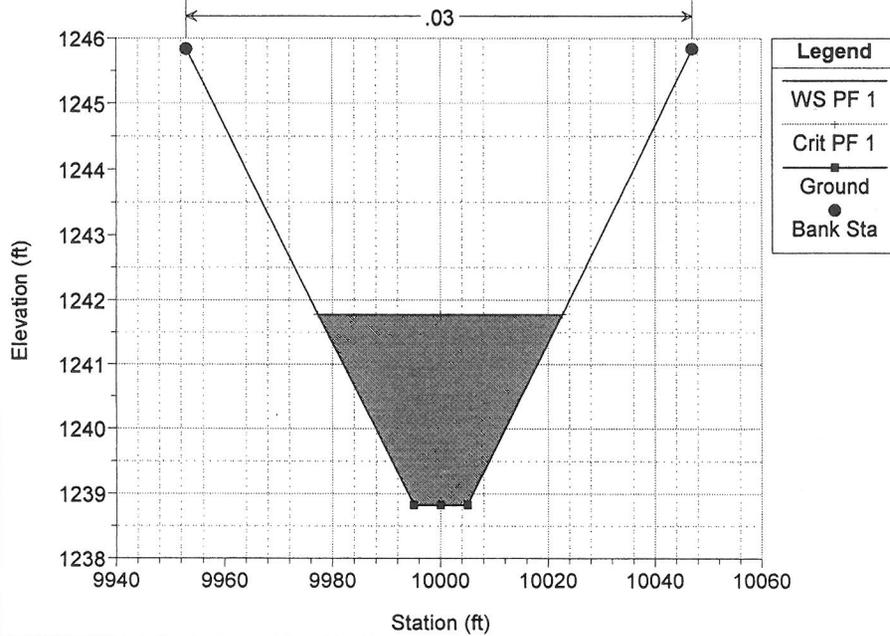
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.657



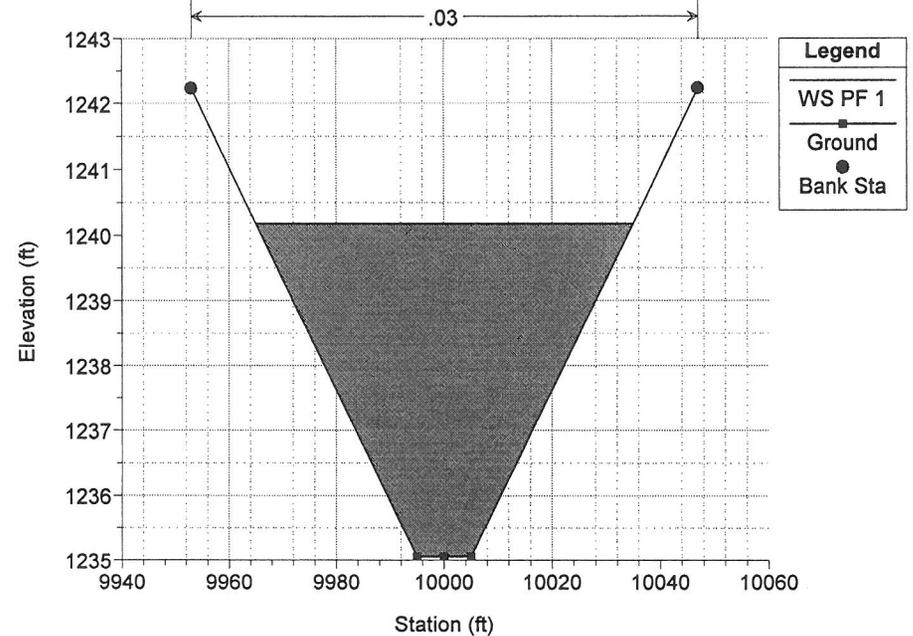
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.656



Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.655

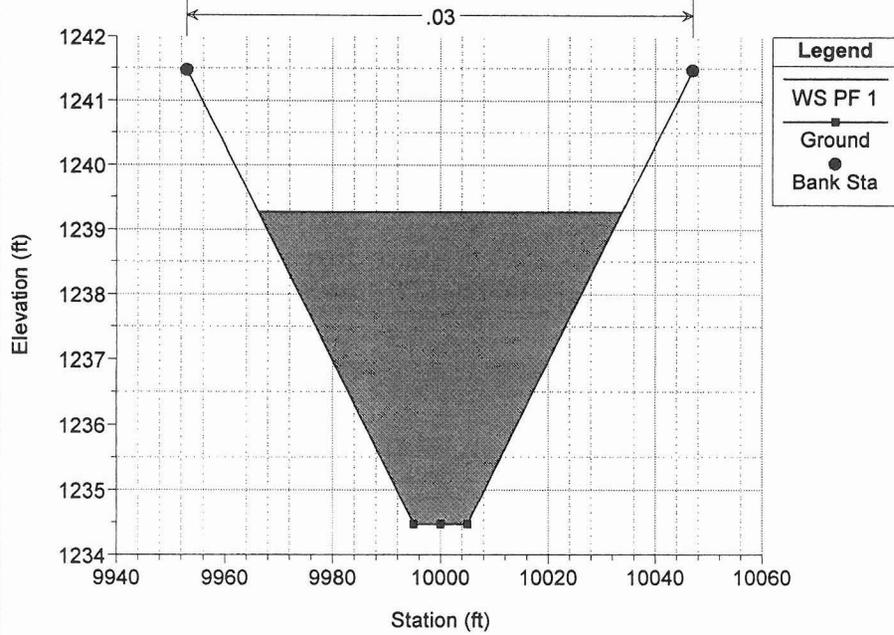


Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.654



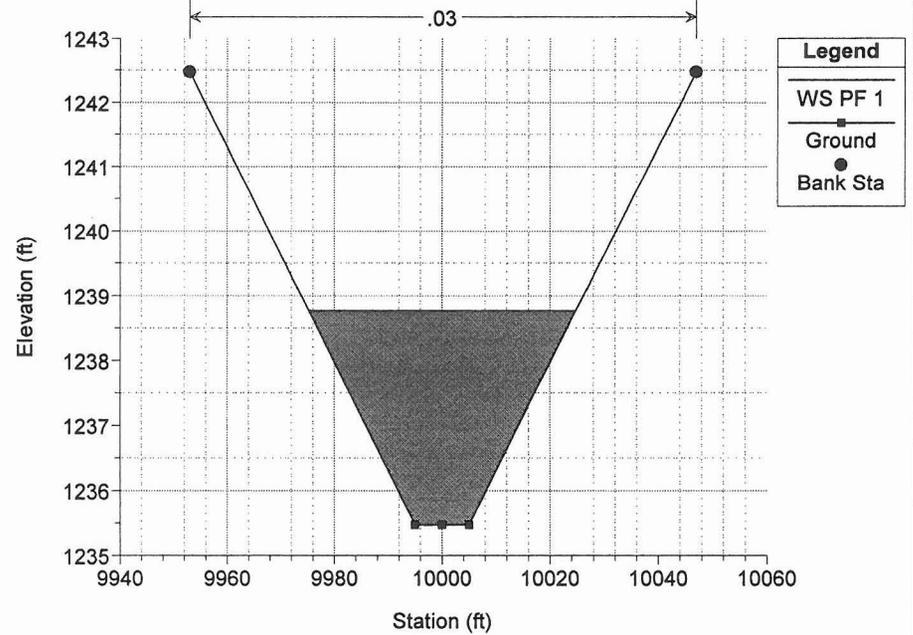
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.497



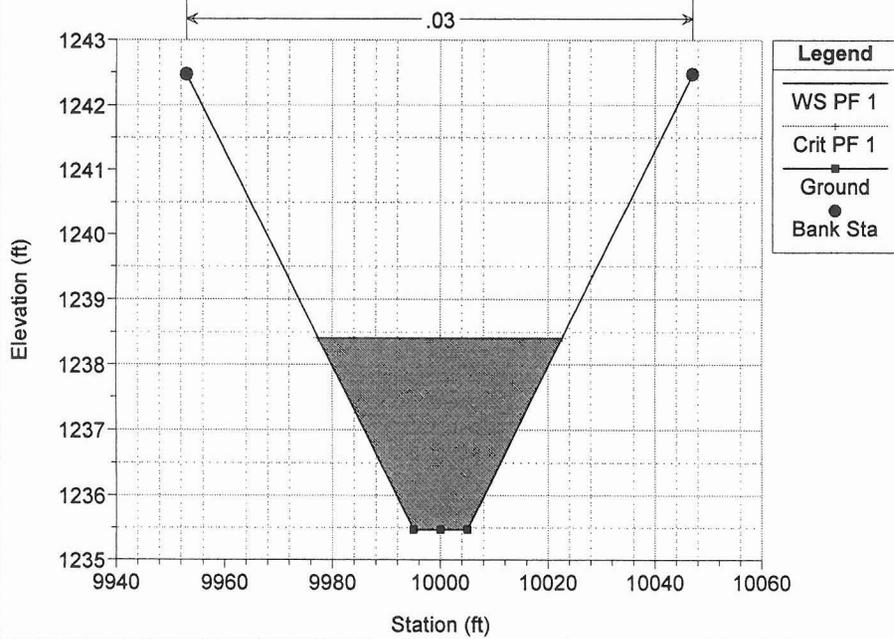
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.496



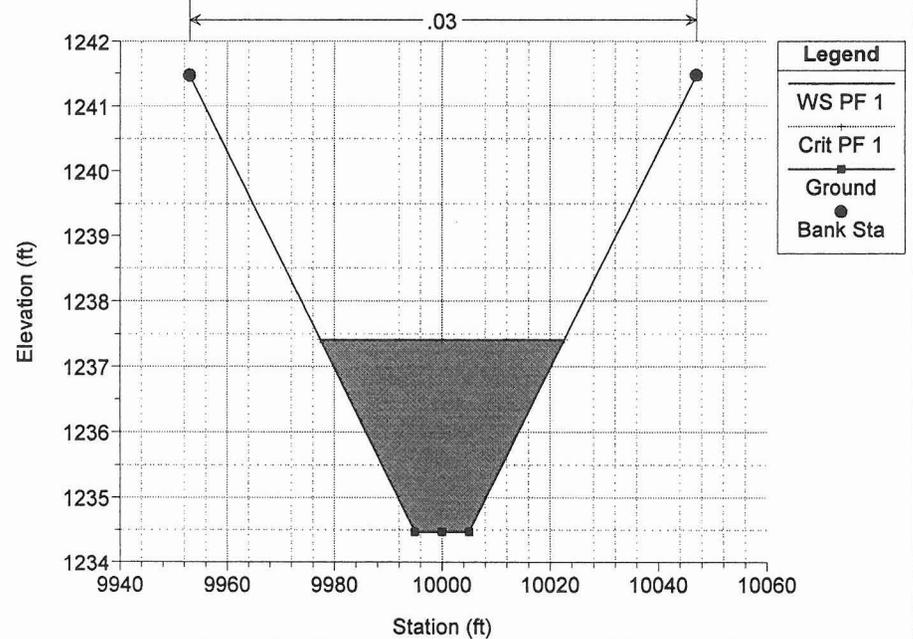
Proposed Channel Plan: Imported Plan 01

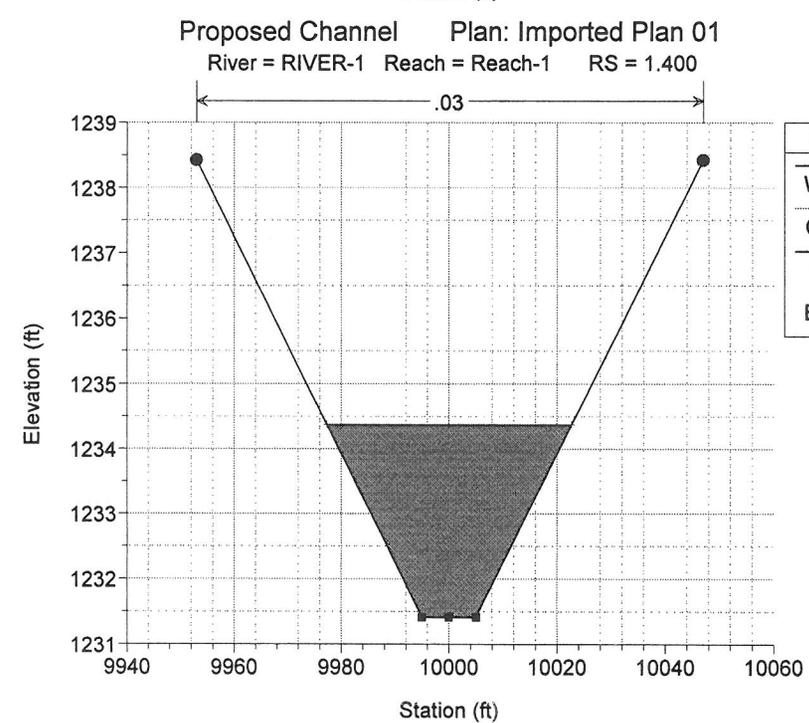
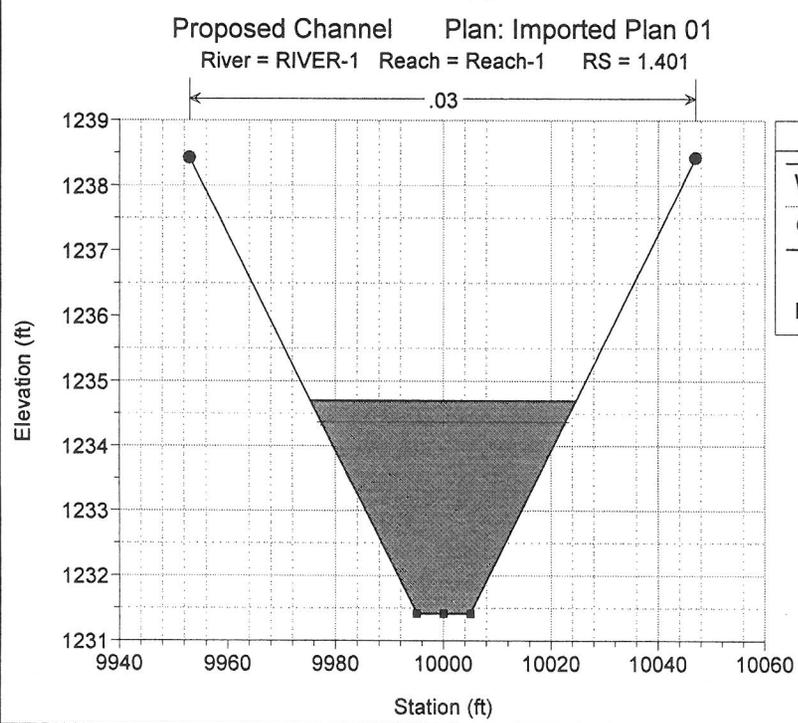
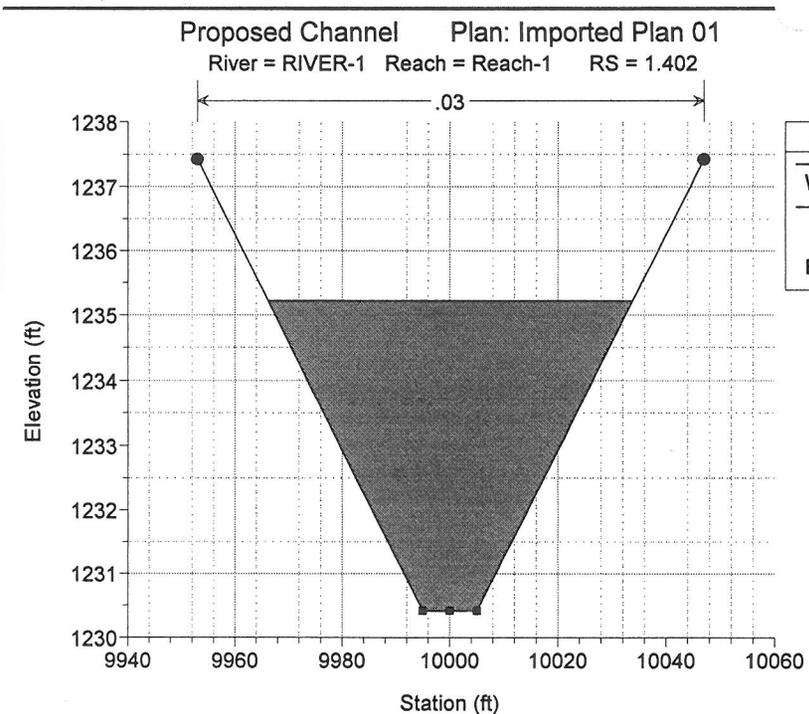
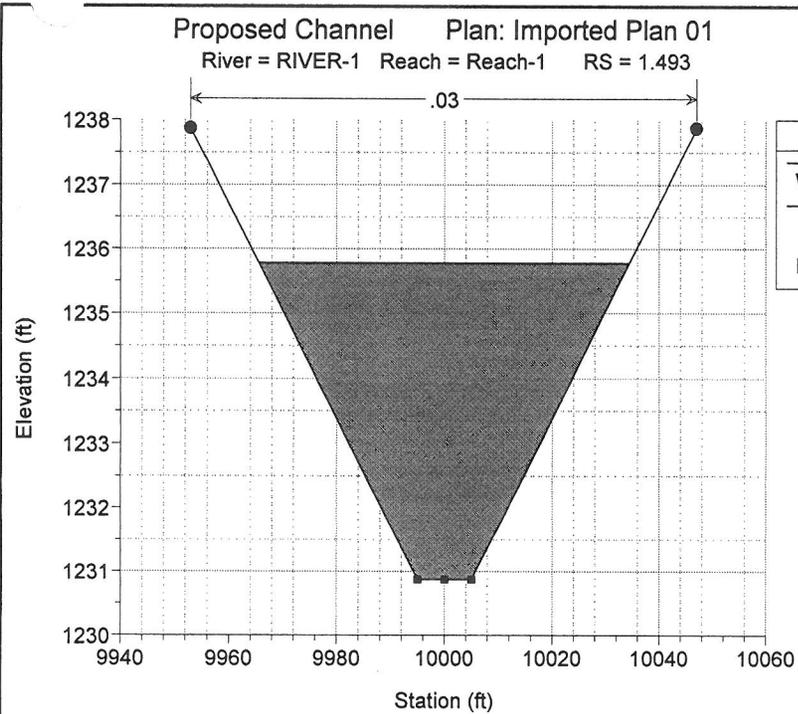
River = RIVER-1 Reach = Reach-1 RS = 1.495

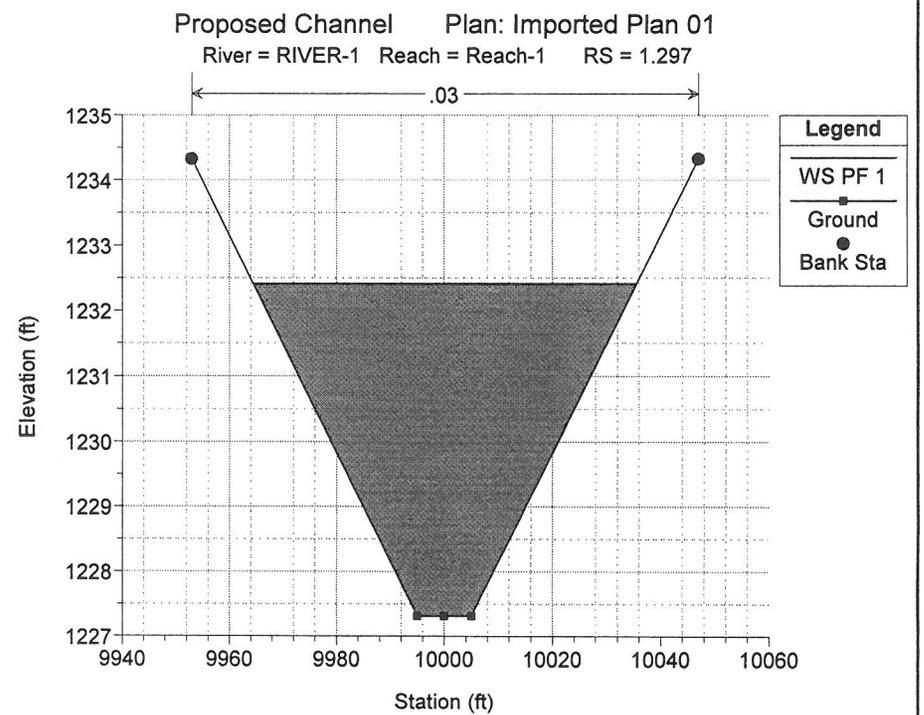
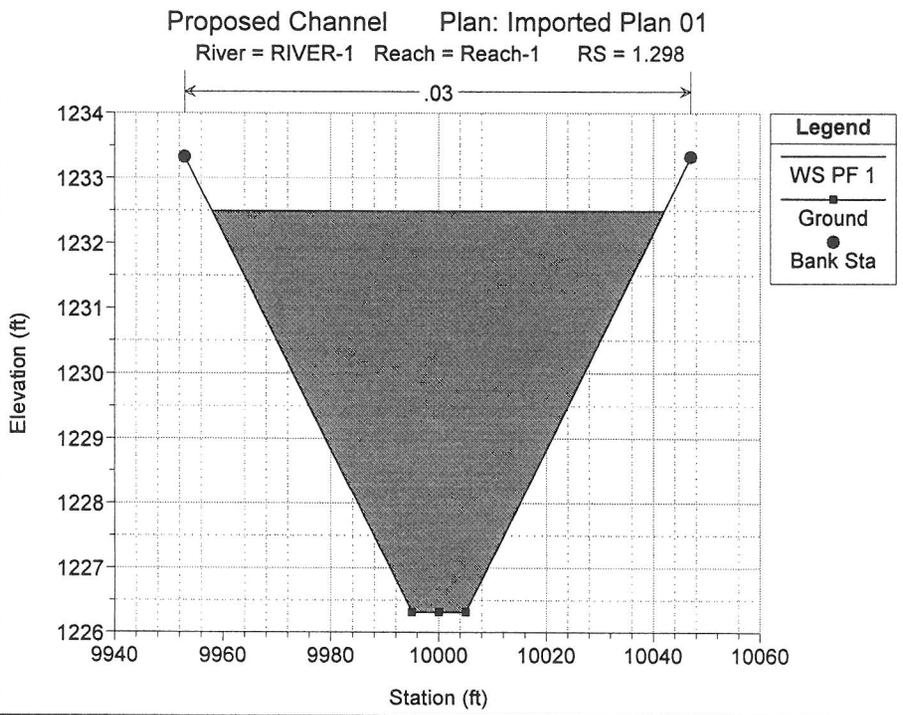
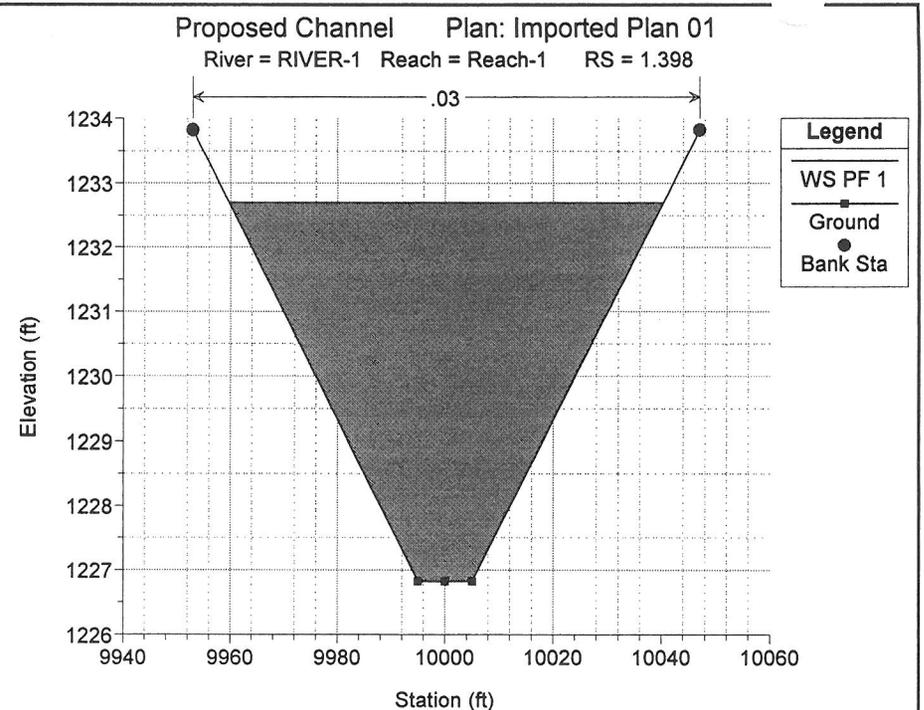
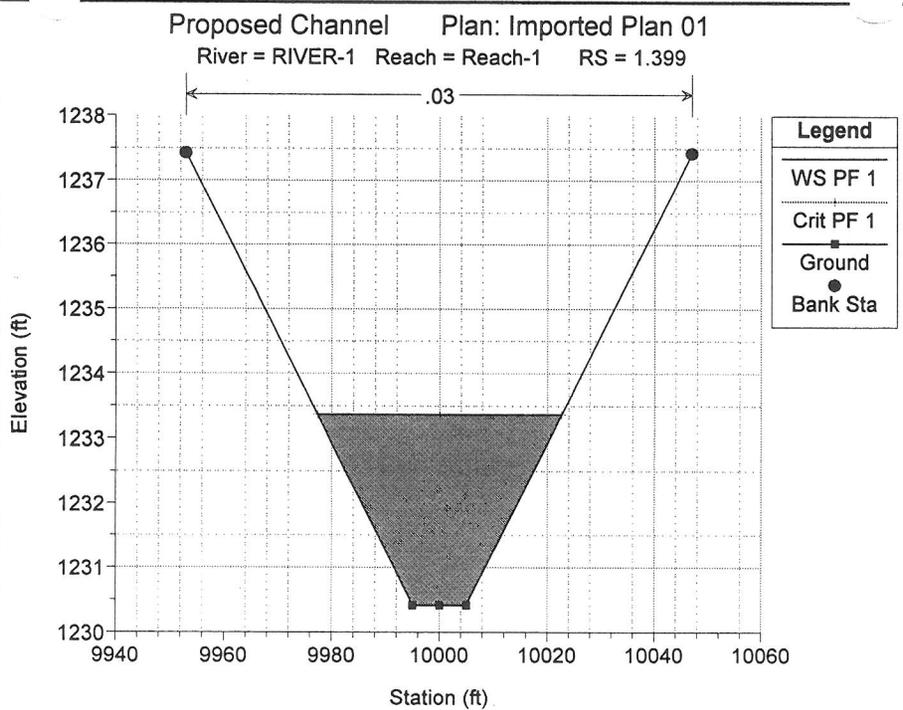


Proposed Channel Plan: Imported Plan 01

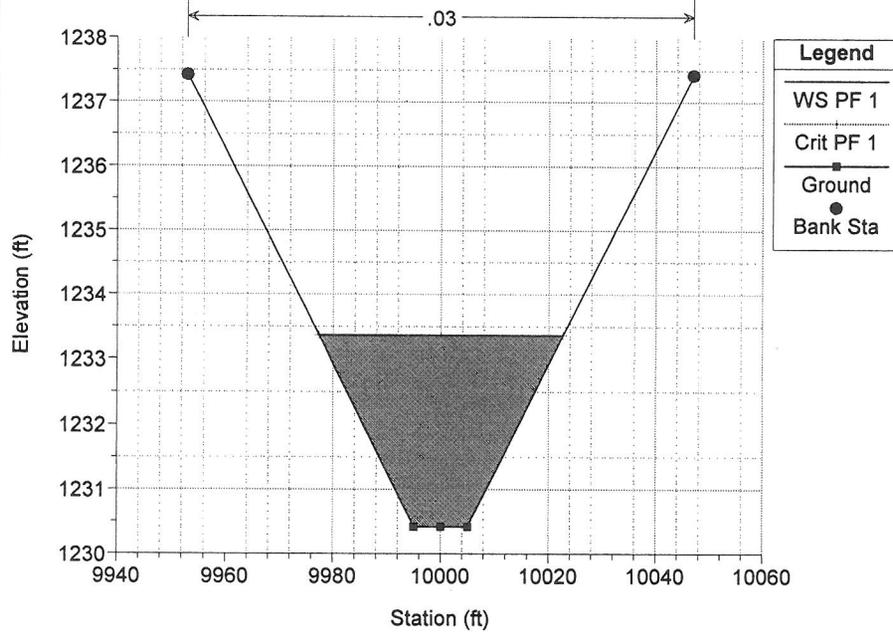
River = RIVER-1 Reach = Reach-1 RS = 1.494



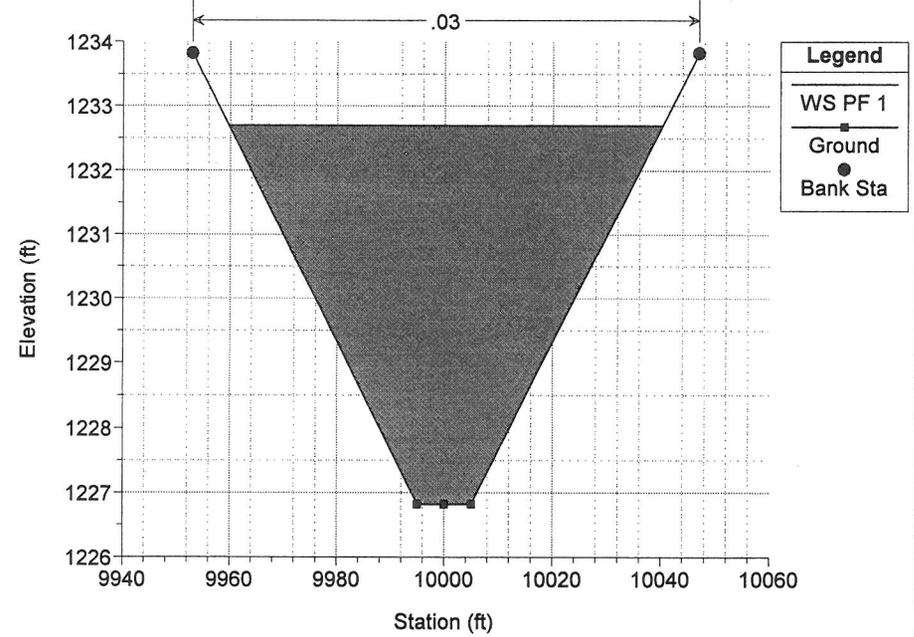




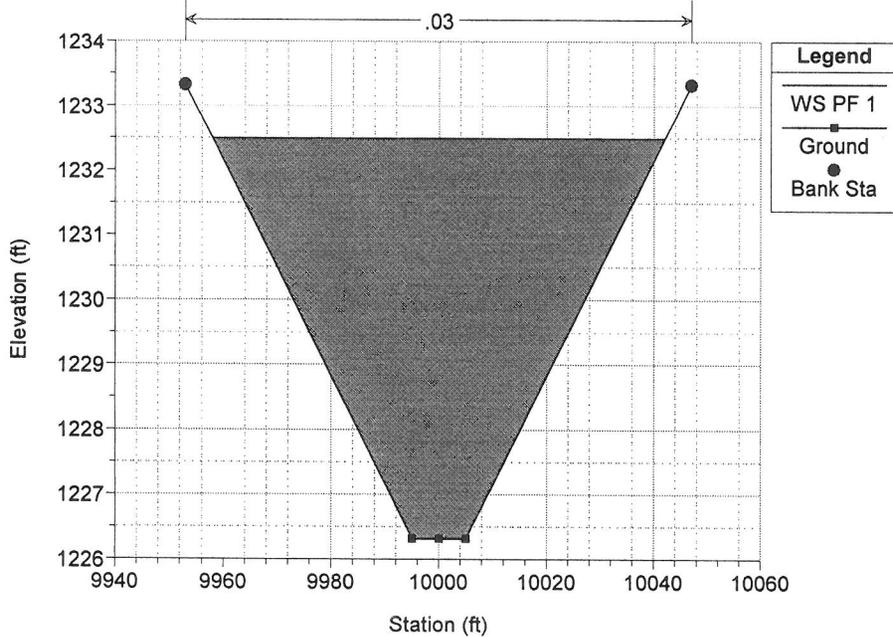
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.399



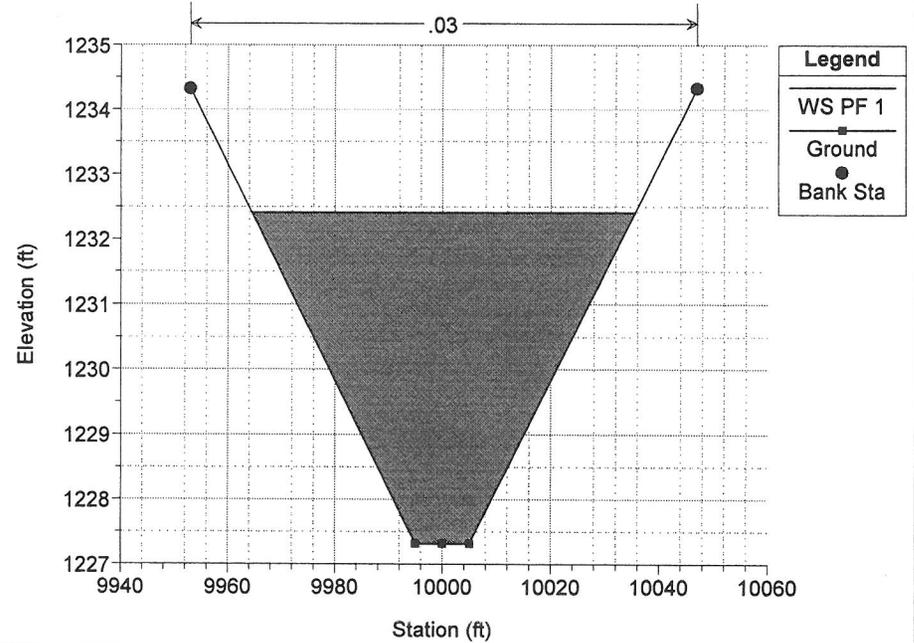
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.398



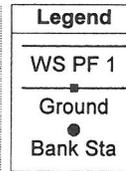
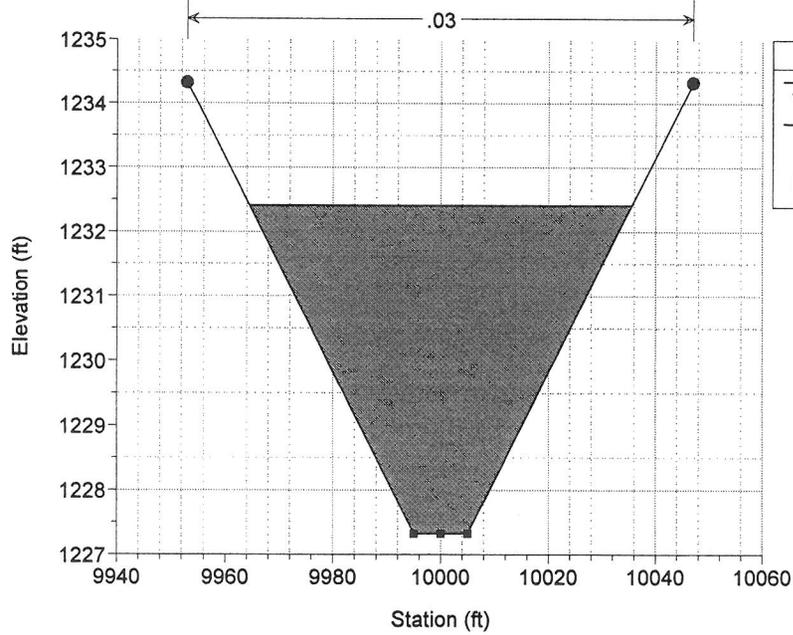
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.298



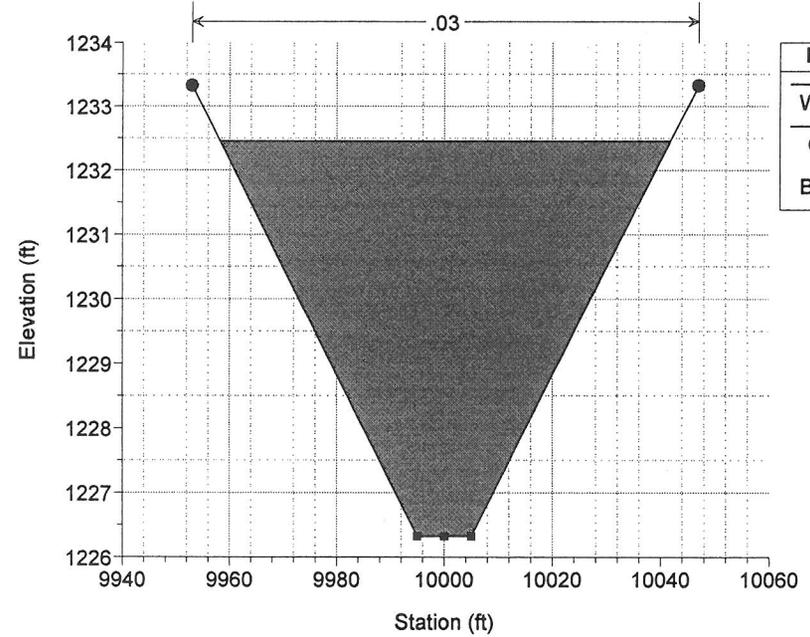
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.297



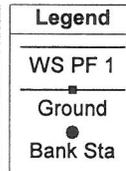
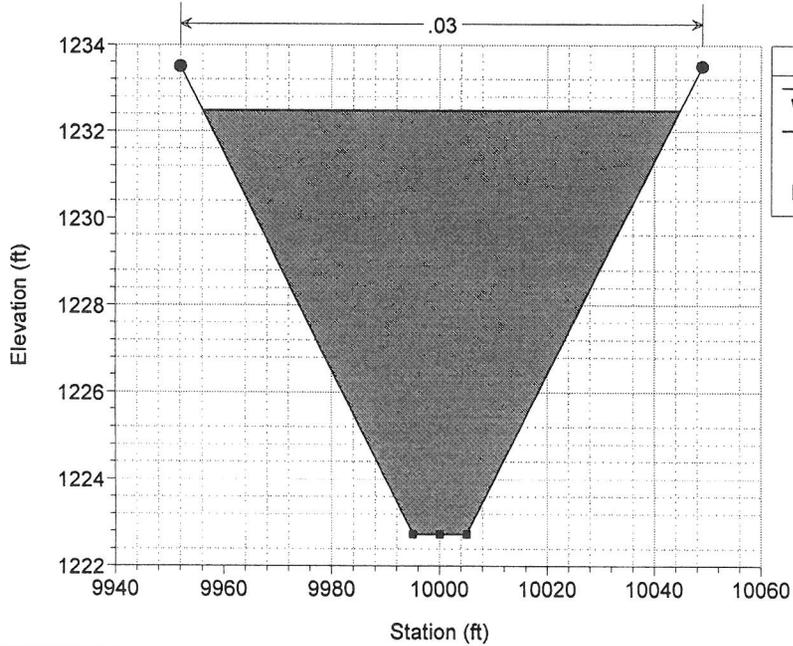
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.296



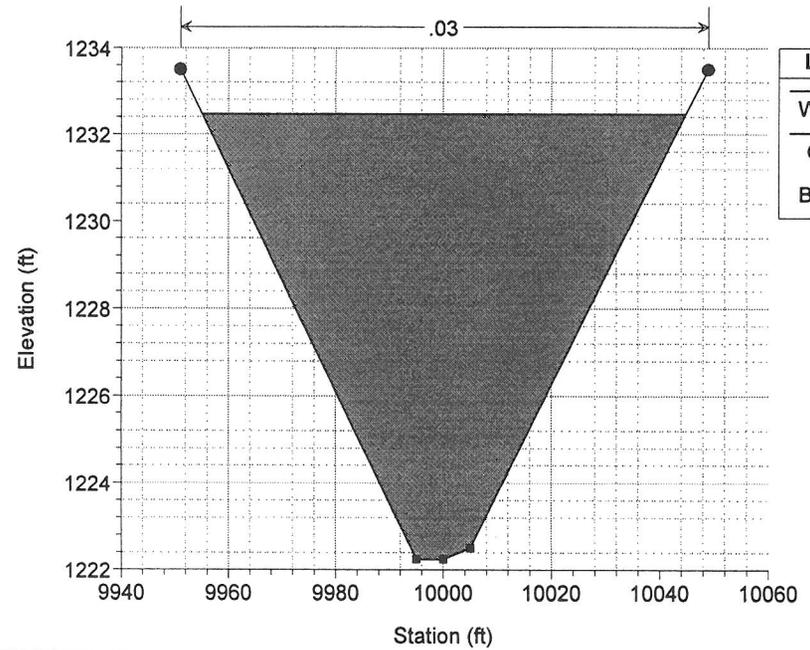
Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.295



Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.294

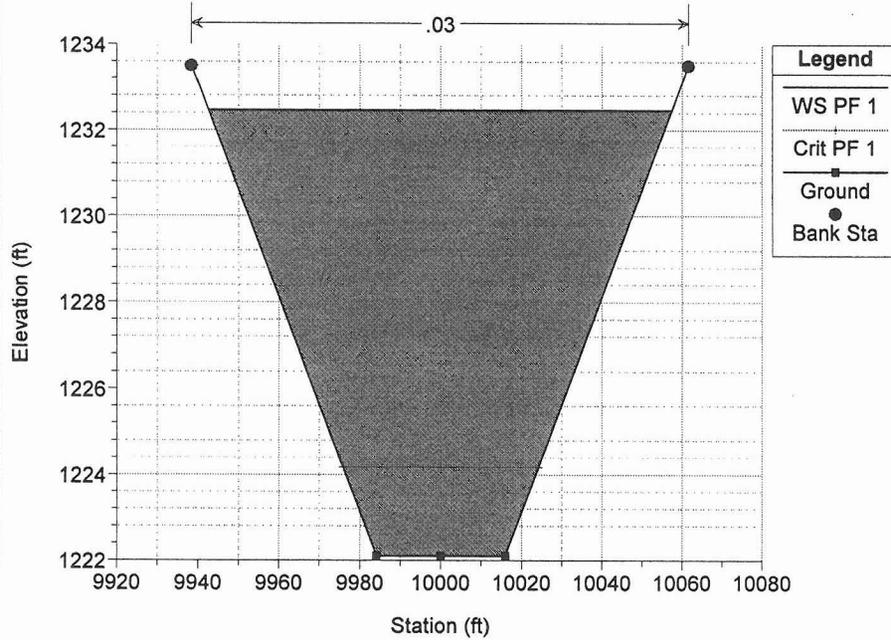


Proposed Channel Plan: Imported Plan 01
 River = RIVER-1 Reach = Reach-1 RS = 1.224



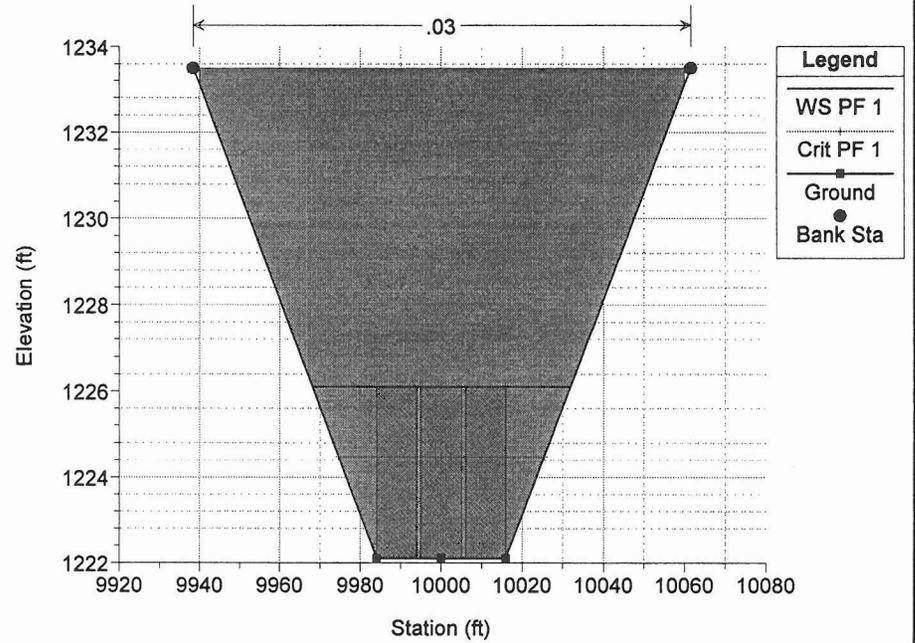
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.201



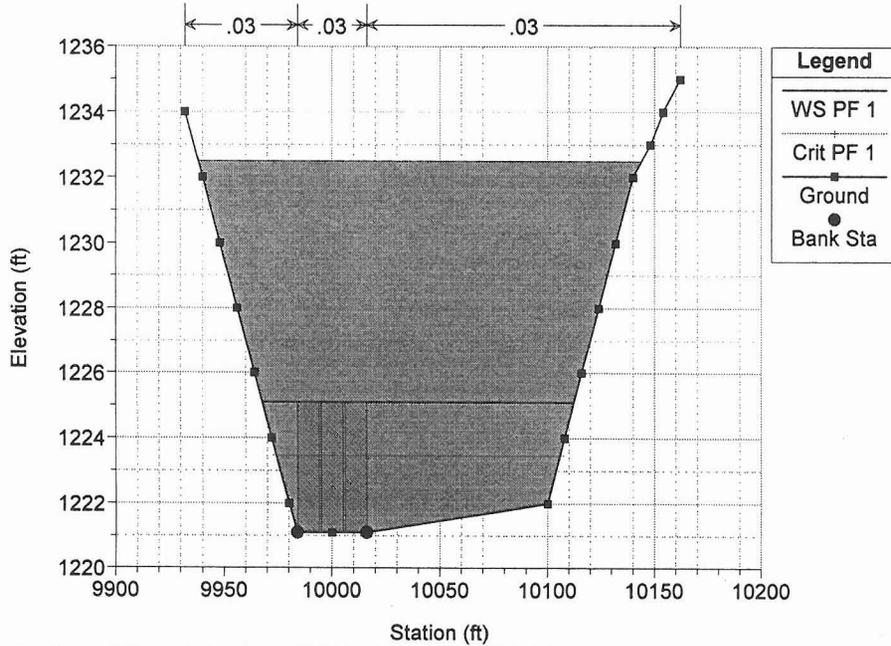
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.175



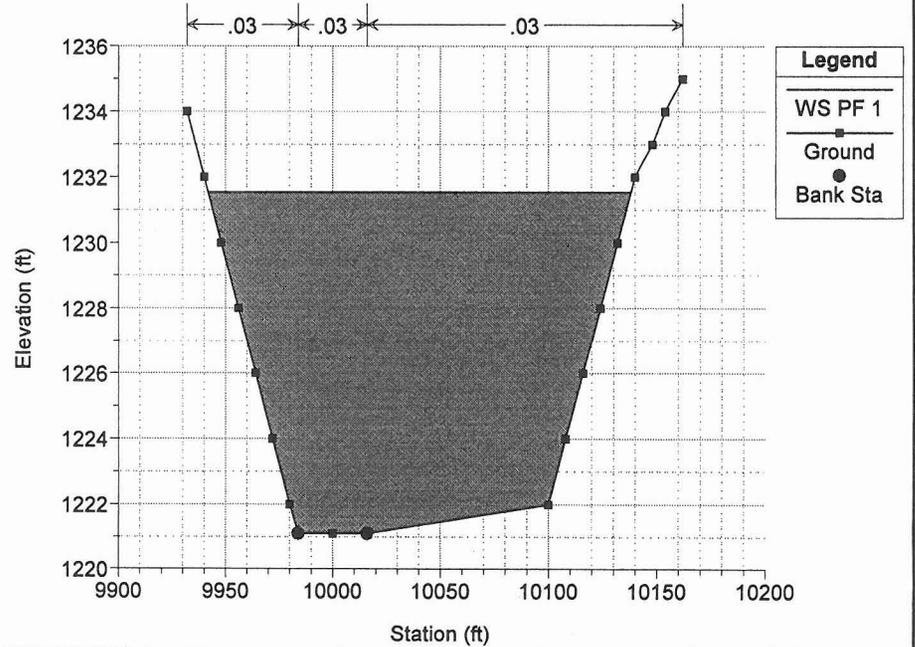
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.175



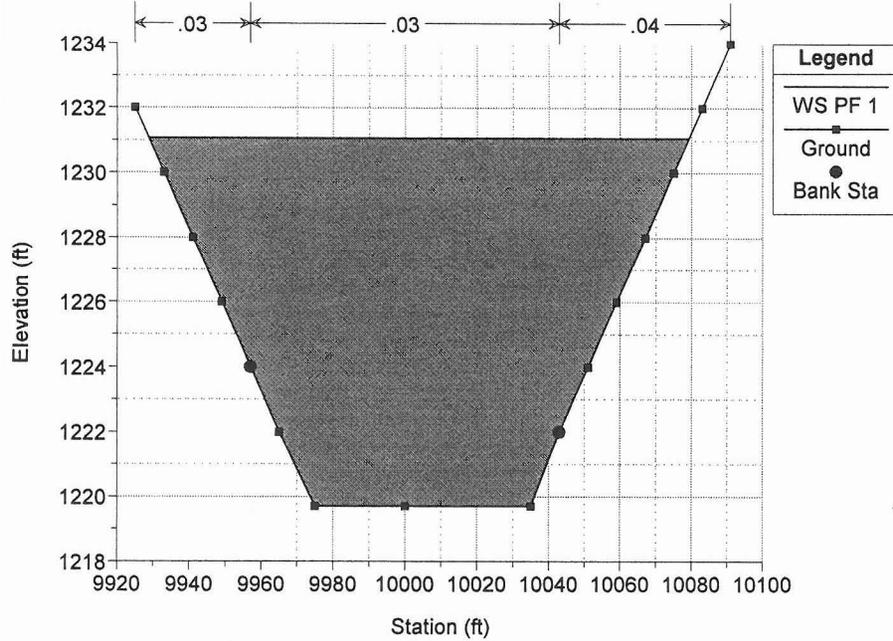
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.148



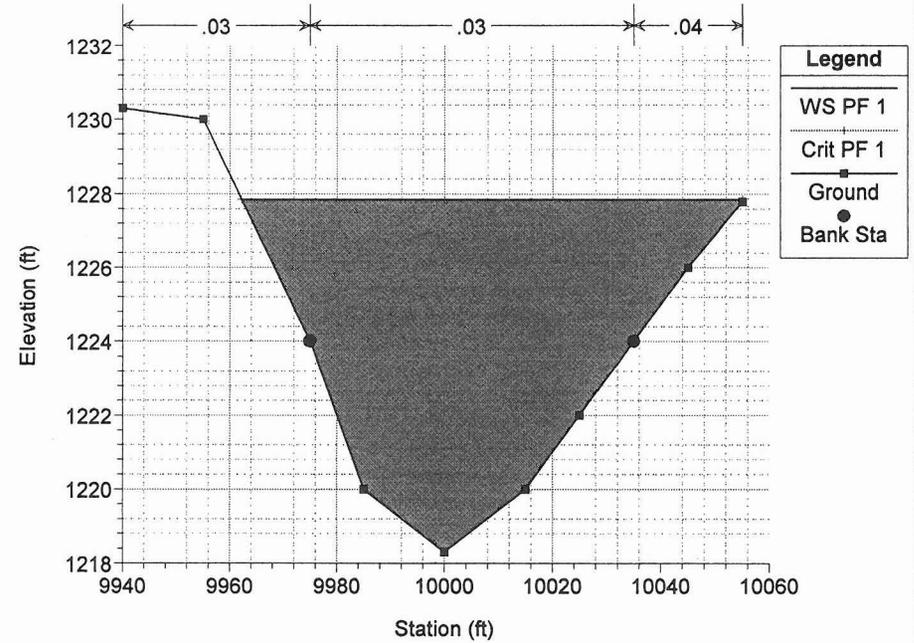
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 1.074



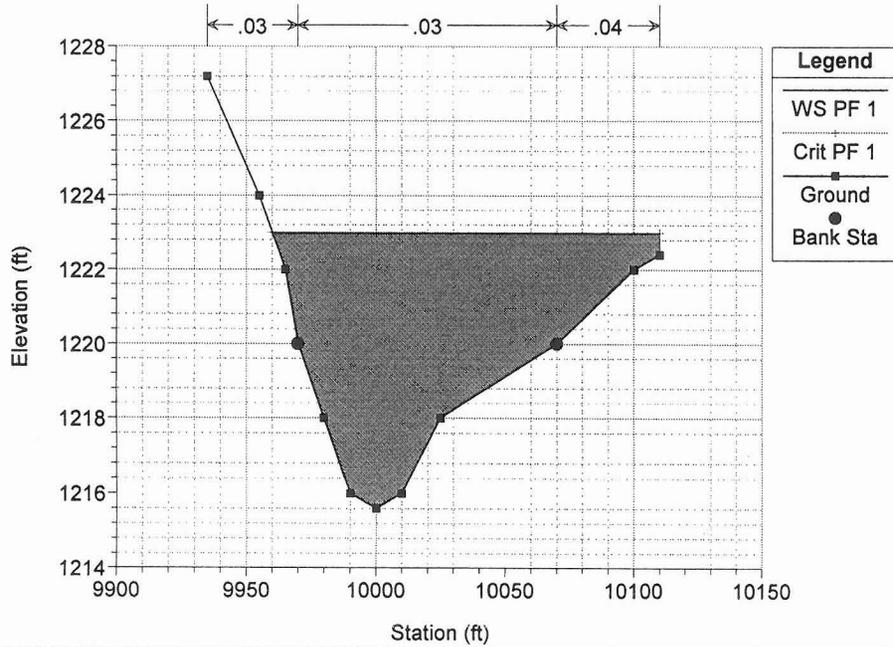
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 0.998



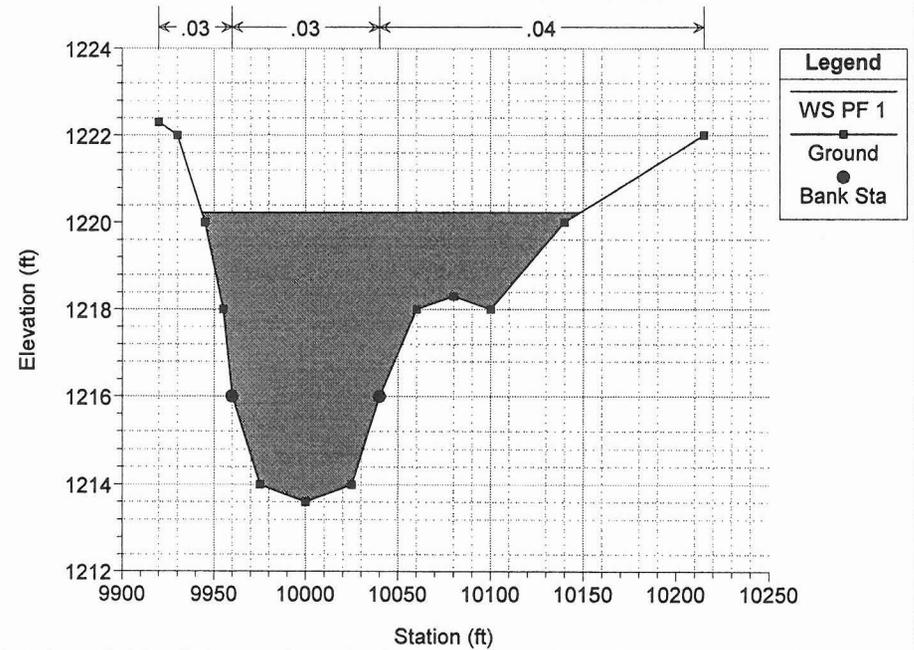
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 0.92



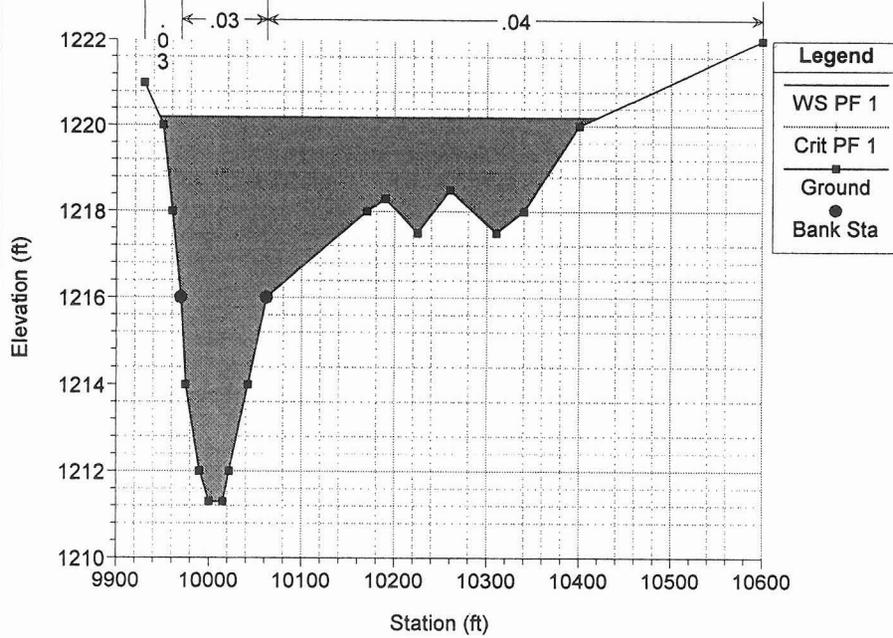
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 0.846



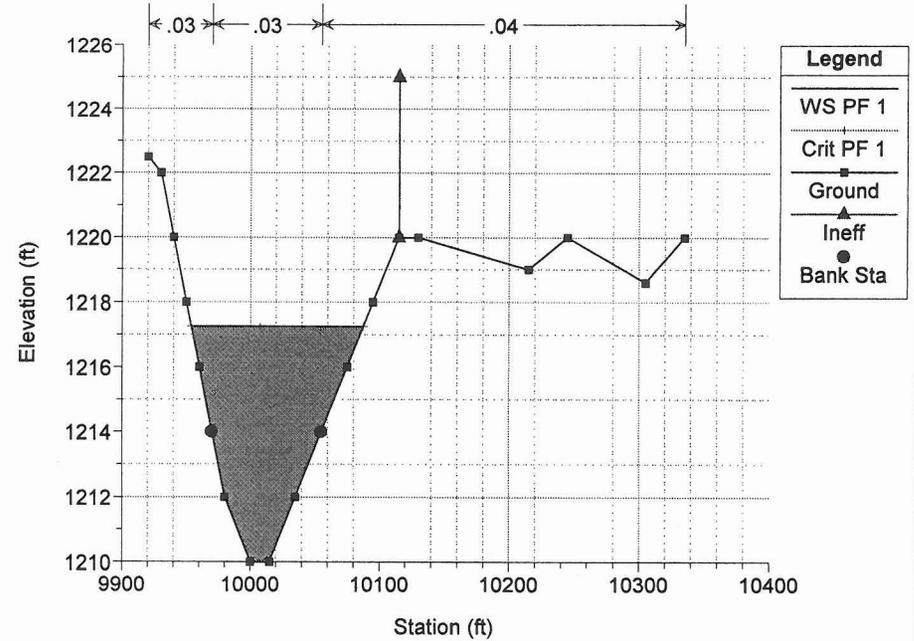
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 0.77 Widen bottom 15' from Sta 10000 to the west ss 10:1



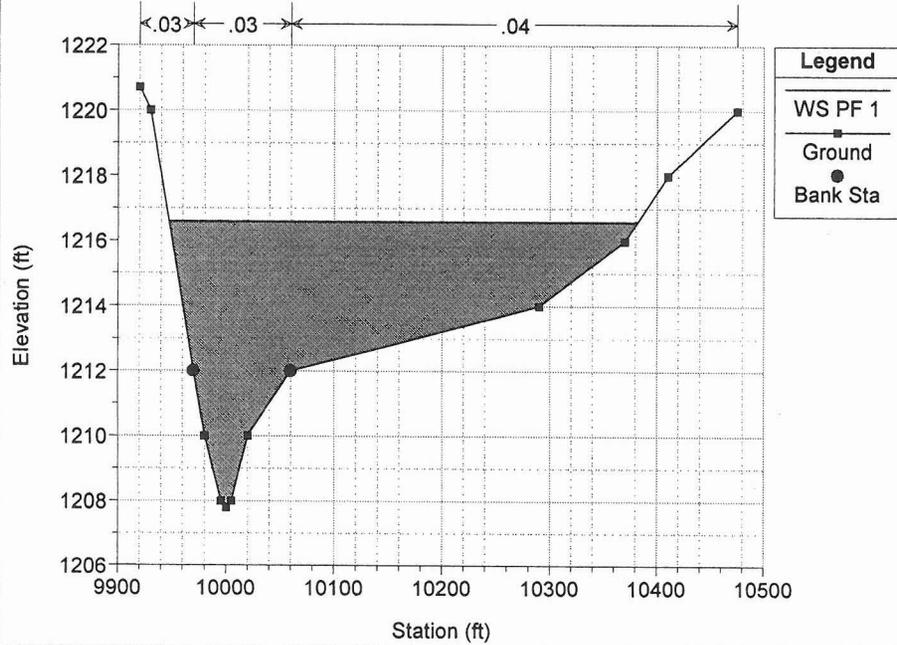
Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 0.696 Widen bottom 15' from Sta 10000 to the west ss 10:1



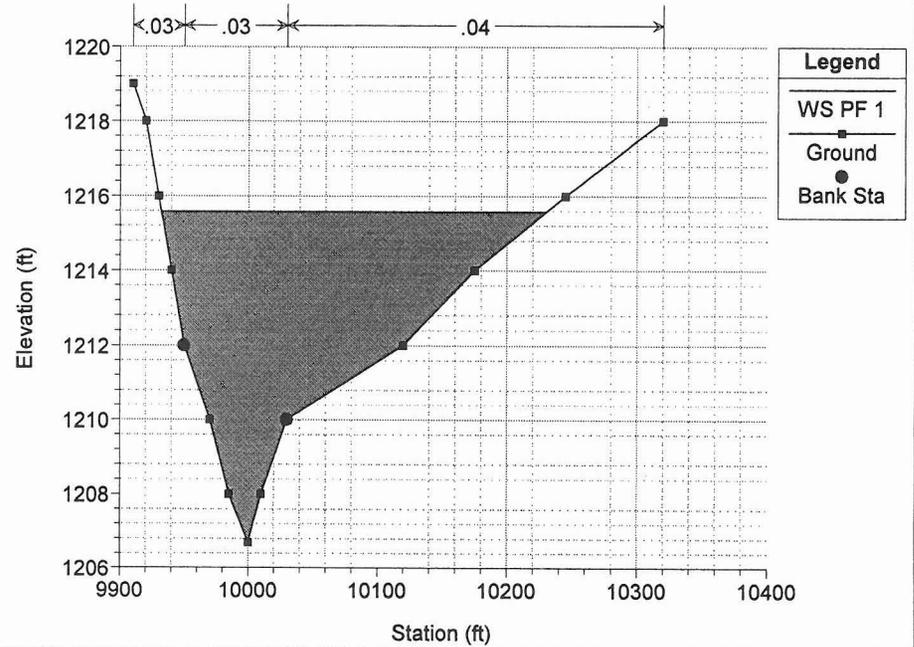
Proposed Channel Plan: Imported Plan 01

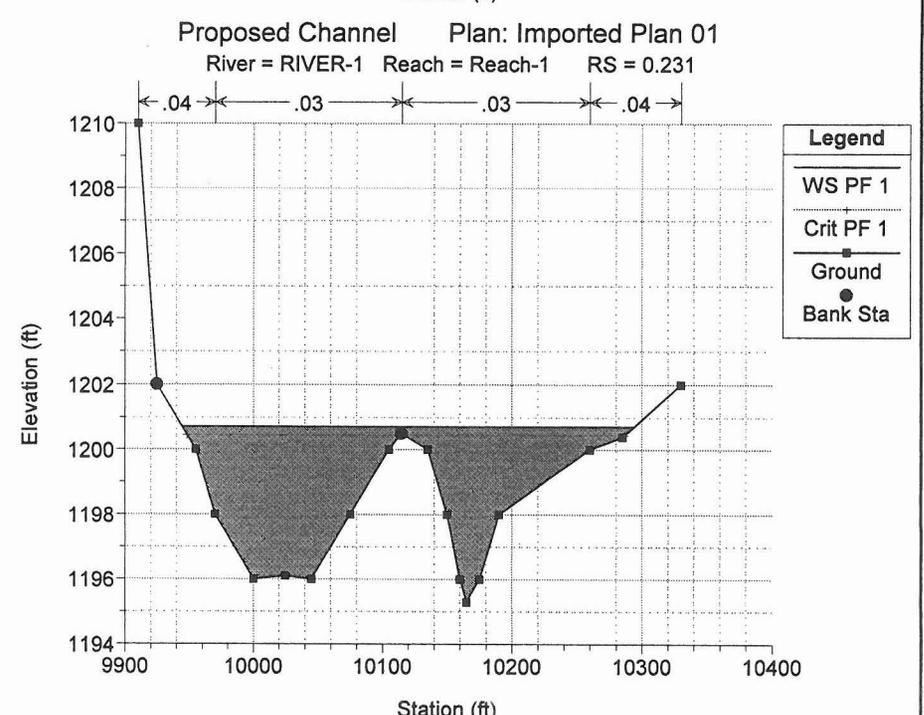
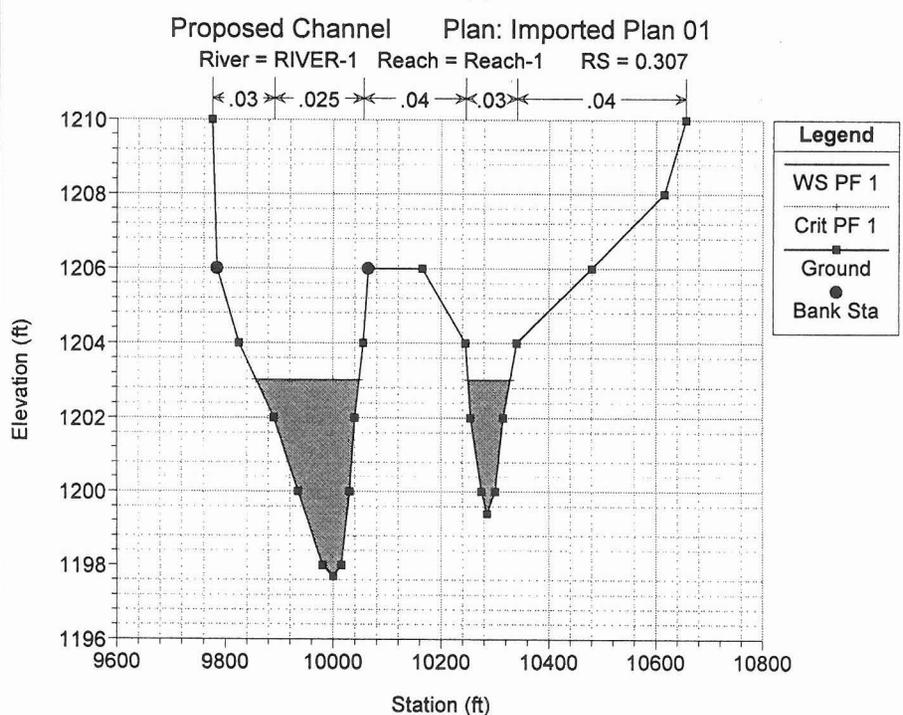
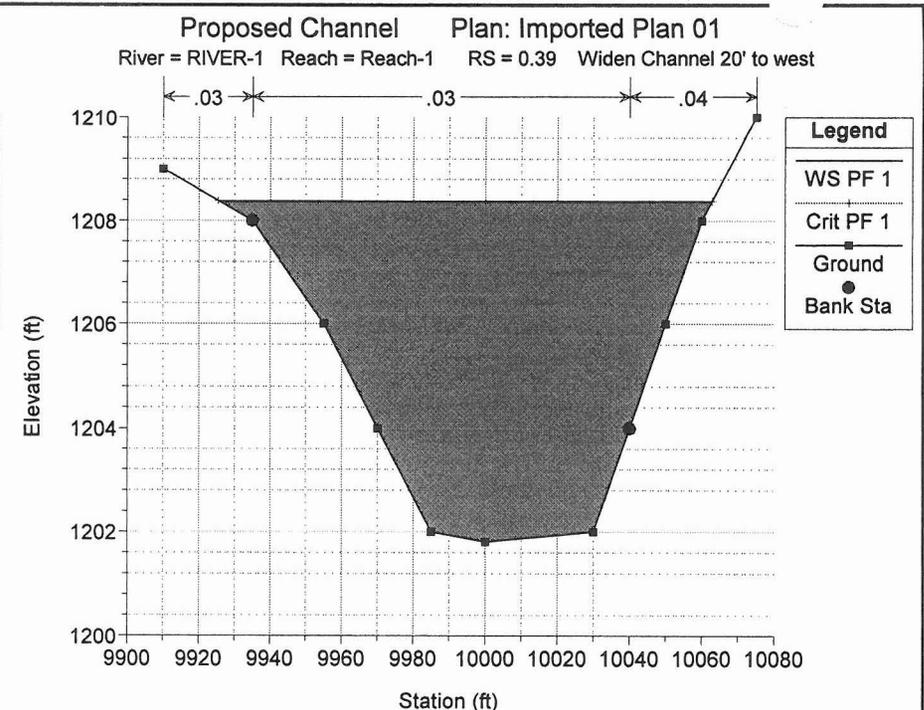
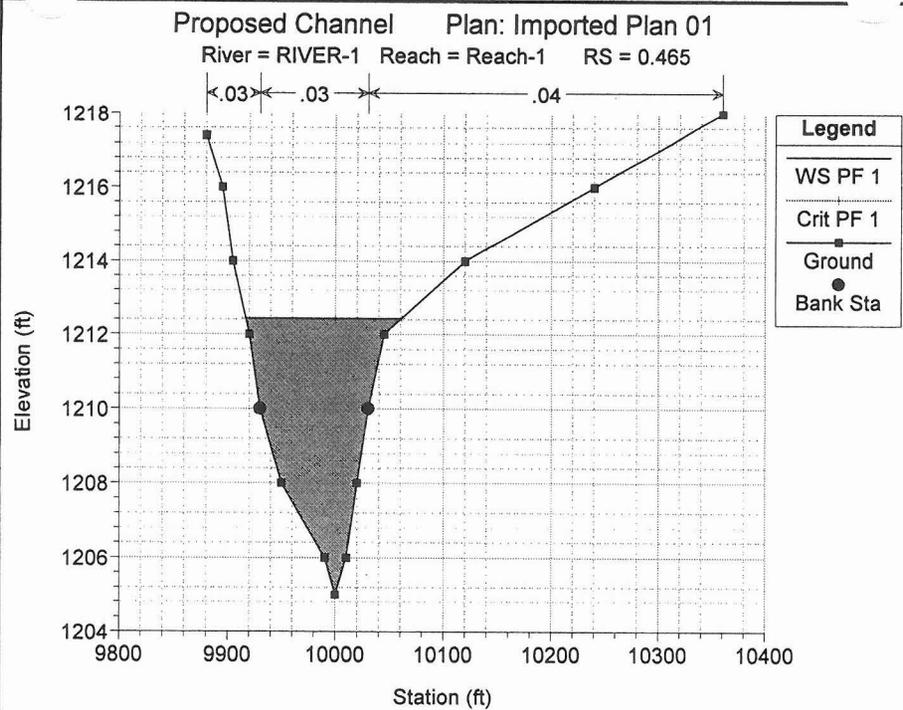
River = RIVER-1 Reach = Reach-1 RS = 0.62

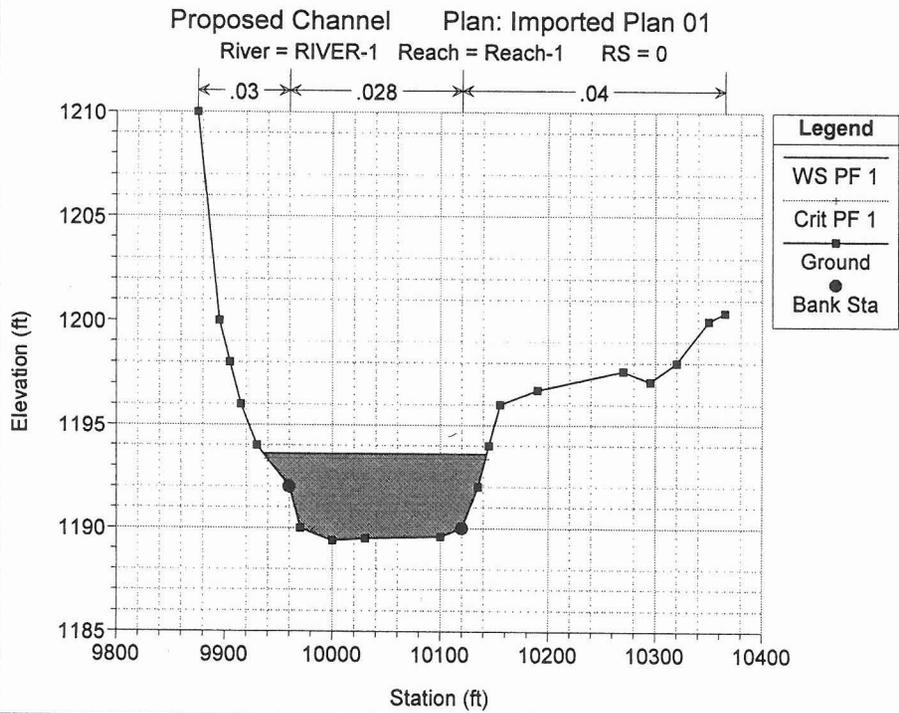
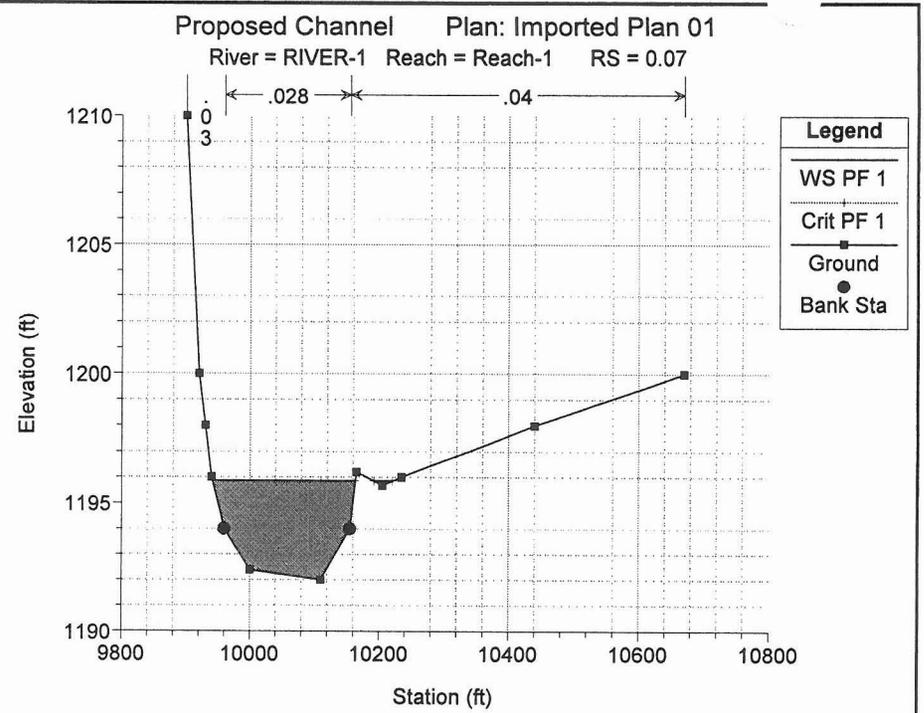
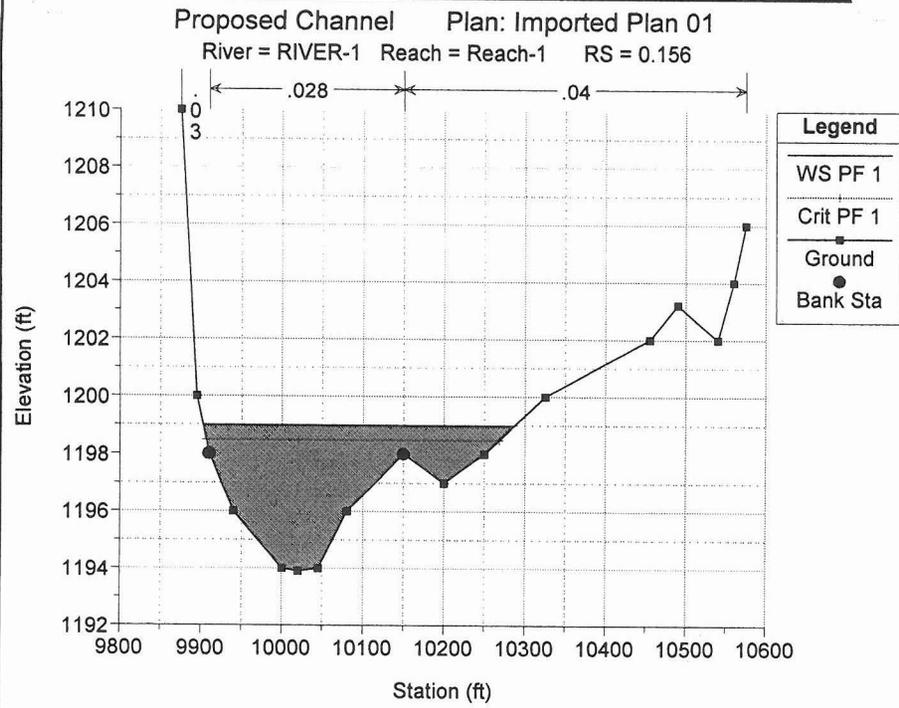


Proposed Channel Plan: Imported Plan 01

River = RIVER-1 Reach = Reach-1 RS = 0.543







APPENDIX I

15% TO 30% OPINION OF PROBABLE CONSTRUCTION COSTS

Preferred Alternative - Probable Opinion of Construction Cost

CONTRACT: FCD 2000 C 036

Construction Elements	Preferred Alternative
Excavation	\$319,093
Slope Protection	\$809,144
Drop Structures	\$440,190
Culverts	\$536,426
Landscaping	\$240,842
Maintenance Rd.	\$72,100
Aesthetic Treatment	\$99,409
Construction subtotal:	\$2,517,205
12% Engineering & Construction Administration	\$302,065
20% Construction & Other Contingency	\$503,441
Construction Total:	\$3,322,711
Right of Way	
Right of Way	\$308,283
10% Administrative Costs	\$30,828
Right of Way Total:	\$339,111
PROJECT TOTAL (Rounded):	\$3,700,000
Operation & Maintenance	
50 Year Operation & Maintenance	\$878,024
LIFE CYCLE TOTAL (Rounded):	\$4,500,000

Notes: 1. These estimates are probable costs for 15% to 30% plans only.

White Tanks FRS #3, North Inlet Channel

White Tanks FRS #3 North Inlet Channel 15% to 30% Design, Quantities, and Cost Estimate Table	Design Q100 (ft ³ /s)	Comp. Capacity (ft ³ /s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Length (ft)	Original Slope (ft/ft)	Design Invert Slope (ft/ft)	Total Vertical Drop (ft)	No. of Drops	Vertical Drop (ft)	Material Type	Manning's "n" Value	Bottom Width, W (ft)	Depth of Flow (ft)	Freeboard (ft)	Side slope (Z:1) Left	Side slope (Z:1) Right	Area (ft ²)	Perimeter (ft)	Flow Top Width (ft)	Hydraulic Depth (ft)	Froude Number	Type of Flow	Velocity (ft/s)	Channel Design Depth from depth + freeboard (ft)					
Segment 1	Culvert under Olive Avenue - 622 cfs																													
From Waterfalls Wash to Olive Avenue	Culvert under Olive Avenue - 2201 cfs																													
Sta. 51+50 to Sta. 67+50																														
Segment 2	Protection of east berm at Cholla Wash																													
From Olive Avenue to Cholla Wash																														
Sta. 67+50 to Sta. 94+50																														
Segment 3																														
From Cholla Wash to Northern Avenue																														
Sta. 94+50 to Sta. 120+00																														
Segment 4	Protection of east berm - Northern to FRS# 3900																													
From Northern Avenue to FRS#3																														
Sta. 120+00 to Sta. 159+00																														
Segment 2-East	600	600	1263.0	1222.1	5150	0.0079	0.0009	36.1	10	3.6	e	0.0300	10	5.00	2.0	8	4	199.7	70.9	70.0	2.9	0.31	Sub	3.00	7.0					
From Olive Avenue to Northern Avenue																														
East side of Beardsley Canal																														
Subtotals	Do Minimal B				9050					10																				
Notes:	1. There is a TCE south of Northern and for the diversion weir. 2. The excavation for channel includes cut and fill quantities. 3. The landscaping unit cost for Segment 4 only includes hydromulching. 4. The Basin R/W, landscaping and excavation quantities have been increased 30% for kinder and gentler features. 5. O&M costs have no contingencies applied. 6. The right-of-way width between Olive and Northern accounts for an existing 60' drainage easement.																													

White Tanks FRS #3, North Inlet Channel

White Tanks FRS #3 North Inlet Channel 15% to 30% Design, Quantities, and Cost Estimate Table	Channel Top width (ft)	Channel Width Plus 60' extra RW	Excavation			Slope Protection					Drop Structures					Landscaping					
			Excavated Volume (yd³)	Unit Cost (\$/yd³)	Total Excavation Cost	Concrete Quantity (ft²)	Concrete Unit Cost (\$/ft²)	Riprap Quantity (yd³)	Riprap Unit Cost (\$/yd³)	Total Slope Protection Cost	Drop Structures (No.)	Concrete Quantity (yd³)	Concrete Unit Cost (\$/yd³)	Riprap Quantity (yd³)	Riprap Unit Cost (\$/yd³)	Total Drop Structures Cost	Channel Length (ft)	Landscape Width Required (ft)	Landscapable Area (acre)	Landscaping Unit Cost (\$/acre)	Total Landscape Cost
Segment 1					\$0					\$0	0	51.0	\$310	0.0	\$45	\$15,810	0	0	0.0	\$12,000	\$0
From Waterfalls Wash to Olive Avenue Sta. 51+50 to Sta. 67+50					\$0					\$0	0	0.0	\$310	0.0	\$45	\$0	0	0	0.0	\$12,000	\$0
Segment 2			4,261	\$3.25	\$13,849	23184	\$4.80	978	\$45	\$155,285	0	0.0	\$310	0.0	\$45	\$0	-	varies	0.6	\$2,200	\$1,242
From Olive Avenue to Cholla Wash Sta. 67+50 to Sta. 94+50																					
Segment 3					\$0					\$0	0	0.0	\$310	0.0	\$45	\$0	-	-	0.0	\$12,000	\$0
From Cholla Wash to Northern Avenue Sta. 94+50 to Sta. 120+00																					
Segment 4			24,445	\$3.25	\$79,447	148723	\$3.00	4615	\$45	\$653,859	0	0.0	\$310	0.0	\$45	\$0	-	varies	5.7	\$2,200	\$12,603
From Northern Avenue to FRS#3 Sta. 120+00 to Sta. 159+00																					
Segment 2-East	94.0	154.0	69,476	\$3.25	\$225,797					\$0	10	121.8	\$310	104.0	\$45	\$424,380	5150	160	18.9	\$12,000	\$226,997
From Olive Avenue to Northern Avenue East side of Beardsley Canal																					
Subtotals			98,182		\$319,093	171908		5593		\$809,144	10	172.8		104.0		\$440,190			25.2		\$240,842

Quantity Calculations - Opinion of Probable Construction Costs - Preferred Alternative

South of Northern

Thickness (in): 5

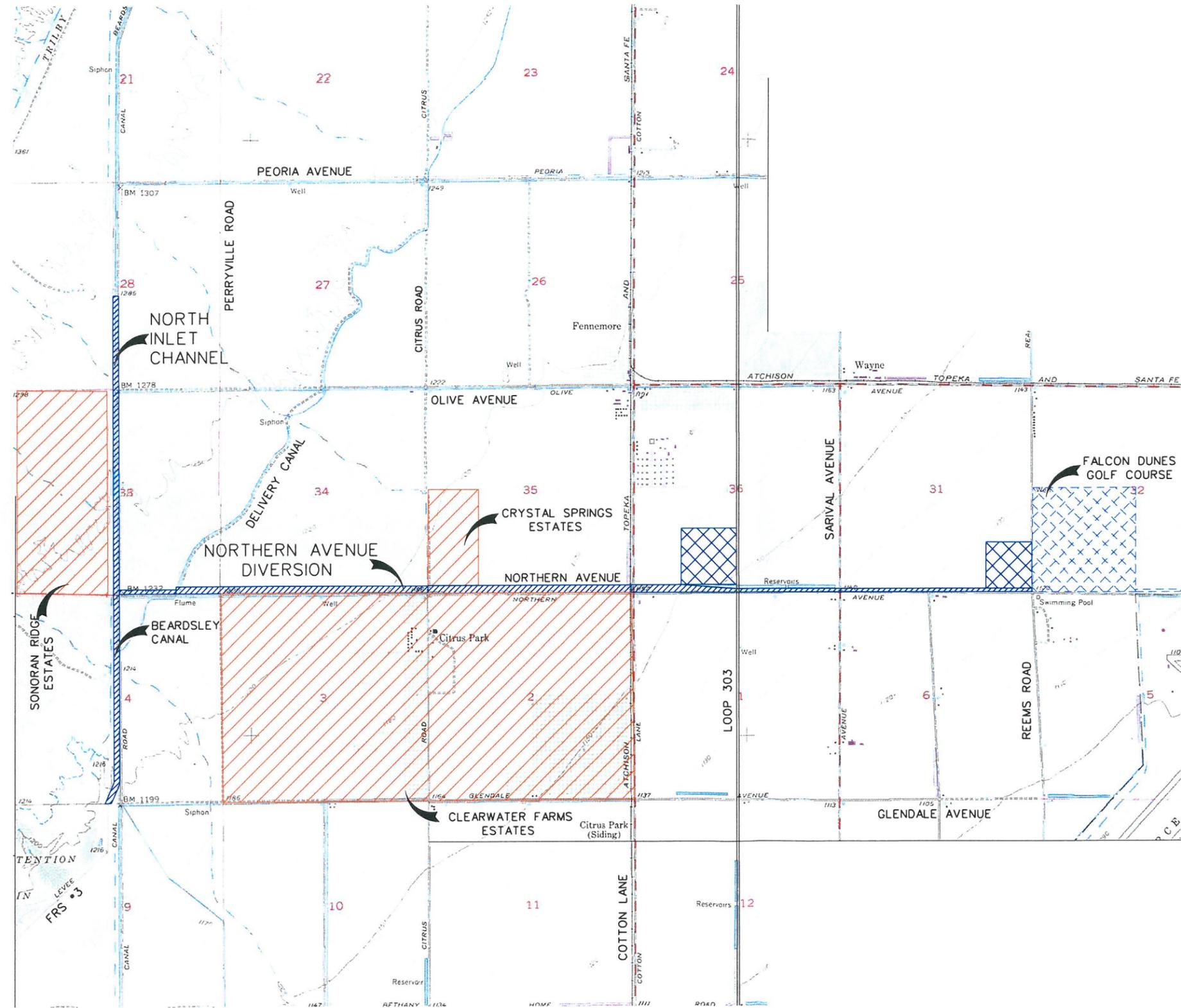
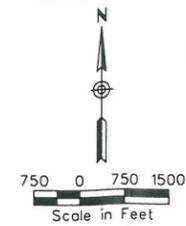
Begin Sta (ft)	End Sta (ft)	Length (ft)	Angle Correction	Adjusted Length (ft)	Begin H (ft)	End H (ft)	Average H (ft)	Face		x-section Area (ft ²)	Concrete Volume (yd ³)	Toe down		Riprap Avg D (ft)	Riprap Volume (yd ³)	Excavation		Disturbance		
								Length (ft)	Area (ft ²)			Begin d (ft)	End d (ft)			Area (ft ²)	Volume (yd ³)	width (ft)	Area L x H	
11708	12070	362	45	391.8	12	12	12	27.83	10906	11.60	168.30	6.00	6.00	4	348.29	4	102.5	1487.5	30	11755
12070	12192	122	45	132.1	12	14	13	30.07	3971	12.53	61.28	6.00	6.00	4	117.38	2	117.5	574.7	40	5282
12192	12350	158	45	171.0	14	14	14	32.30	5525	13.46	85.26	6.00	6.00	4	152.02	0	134.5	851.9	50	8551
12350	12600	250	0	250	14	14	14	32.30	8076	13.46	124.63	6.00	6.00	4	222.22	0	134.5	1245.4	50	12500
12600	12700	100	0	100	14	15	14.5	33.42	3342	13.93	51.58	6.00	6.00	4	88.89	-1	143.75	532.4	55	5500
12700	13030	330	0	330	15	15	15	34.54	11399	14.39	175.90	6.00	6.00	4	293.33	-2	153.5	1876.1	60	19800
13030	13385	355	0	355	15	17	16	36.78	13056	15.32	201.48	6.00	8.00	5	493.06	1	173	2274.6	55	19525
13385	13485	100	0	100	17	19	18	41.25	4125	17.19	63.66	8.00	8.00	6	200.00	2	216.5	801.9	60	6000
13485	13992	507	0	507	19	19	19	43.49	22047	18.12	340.23	8.00	8.00	6	1014.00	0	239.5	4497.3	70	35490
13992	14200	208	0	208	19	17	18	41.25	8580	17.19	132.40	8.00	6.00	5	288.89	-3	217	1671.7	75	15600
14200	14700	500	0	500	17	15	16	36.78	18389	15.32	283.77	6.00	6.00	4	444.44	-4	174.5	3231.5	70	35000
14700	14800	100	0	100	15	16	15.5	35.66	3566	14.86	55.03	6.00	6.00	4	88.89	-3	163.75	606.5	65	6500
14800	15138	338	0	338	16	16	16	36.78	12431	15.32	191.83	6.00	6.00	4	300.44	-4	174.5	2184.5	70	23660
15138	15550	412	0	412	16	16	16	36.78	15152	15.32	233.83	6.00	6.00	4	366.22	-4	174.5	2662.7	70	28840
15550	15755	205	45	221.9	16	16	16	36.78	8160	15.32	125.93	6.00	6.00	4	197.24	-4	174.5	1434.1	70	15532
				TOTAL:	4116.8				148723		2295				4615			24445		5.7 acres

Confluence with Cholla

Thickness (in): 8

Begin Sta (ft)	End Sta (ft)	Length (ft)	Height (ft)	Face		x-section Area (ft ²)	Concrete Volume (yd ³)	Riprap Depth (ft)	Riprap Volume (yd ³)	Excavation		Disturbance		
				Length (ft)	Area (ft ²)					Area (ft ²)	Volume (yd ³)	width (ft)	Area L x H	
17580	17680	100	15.5	35.66	3566	14.86	55.03	4	88.89	-3	163.75	606.5	37	3700
17680	18080	400	17.5	40.13	16052	16.72	247.72	6	800.00	3	205.75	3048.1	43	17200
18080	18180	100	15.5	35.66	3566	14.86	55.03	4	88.89	-3	163.75	606.5	37	3700
				TOTAL:	600	23184	358		978			4261		0.6 acres

PLATES



VICINITY MAP

3			
2			
1			
NO.	REVISION	BY	DATE

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION

WHITETANKS FRS #3 NORTH INLET CHANNEL PRE-DESIGN STUDY

	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. McKASKLE	03/02
CHECKED	A. PATEL	03/02

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

DRAWING NO.	WP* 011315.03	SHEET OF
	CONTRACT FCD 2000 C 036	1 1

TWO WORKING DAYS
BEFORE YOU DIG, CALL
363-1100
BLUE STAKE

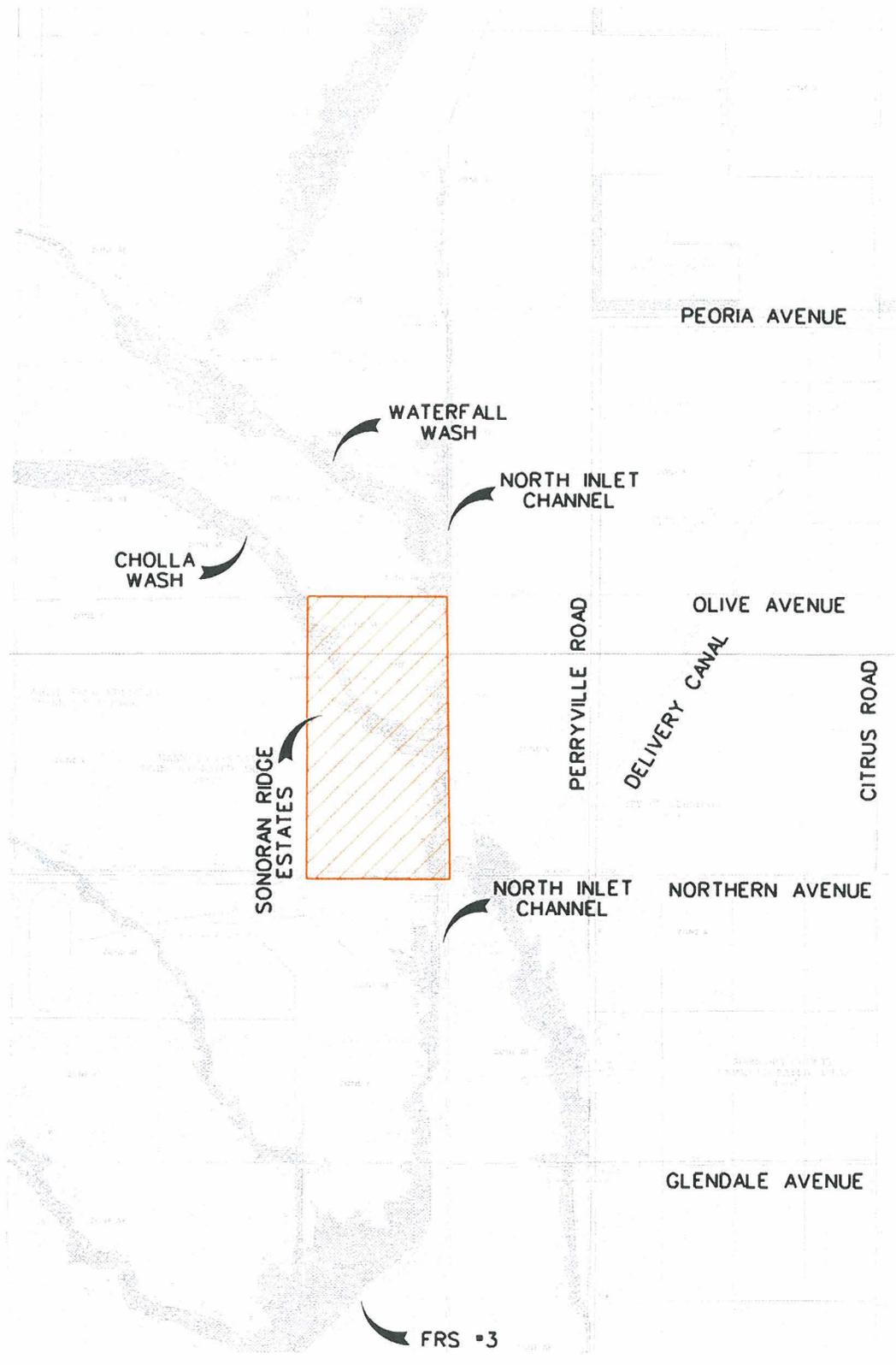
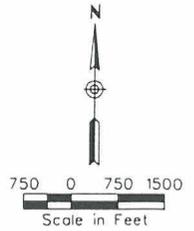
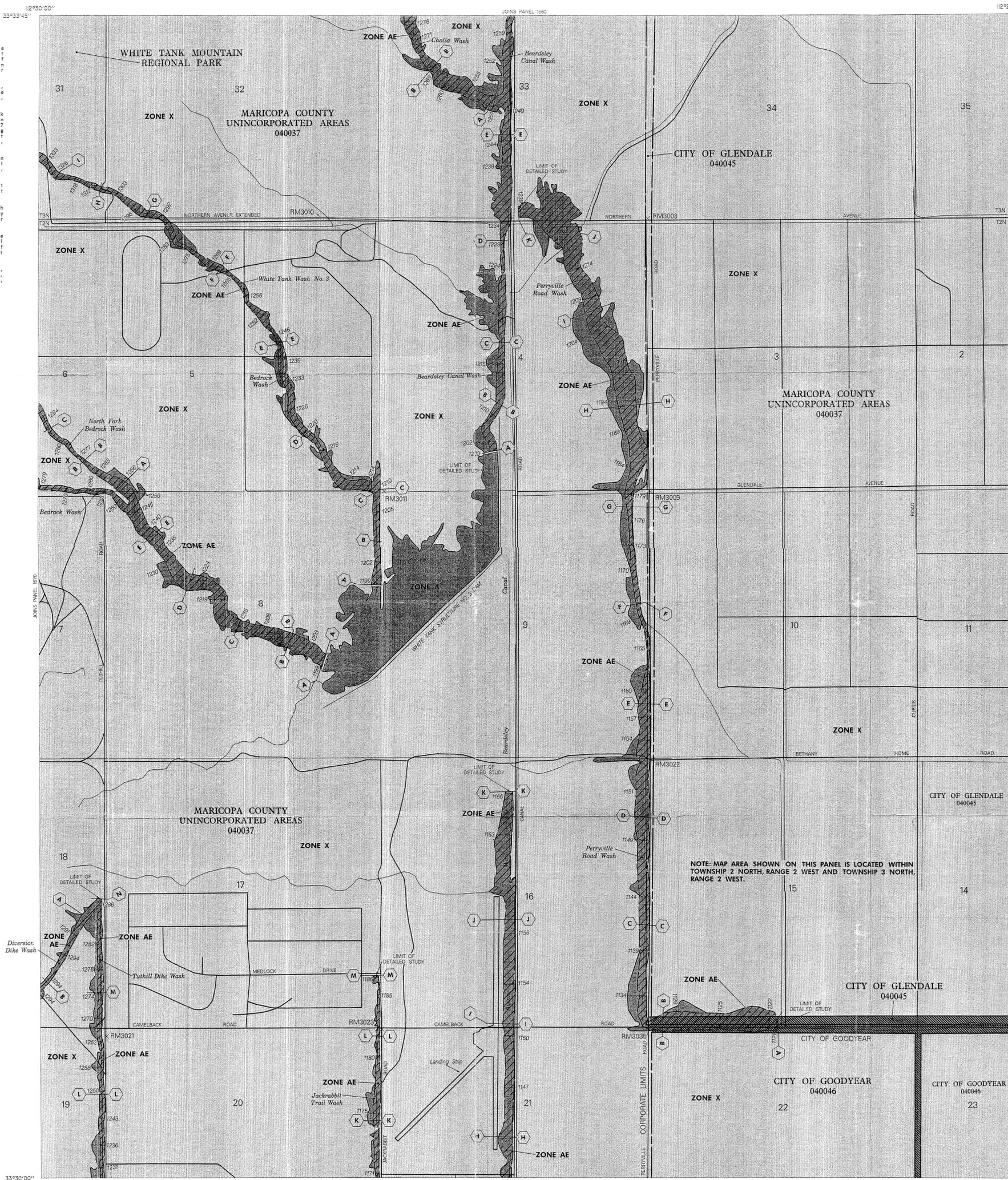


PLATE 2-1
FLOOD INSURANCE RATE MAP PANELS 1580 & 1590
FEDERAL EMERGENCY MANAGEMENT AGENCY

REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM3008	1218.83	Chiseled square in concrete base electrical transformer W5C 363 at southeast corner of intersection of Perryville Road and Northern Avenue, near southeast corner section 33, T3N, R2W.
RM3009	1182.66	1--inch iron pin in gothole, Perryville Road and Glendale Avenue, southeast corner section 4, T2N, R2W.
RM3010	1264.23	National Geodetic Survey benchmark - stainless-steel rod engaged in pipe and stamped L475 981 0.7 mile west of Beardley Canal along Northern Avenue, q 1050 feet west of northeast corner section 5, T2N, R2W.
RM3011	1213.89	Iron pin at centerline intersection of Glendale Avenue and Jackrabbit Trail, southeast corner section 5, T2N, R2W.
RM3021	1262.08	Inverted aluminum cap at southwest corner of section 17, southeast corner section 17, T2N, R2W.
RM3022	1153.06	1-inch iron pipe flush with pavement, Perryville and Bethany Home Roads, southeast corner section 9, T2N, R2W.
RM3023	1185.68	40d nail in west face of power pole on east side of Jackrabbit Trail approximately 100 feet south of Medlock Drive, near southeast corner section 17, T2N, R2W.
RM3035	1132.41	Iron rod flush with pavement, Perryville and Camelback Roads, southeast corner section 16, T2N, R2W.



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

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

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

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

OTHER AREAS

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

UNDEVELOPED COASTAL BARRIERS

- Identified 1983
- Identified 1993
- Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

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

Base Flood Elevation Line
Elevation in Feet. See Map Index for Elevation Datum.

Cross Section Line
Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

Elevation Reference Mark

River Mile

Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size or all payments features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's and for any information on floodway designations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, AH, AO, AV, A99, V, VE, and VI-V30.

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

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

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 120 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and/or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1980 (PL 101-591).

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:
SEPTEMBER 4, 1991 SEPTEMBER 30, 1996

Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6622.

APPROXIMATE SCALE IN FEET
1000 0 1000

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFEs shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

ERM elevations listed on this map were obtained and/or developed to establish vertical control for determination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevation information on National Geodetic Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFE's shown on this map may apply only landward of 0.2' NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1590 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS COMMUNITY	NUMBER	PANEL	SUFFIX
GLENDALE CITY OF	040045	1590	0
GOODYEAR CITY OF	040046	1590	0
MARICOPA COUNTY UNINCORPORATED AREAS	040037	1590	0

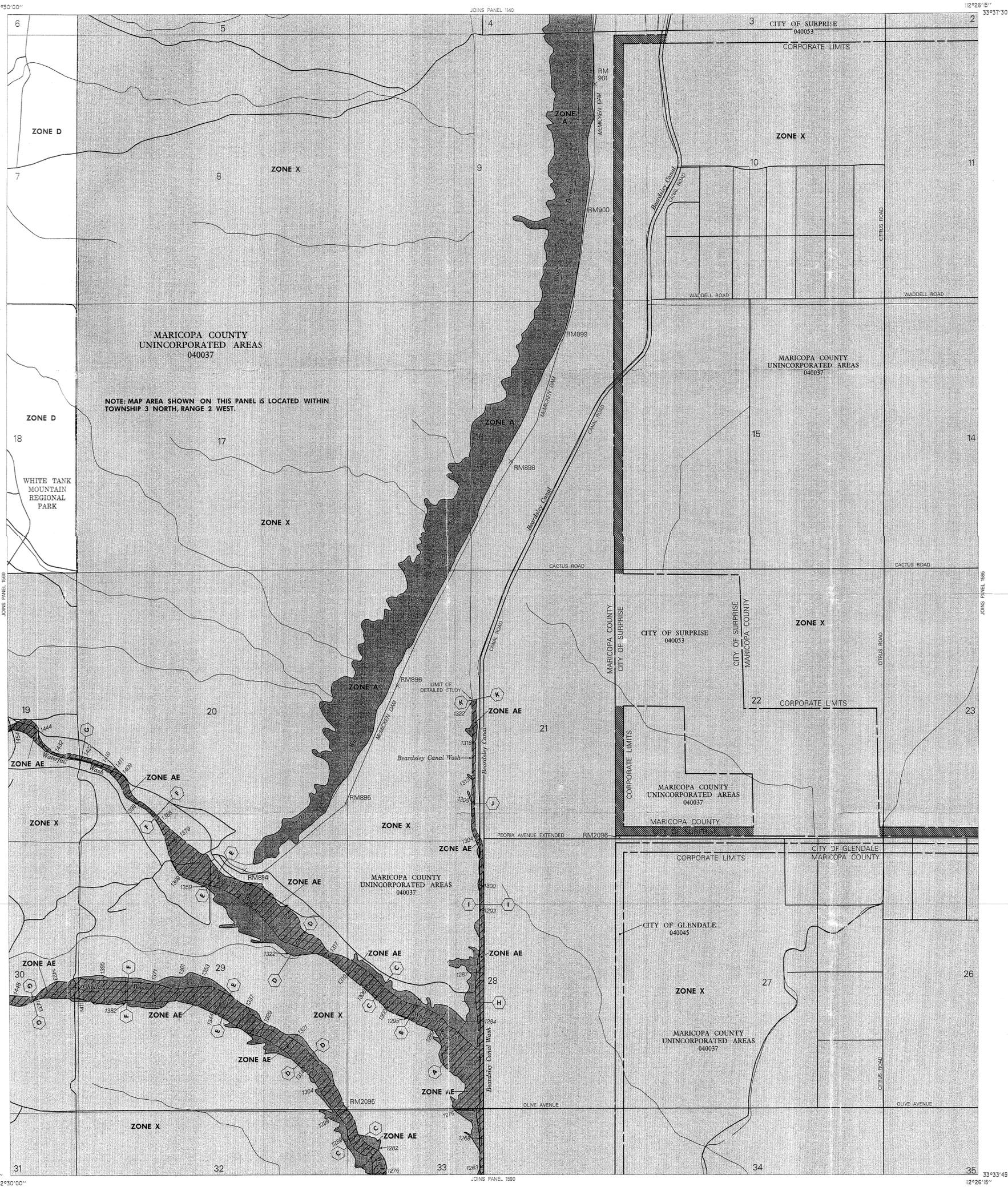
MAP NUMBER
04013C1590 G

MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 2 NORTH, RANGE 2 WEST AND TOWNSHIP 3 NORTH, RANGE 2 WEST.

REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM894	1360.94	Brass cap in concrete on top of McMicken Dam, stamped 40.
RM895	1361.36	Brass cap in concrete on top of McMicken Dam, stamped 05.
RM896	1361.27	Brass cap in concrete on top of McMicken Dam, stamped 90.
RM897	1361.98	Brass cap in concrete on top of McMicken Dam, stamped 115.
RM898	1361.34	Brass cap in concrete on top of McMicken Dam, stamped 140.
RM899	1361.27	Brass cap in concrete on top of McMicken Dam, stamped 165.
RM900	1360.98	Brass cap in concrete on top of McMicken Dam, stamped 190.
RM901	1361.05	Brass cap in concrete on top of McMicken Dam, stamped 215.
RM2095	1299.40	1-inch pipe in handhole at centerline intersection of Jackrabbit Trail and Olive Avenue, northwest corner section 33, T3N, R2W.
RM2096	1280.02	Chiseled X on top concrete ditch southwest corner of intersection Perryville Road and Peoria Avenue, near southeast corner section 21, T3N, R2W.



MARICOPA COUNTY UNINCORPORATED AREAS 040037

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 3 NORTH, RANGE 2 WEST.

WHITE TANK MOUNTAIN REGIONAL PARK

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFE) and/or floodway limits have been determined, users are encouraged to consult the Flood Profiles and Floodway Data Tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFEs shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

ERM elevations listed on this map were obtained and/or developed to establish vertical control for determination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these ERM elevations may have changed since the publication of this map. To obtain up-to-date elevation information on National Geospatial Survey (NGS) ERMs shown on this map, please contact the Information Services Branch of the NGS at (202) 755-9242 or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS ERM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFEs shown on this map may apply only landward of 0.0' NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATE BY 100-YEAR FLOOD

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

UNDEVELOPED COASTAL BARRIERS

- Identified 1993
- Identified 1990
- Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

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

Base Flood Elevation Line: Elevation in Feet. See Map Index for Elevation Datum.

Cross Section Line

Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum, Elevation Reference Mark.

513

(EL 987)

RM7 X

1/2

River Mile

Horizontal Coordinates Based on North American Datum of 1983 (NAD 83) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify areas subject to flooding, particularly from local drainage sources of small size or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFEs, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard 100-year flood include Zones A, AE, AH, AO, APF, V, VE and X. Areas of Special Flood Hazard 500-year flood include Zones X and D.

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

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 1/2 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and/or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (P.L. 101-561).

For community map revision history prior to countywide mapping, see Section 8.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY

Refer to Repository Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP:

APRIL 15, 1998

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:

SEPTEMBER 4, 1991; SEPTEMBER 30, 1995

Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6822.

APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1580 OF 4350

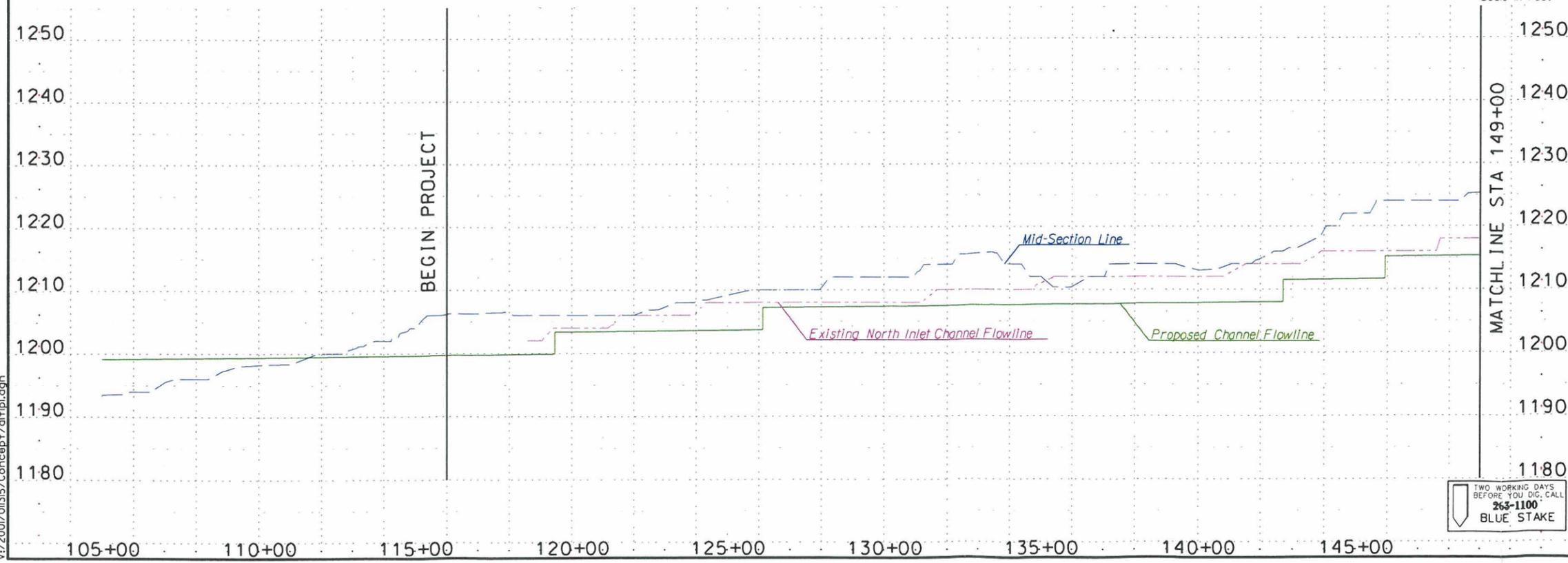
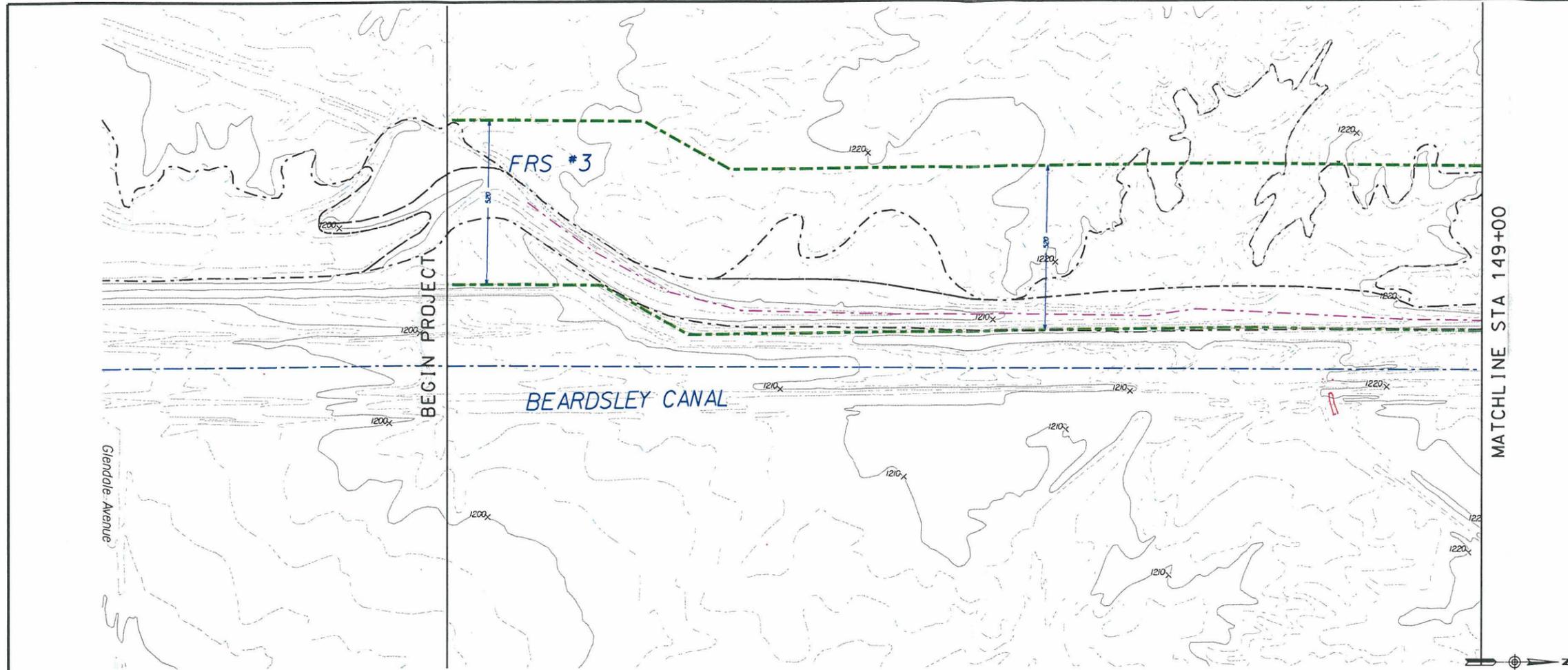
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS COMMUNITY	NUMBER	PANEL	SUFFIX
GLENDALE, CITY OF	040045	1580	G
MARICOPA COUNTY UNINCORPORATED AREAS	040037	1580	G
SURPRISE, CITY OF	040053	1580	G

MAP NUMBER 0401361580 G

MAP REVISED: JULY 19, 2001

Federal Emergency Management Agency



LEGEND

- Floodplain Delineation
- Mid-Section Line
- Existing Wash Flowline
- Proposed Channel Profile
- Area Required For Channel Construction

**ALTERNATIVE 1
NORTH INLET CHANNEL**

NO.	REVISION	BY	DATE
3			
2			
1			

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

**WHITETANKS FRS #3
NORTH INLET CHANNEL
PRE-DESIGN STUDY**

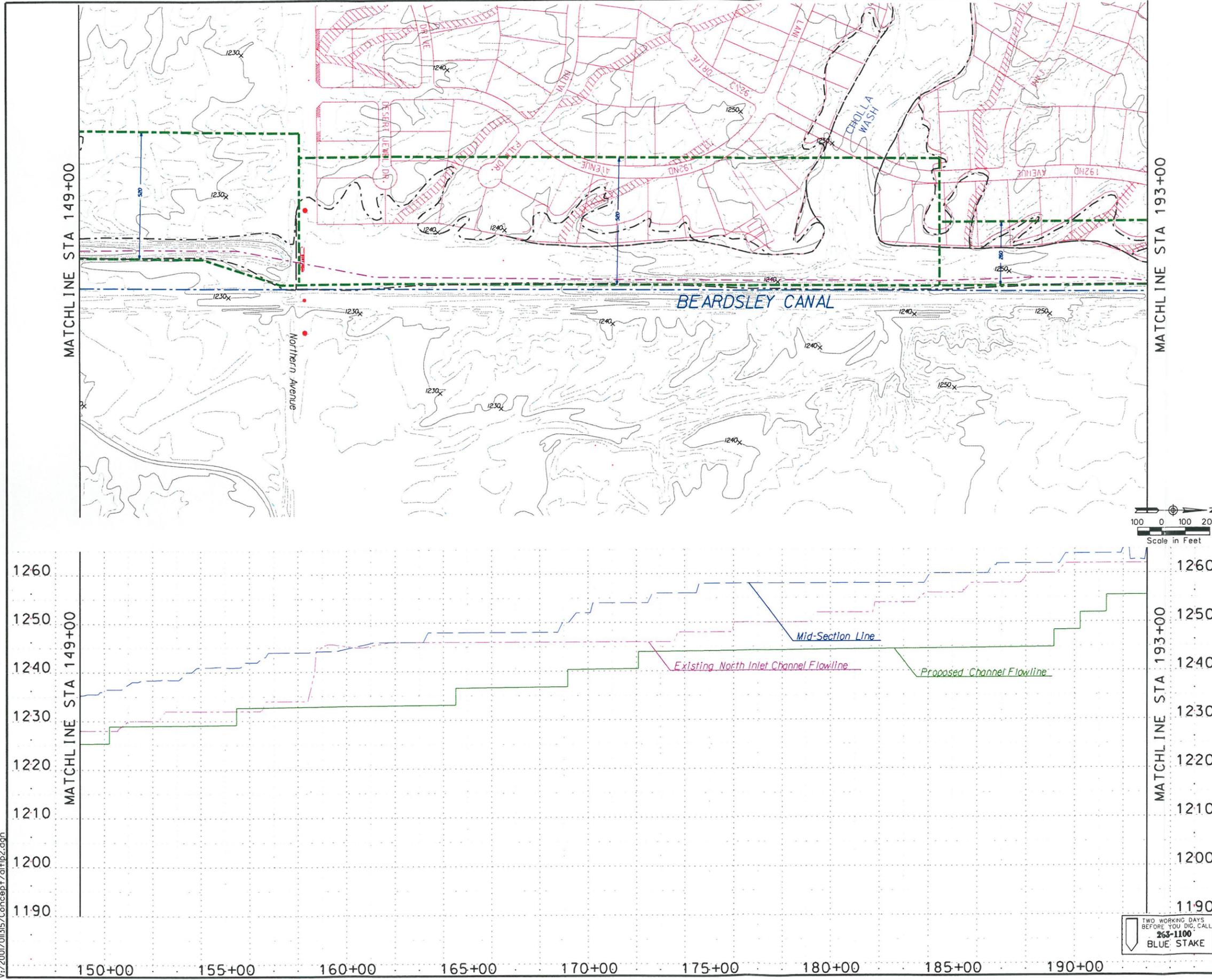
	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. McKASKLE	03/02
CHECKED	A. PATEL	03/02

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

DRAWING NO. WP# 011315.03 CONTRACT FCD 2000 C 036 SHEET OF 1 3

V:\2001\011315\Concept\at1pl.dgn

PLATE 3-1



LEGEND

- Floodplain Delineation
- Mid-Section Line
- 60' ROW Line
- Existing Wash Flowline
- Proposed Channel Profile
- Property Lines
- Area Required For Channel Construction

**ALTERNATIVE 1
NORTH INLET CHANNEL**

3			
2			
1			
NO.	REVISION	BY	DATE

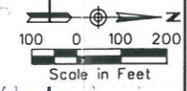
**FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION**

**WHITETANKS FRS #3
NORTH INLET CHANNEL
PRE-DESIGN STUDY**

	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. MCKASKLE	03/02
CHECKED	A. PATEL	03/02

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

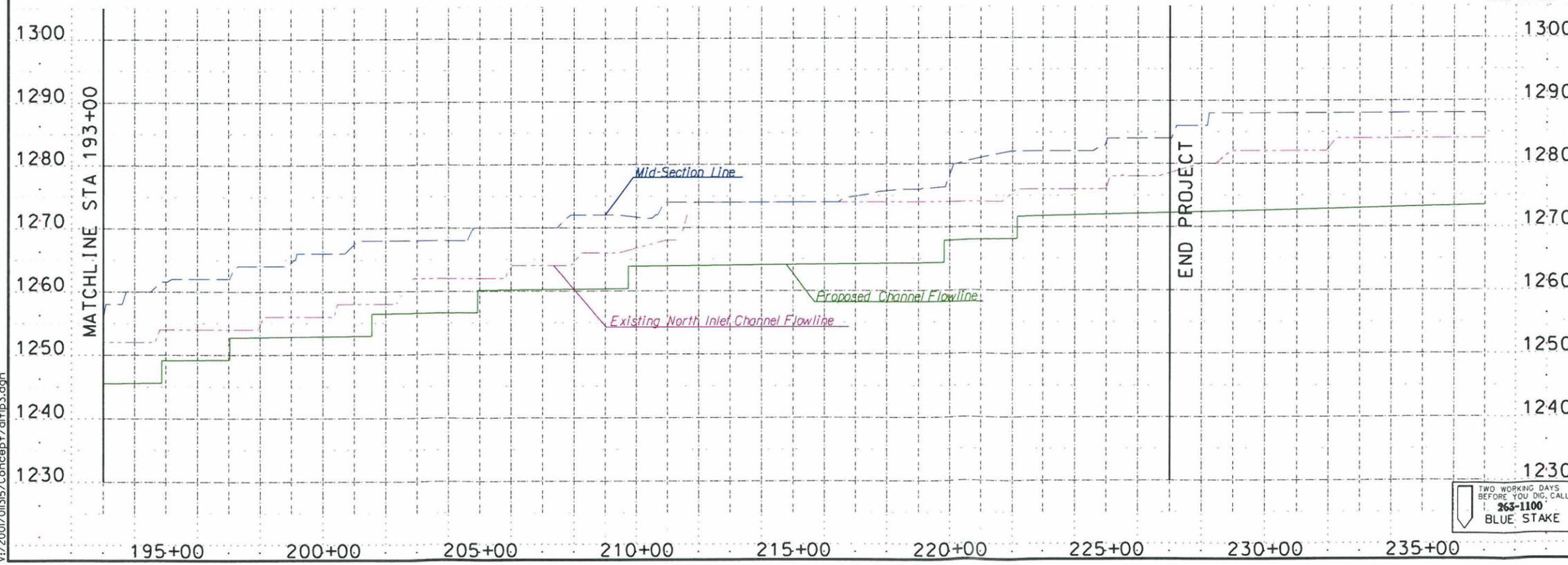
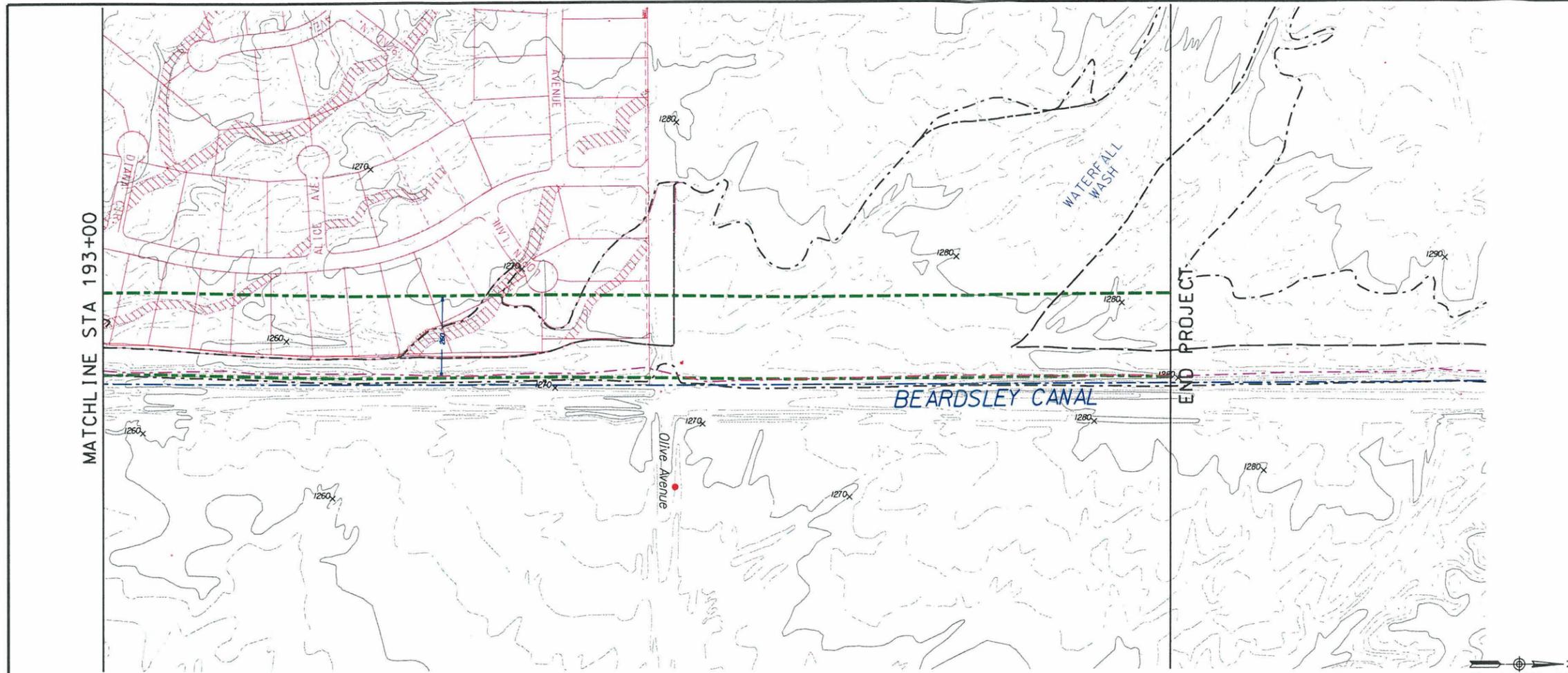
DRAWING NO.	WP 011315.03 CONTRACT FCD 2000 C 036	SHEET OF 2 3
-------------	---	-----------------



TWO WORKING DAYS
BEFORE YOU DIG, CALL
265-1100
BLUE STAKE

v:\2001\011315\Concept\atlip2.dgn

PLATE 3-1



LEGEND

- Floodplain Delineation
- Mid-Section Line
- 60' ROW Line
- Existing Wash Flowline
- Proposed Channel Profile
- Property Line
- Area Required For Channel Construction

ALTERNATIVE 1 NORTH INLET CHANNEL

NO.	REVISION	BY	DATE
3			
2			
1			

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

**WHITETANKS FRS #3
NORTH INLET CHANNEL
PRE-DESIGN STUDY**

	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. MCKASKLE	03/02
CHECKED	A. PATEL	03/02

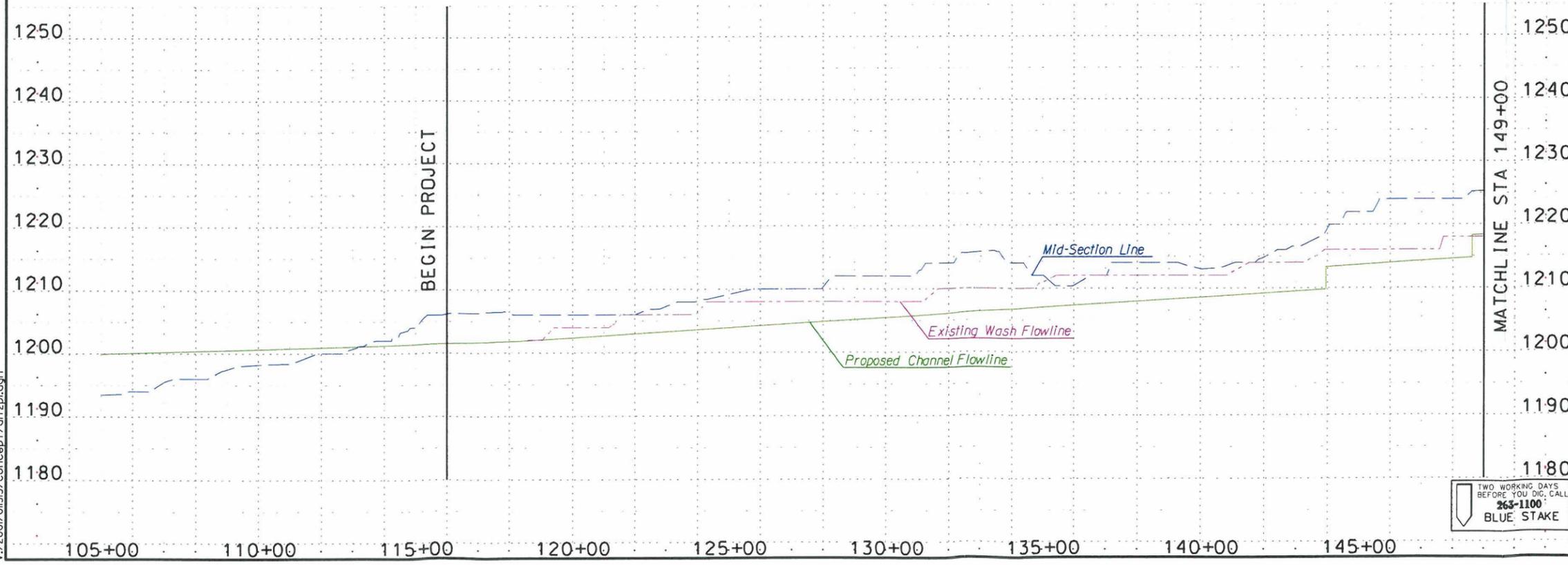
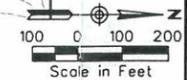
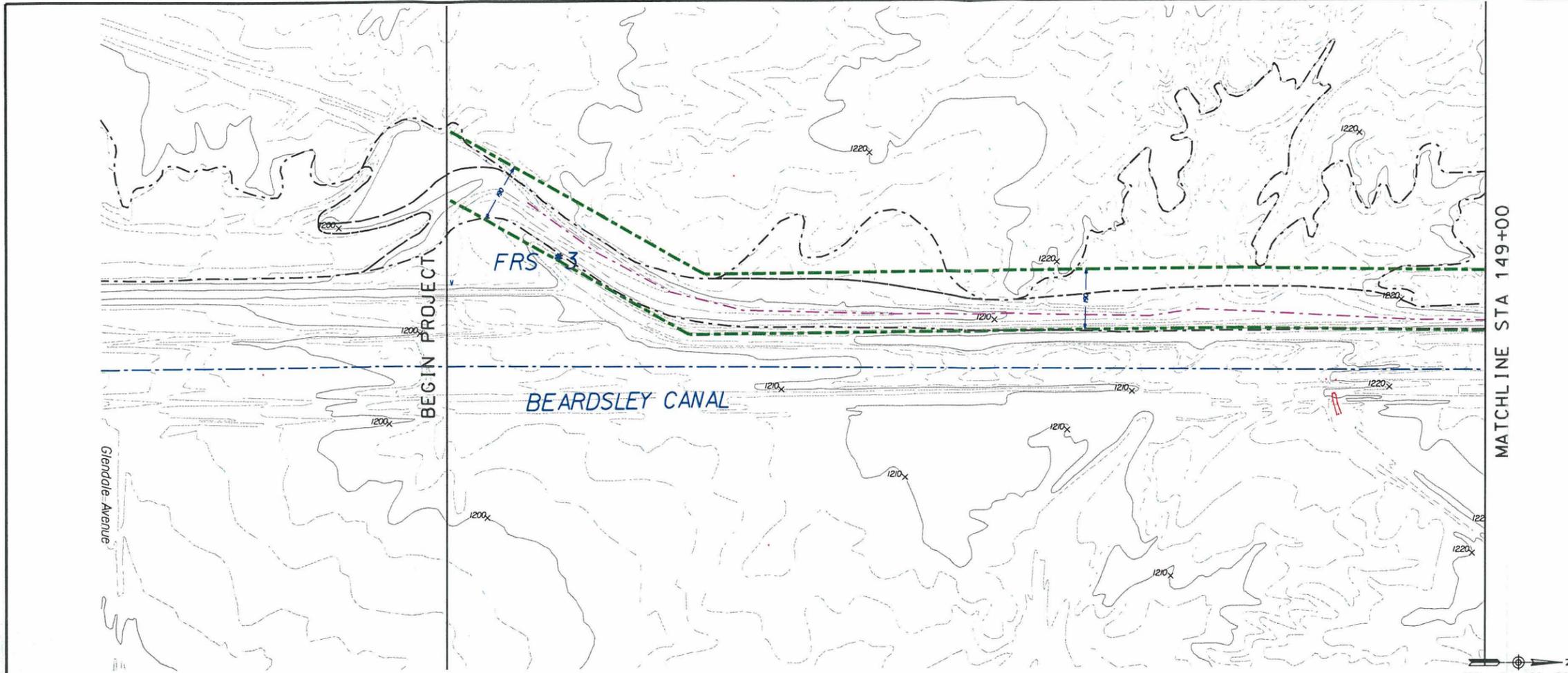


WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

DRAWING NO.	WP* 011315.03 CONTRACT FCD 2000 C 036	SHEET OF 3 3
-------------	--	-----------------

TWO WORKING DAYS
BEFORE YOU DIG, CALL
263-1100
BLUE STAKE

v:\2001\011315\Concept\alt1p3.dgn



LEGEND

- Floodplain Delineation
- Mid-Section Line
- Existing North Inlet Channel Flowline
- Proposed Channel Profile
- Area Required For Channel Construction

**ALTERNATIVE 2
NORTH INLET CHANNEL**

3			
2			
1			
NO.	REVISION	BY	DATE

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

**WHITETANKS FRS #3
NORTH INLET CHANNEL
PRE-DESIGN STUDY**

	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. McKASKLE	03/02
CHECKED	A. PATEL	03/02

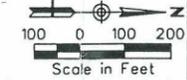
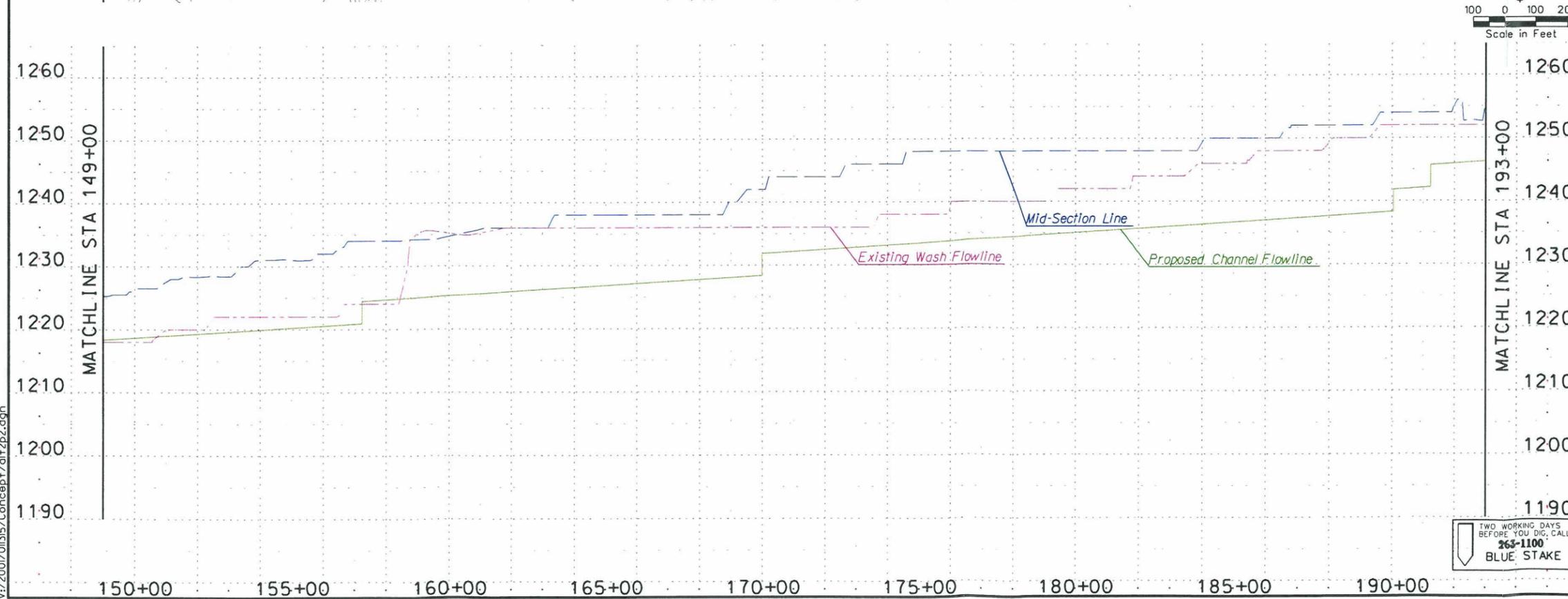
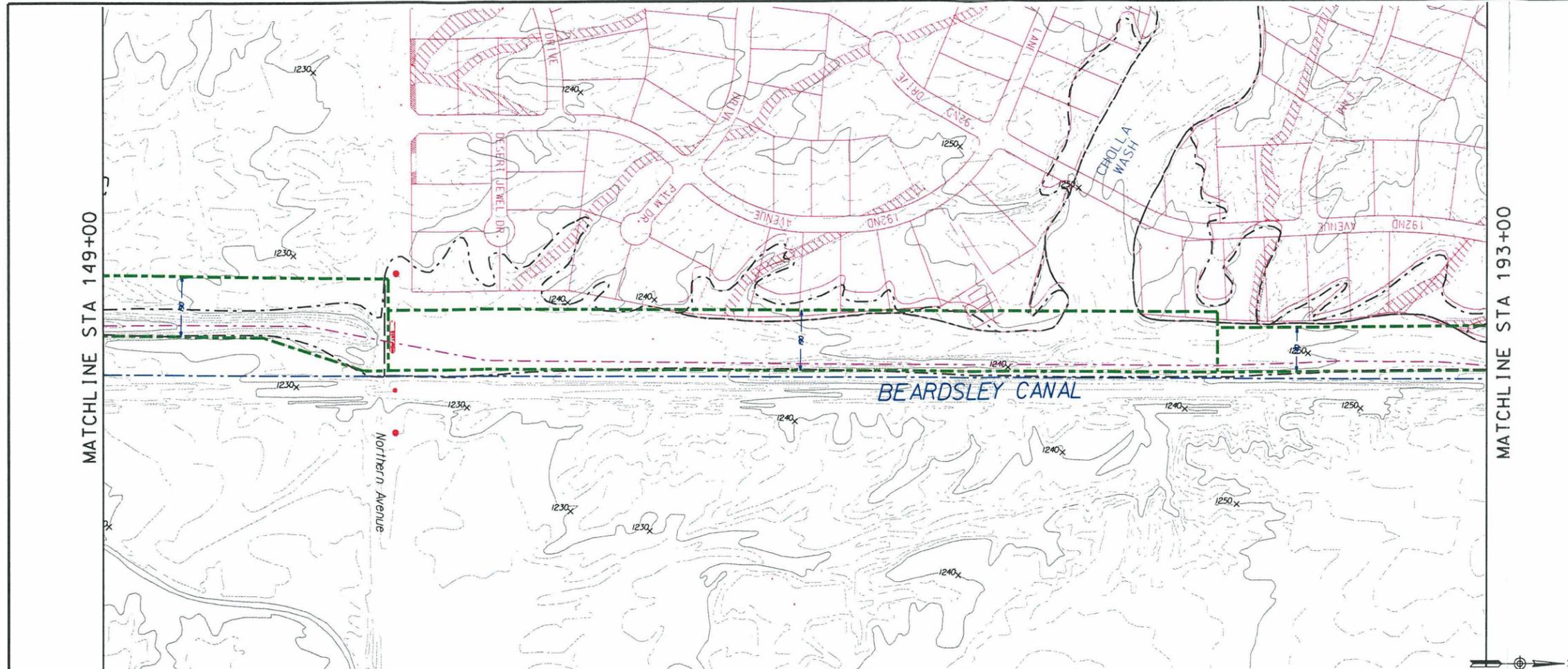
WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

DRAWING NO.	WP* 011315.03 CONTRACT FCD 2000 C 036	SHEET OF 1 3
-------------	--	-----------------



TWO WORKING DAYS
BEFORE YOU DIG, CALL
365-1100
BLUE STAKE

V:\2001\011315\Concept\alt2p1.dgn



LEGEND	
--- --	Floodplain Delineation
--- --	Mid-Section Line
--- --	60' ROW Line
--- --	Existing Wash Flowline
--- --	Proposed Channel Profile
--- --	Property Lines
--- --	Area Required For Channel Construction

**ALTERNATIVE 2
NORTH INLET CHANNEL**

NO.	REVISION	BY	DATE
3			
2			
1			

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

**WHITETANKS FRS #3
NORTH INLET CHANNEL
PRE-DESIGN STUDY**

	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. McKASKLE	03/02
CHECKED	A. PATEL	03/02

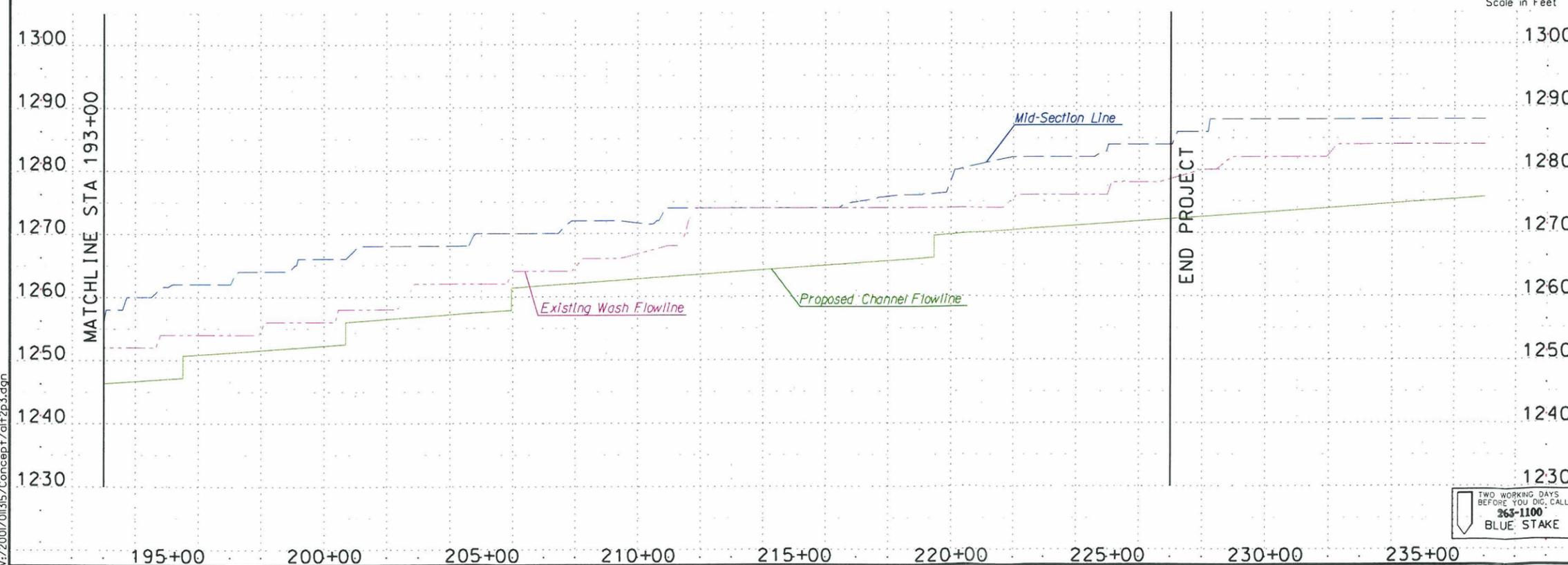
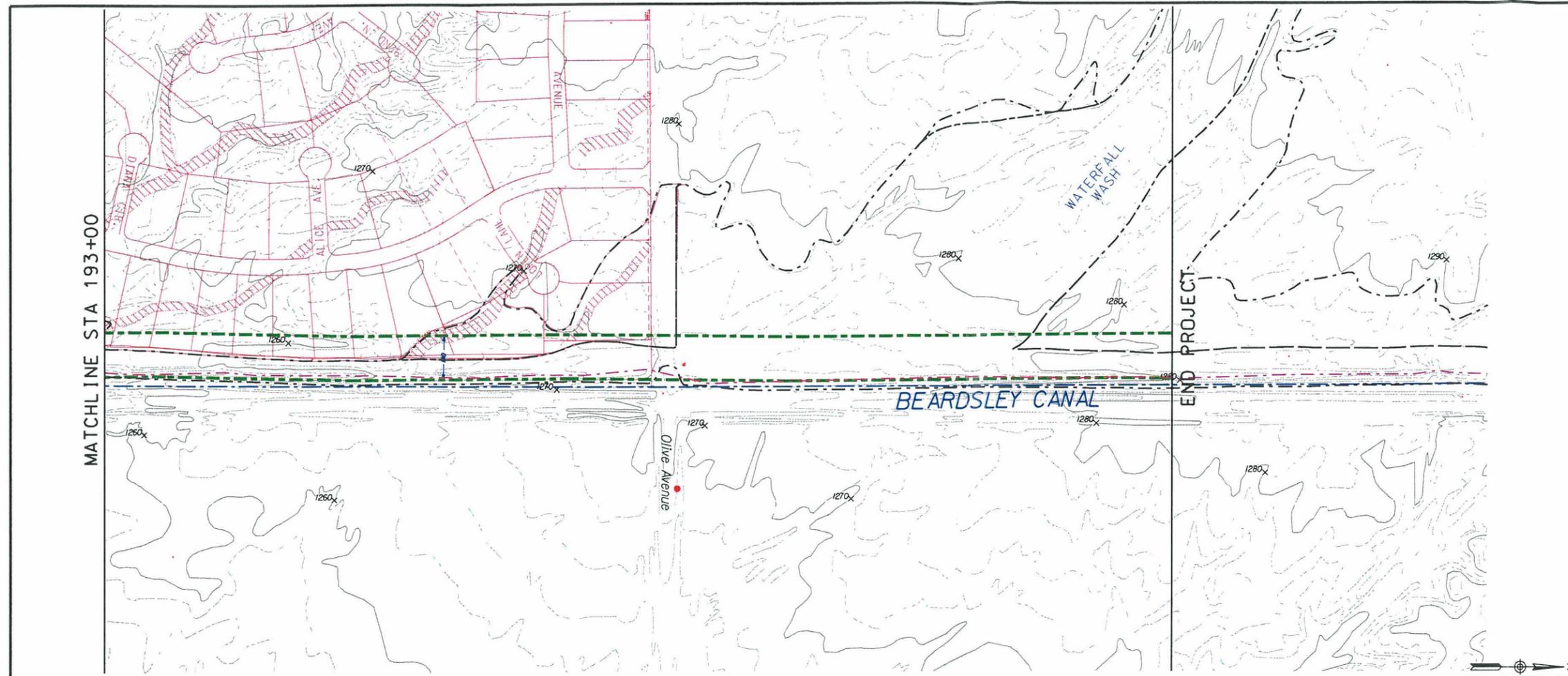
WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

DRAWING NO.	WP* 011315.03	SHEET OF
	CONTRACT FCD 2000 C 036	2 3



TWO WORKING DAYS
BEFORE YOU DIG, CALL
863-1100
BLUE STAKE

V:\2001\011315\Concept\alt2p2.dgn



LEGEND

- Floodplain Delineation
- Mid-Section Line
- 60' ROW Line
- Existing Wash Flowline
- Proposed Channel Profile
- Property Lines
- Area Required For Channel Construction

**ALTERNATIVE 2
NORTH INLET CHANNEL**

3			
2			
1			
NO.	REVISION	BY	DATE

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

**WHITETANKS FRS #3
NORTH INLET CHANNEL
PRE-DESIGN STUDY**

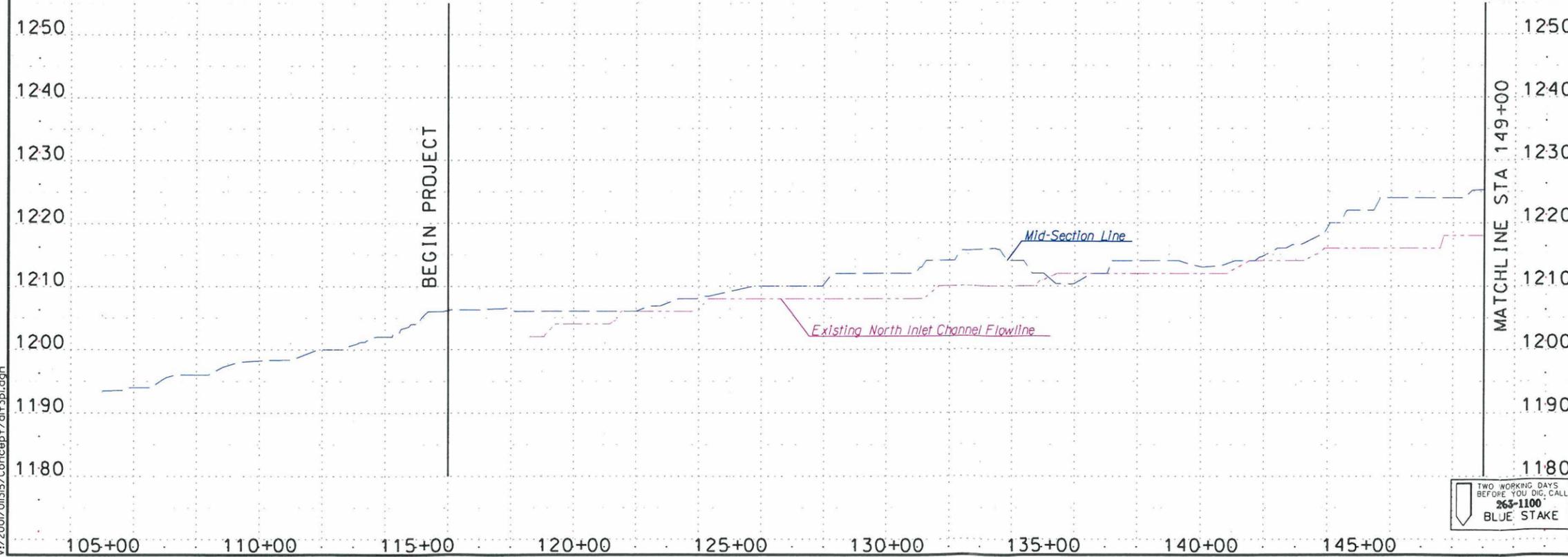
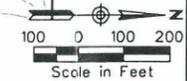
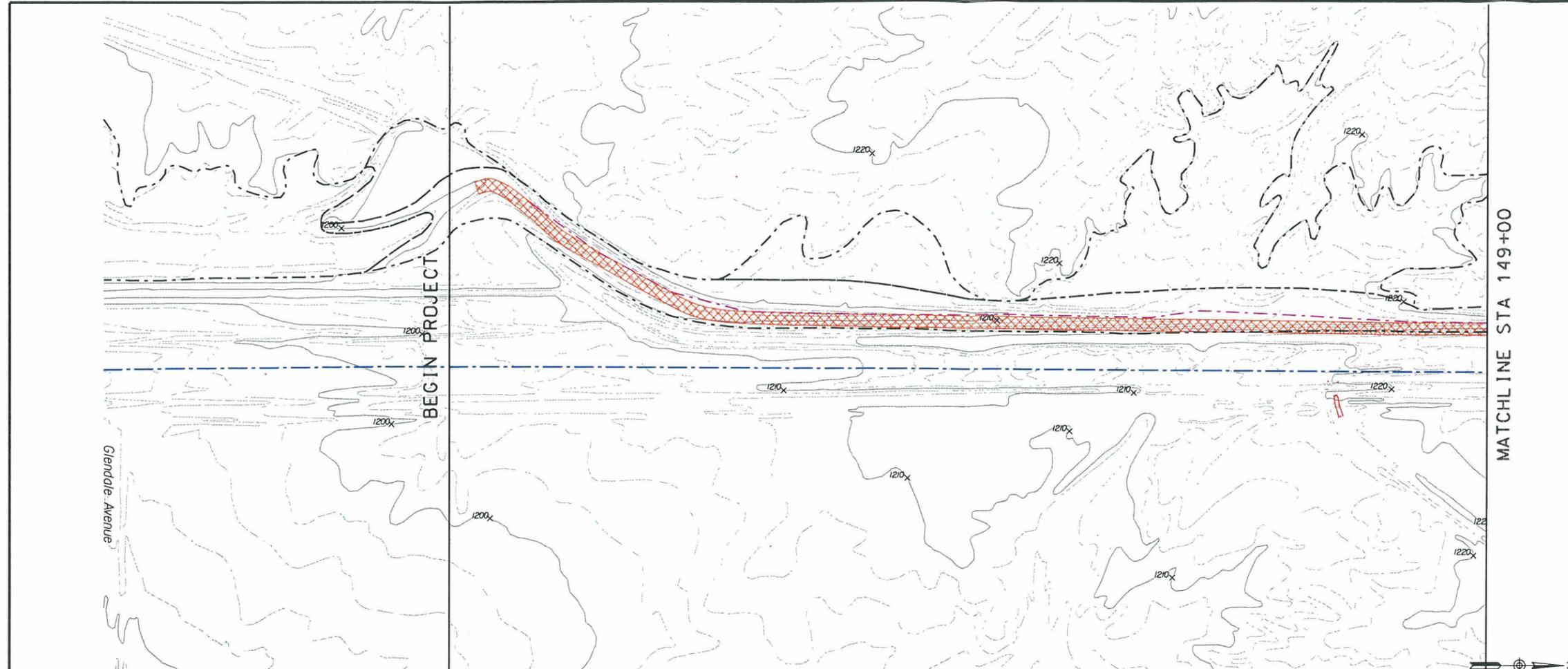
	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. McKASKLE	03/02
CHECKED	A. PATEL	03/02

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

DRAWING NO.	WP* 011315.03	SHEET OF
	CONTRACT FCD 2000 C 036	3 3

v:\2001\011315\Concept\alt2p3.dgn

PLATE 3-3



LEGEND

- Floodplain Delineation
- Mid-Section Line
- Existing Wash Flowline
- Slope Protection and Hydroseeding

**ALTERNATIVE 3
NORTH INLET CHANNEL**

NO.	REVISION	BY	DATE
3			
2			
1			

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

**WHITETANKS FRS #3
NORTH INLET CHANNEL
PRE-DESIGN STUDY**

	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. MCKASKLE	03/02
CHECKED	A. PATEL	03/02

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

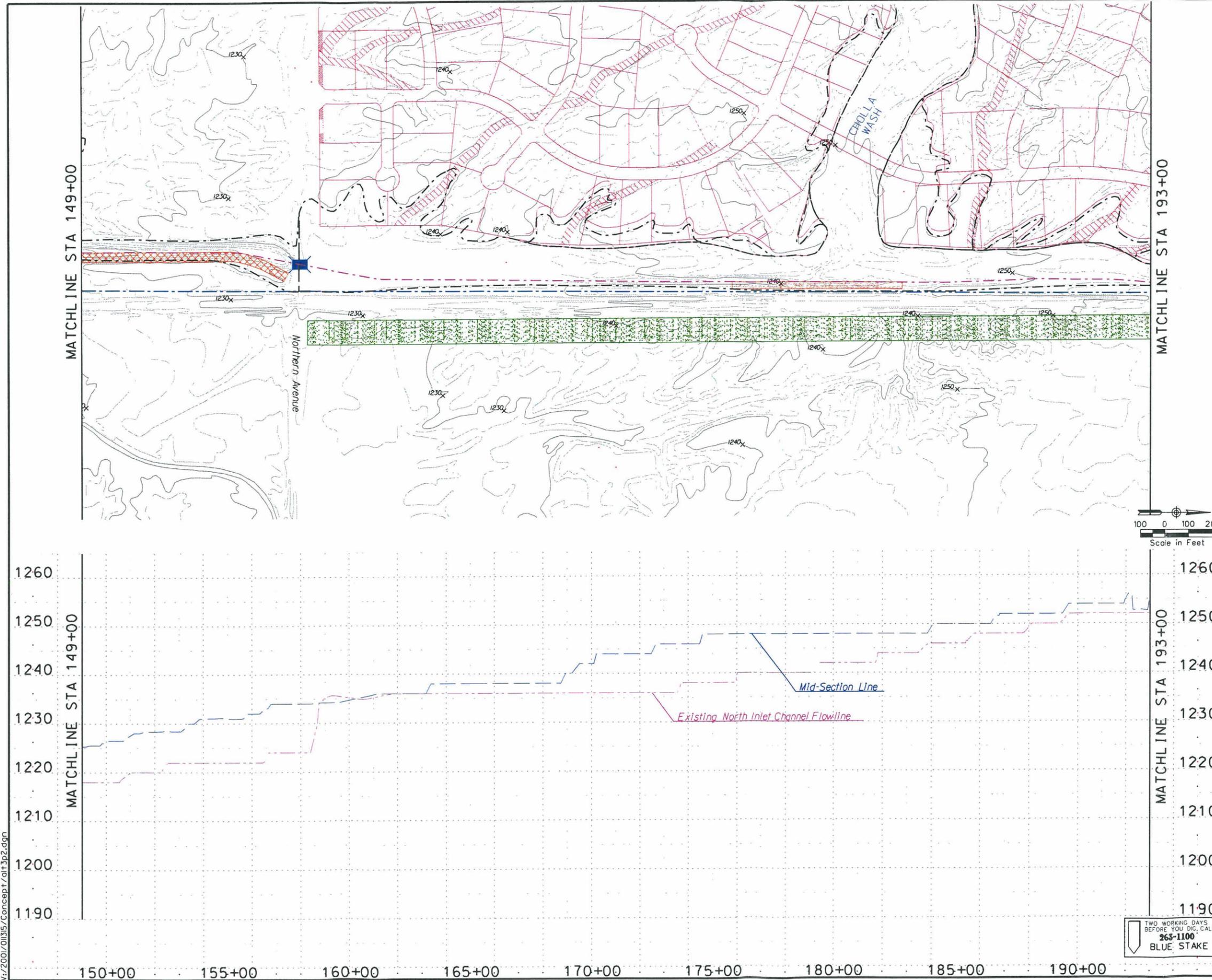
DRAWING NO.	WP 011315.03 CONTRACT FCD 2000 C 036	SHEET OF 1 3
-------------	---	-----------------



TWO WORKING DAYS
BEFORE YOU DIG, CALL
363-1100
BLUE STAKE

v:\2001\011315\Concept\alt3p1.dgn

PLATE 3-3



LEGEND

- Floodplain Delineation
- Mid-Section Line
- 60' ROW Line
- Existing Wash Flowline
- Property Lines
- Slope Protection and Hydroseeding
- Landscaping and Trails
- Medium Slope Protection (6" thick with 6' toe down)
- Heavy Slope Protection (8" thick with 8' toe down)
- Culvert

**ALTERNATIVE 3
NORTH INLET CHANNEL**

3			
2			
1			
NO.	REVISION	BY	DATE

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

**WHITETANKS FRS #3
NORTH INLET CHANNEL
PRE-DESIGN STUDY**

	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. MCKASKLE	03/02
CHECKED	A. PATEL	03/02

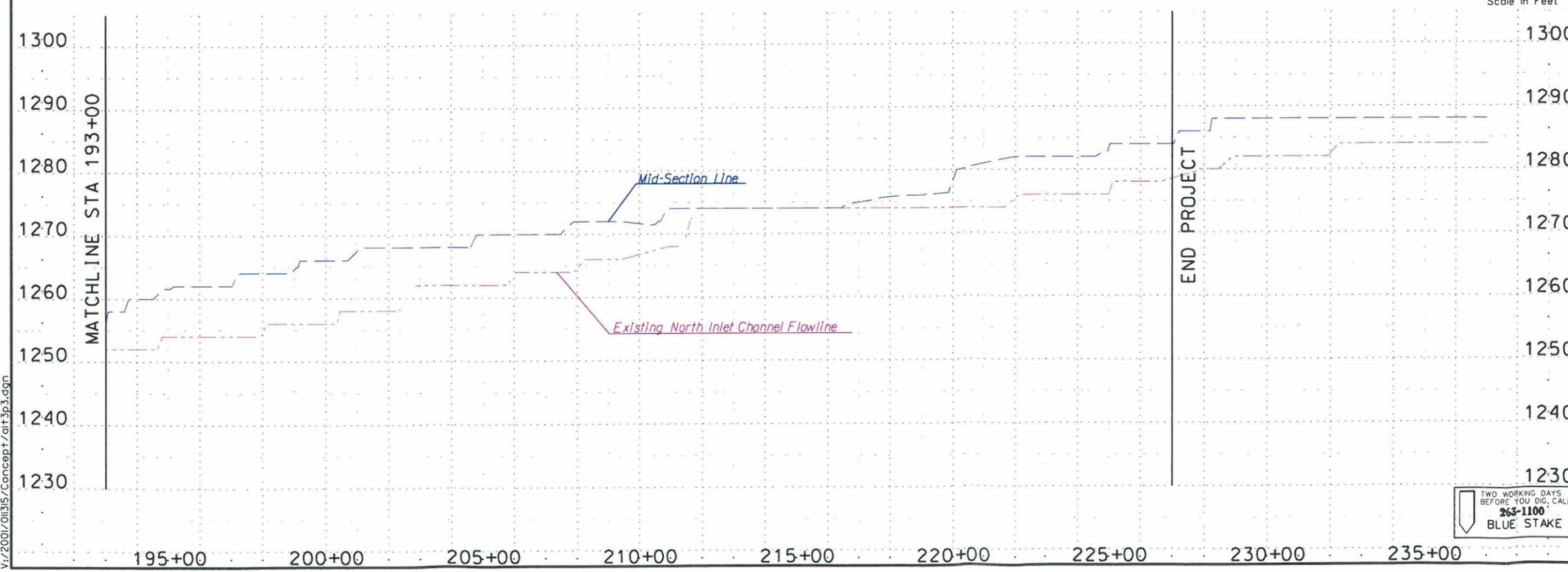
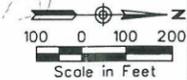
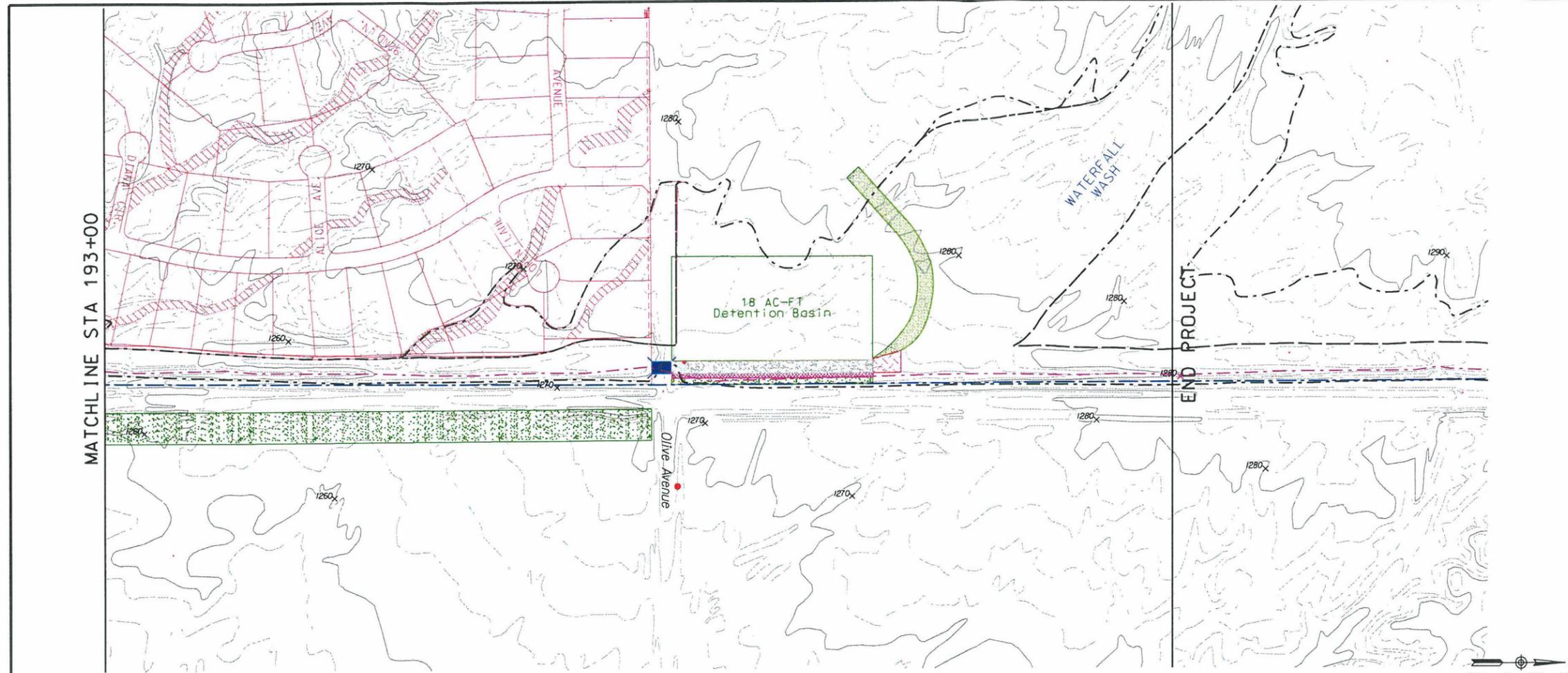
WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

DRAWING NO.	WP- 011315.03 CONTRACT FCD 2000 C 036	SHEET OF 2 3
-------------	--	-----------------

TWO WORKING DAYS
BEFORE YOU DIG, CALL
363-1100
BLUE STAKE

V:\2001\011315\Concept\alt3p2.dgn

PLATE 3-3



LEGEND

- Floodplain Delineation
- Mid-Section Line
- 60' ROW Line
- Existing Wash Flowline
- Property Lines
- [Hatched Box] Maintenance Path
- [Green Box] Landscaping and Trails
- [Green Box] Diversion Berm
- [Hatched Box] Drop Structure
- [Stippled Box] Concrete Lined Channel
- [Blue Box] Culvert

**ALTERNATIVE 3
NORTH INLET CHANNEL**

3			
2			
1			
NO.	REVISION	BY	DATE

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

**WHITETANKS FR3 #3
NORTH INLET CHANNEL
PRE-DESIGN STUDY**

	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. MCKASKLE	03/02
CHECKED	A. PATEL	03/02

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

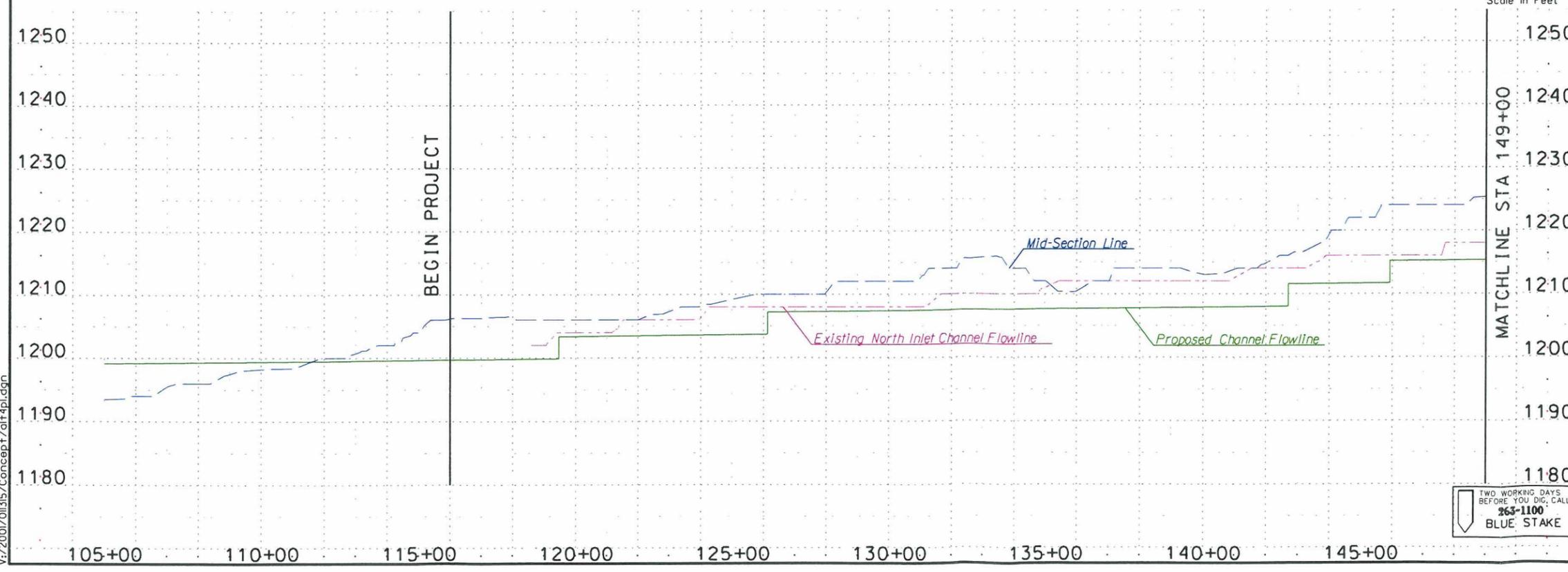
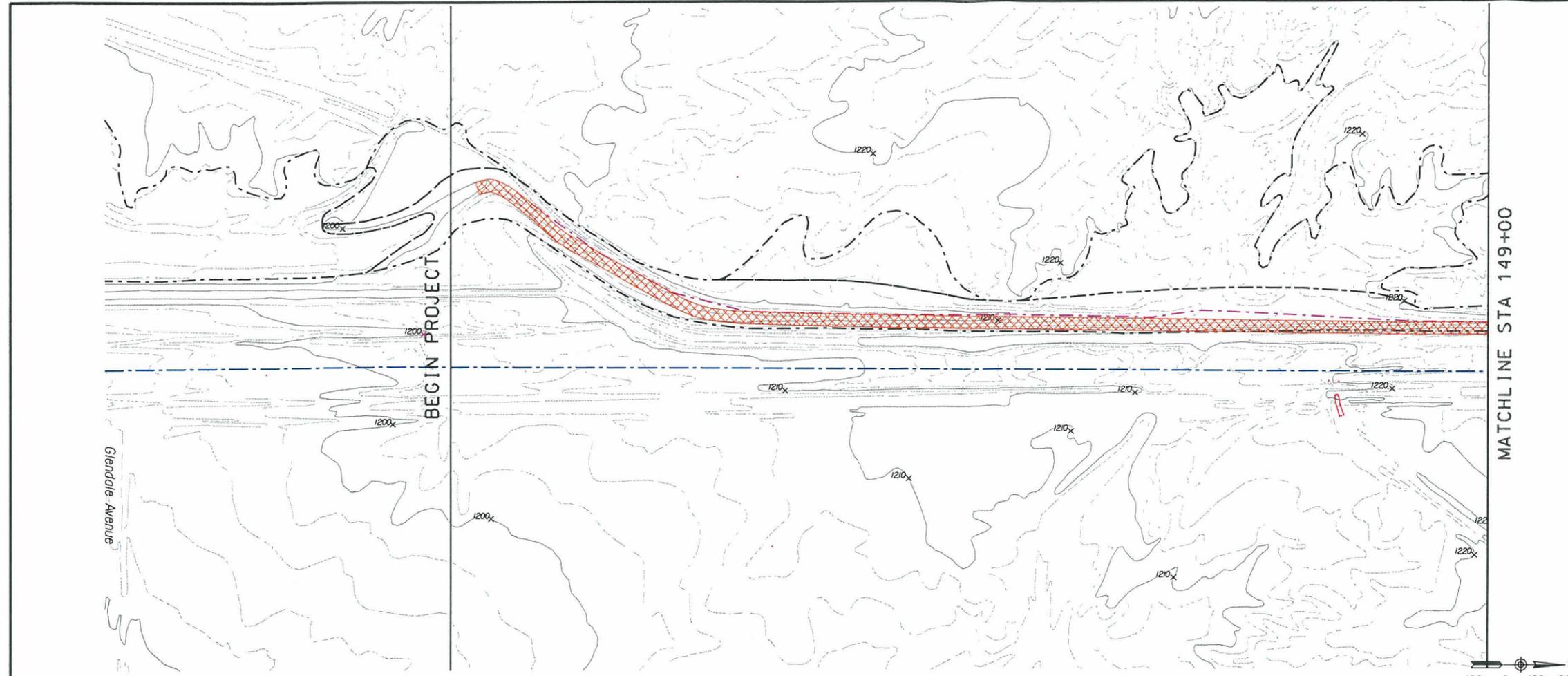
DRAWING NO.	WP* 011315.03	SHEET OF
	CONTRACT FCD 2000 C 036	3 3

TWO WORKING DAYS
BEFORE YOU DIG, CALL
263-1100
BLUE STAKE



V:\2001\011315\Concept\alt3p3.dgn

PLATE 3-4



LEGEND

- Floodplain Delineation
- - - Mid-Section Line
- - - Existing Wash Flowline
- ▨ Slope Protection and Hydroseeding

**ALTERNATIVE 4
NORTH INLET CHANNEL**

3			
2			
1			
NO.	REVISION	BY	DATE

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

**WHITETANKS FRS #3
NORTH INLET CHANNEL
PRE-DESIGN STUDY**

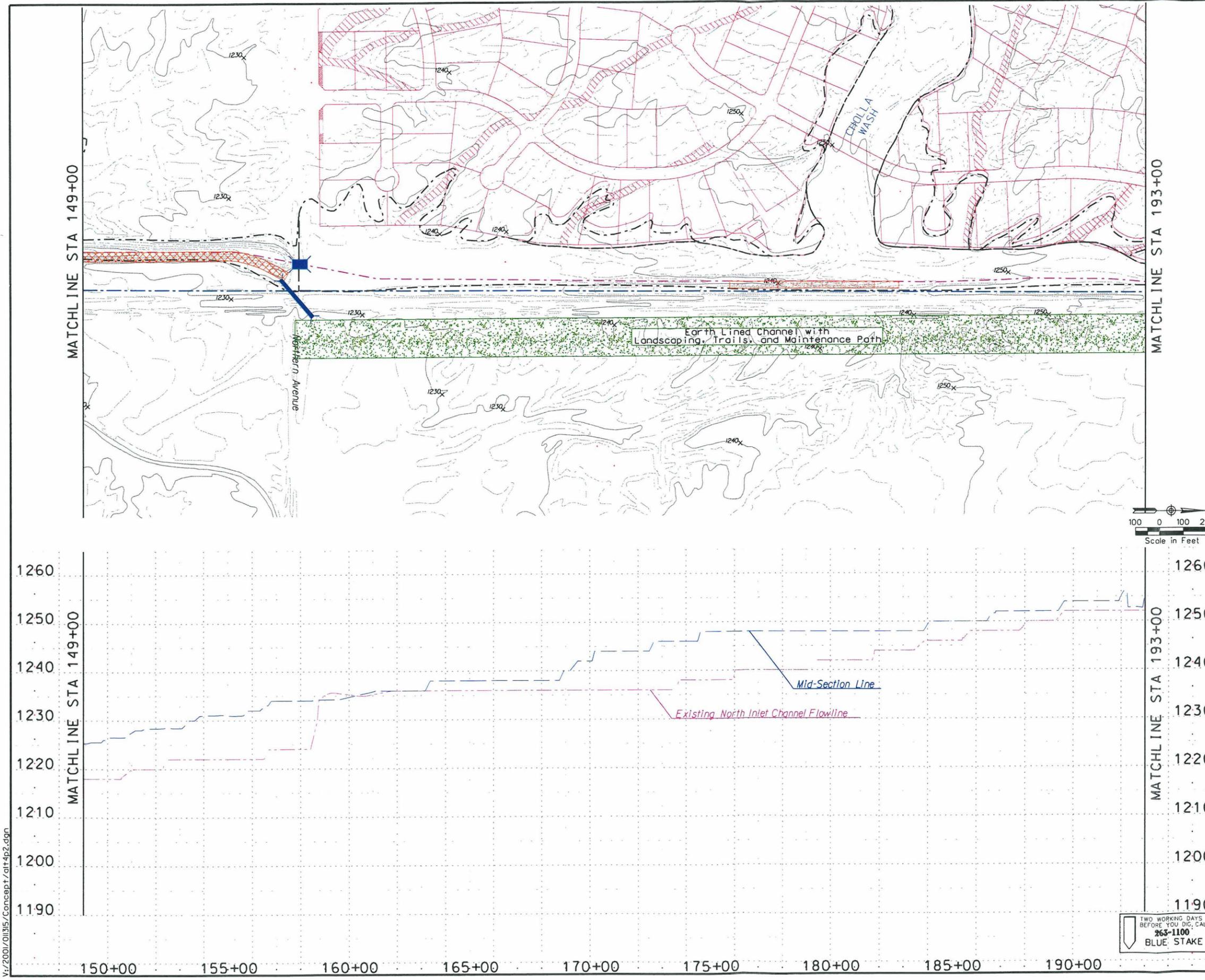
	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. MCKASKLE	03/02
CHECKED	A. PATEL	03/02

WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

DRAWING NO. WP* 011315.03 SHEET OF 1 3
CONTRACT FCD 2000 C 036

V:\2001\011315\Concept\alt4p1.dgn

PLATE 3-4



LEGEND

- Floodplain Delineation
- Mid-Section Line
- 60' ROW Line
- Existing Wash Flowline
- Property Lines
- Slope Protection and Hydroseeding
- Landscaping and Trails
- Buried Medium Slope Protection (6" thick with 6" toe down)
- Buried Heavy Slope Protection (8" thick with 8" toe down)
- Culvert

ALTERNATIVE 4 NORTH INLET CHANNEL

NO.	REVISION	BY	DATE
3			
2			
1			

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

**WHITETANKS FRS #3
NORTH INLET CHANNEL
PRE-DESIGN STUDY**

	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. McKASKLE	03/02
CHECKED	A. PATEL	03/02

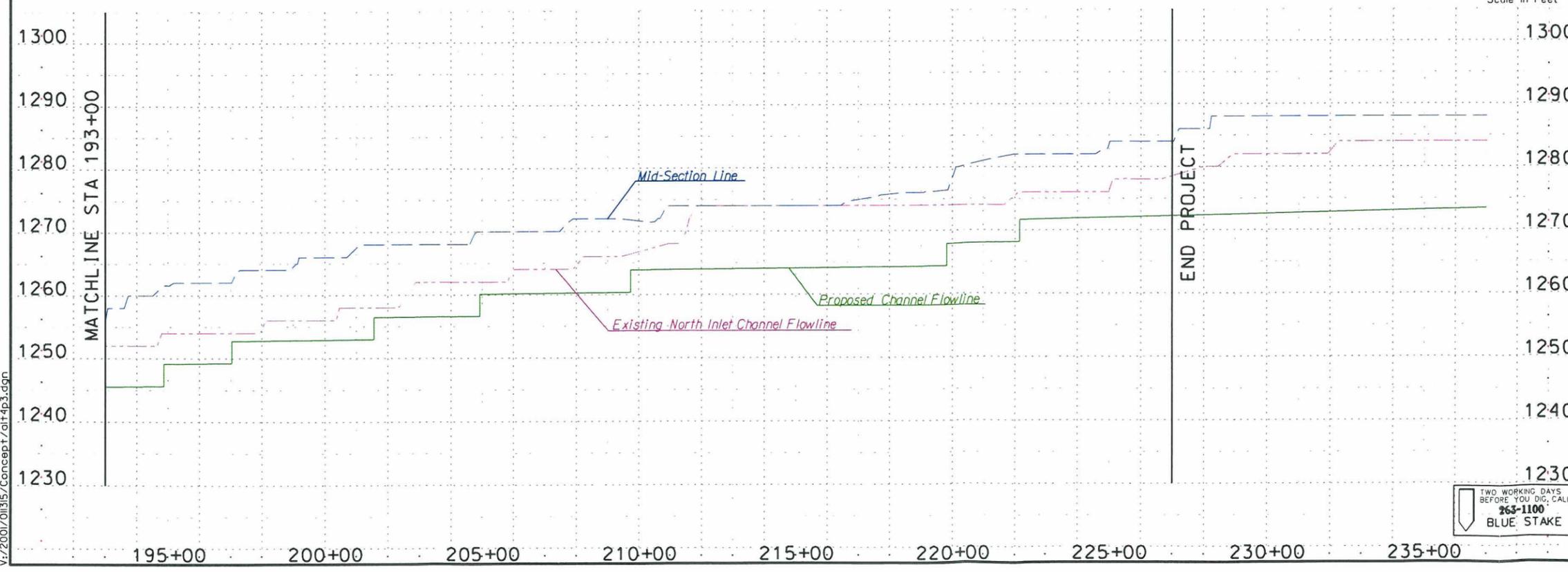
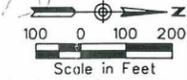
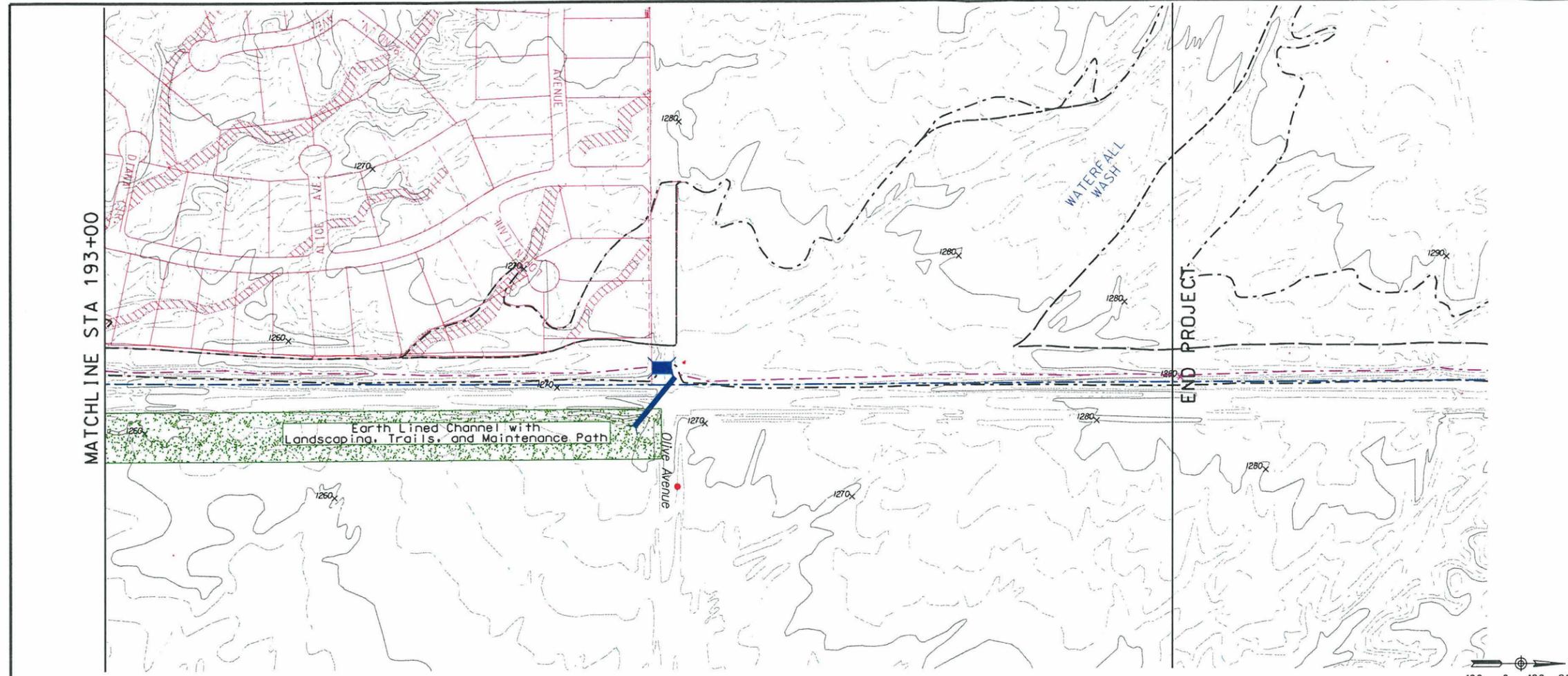


WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

DRAWING NO.	WP* 011315.03 CONTRACT FCD 2000 C 036	SHEET OF 2 3
-------------	--	-----------------

TWO WORKING DAYS
BEFORE YOU DIG, CALL
863-1100
BLUE STAKE

V:\2001\011315\Concept\alt4p2.dgn



LEGEND

- Floodplain Delineation
- Mid-Section Line
- 60' ROW Line
- Existing Wash Flowline
- Property Lines
- Landscaping and Trails
- Culvert

ALTERNATIVE 4 NORTH INLET CHANNEL

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

WHITETANKS FRS #3
NORTH INLET CHANNEL
PRE-DESIGN STUDY

	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. McKASKLE	03/02
CHECKED	A. PATEL	03/02

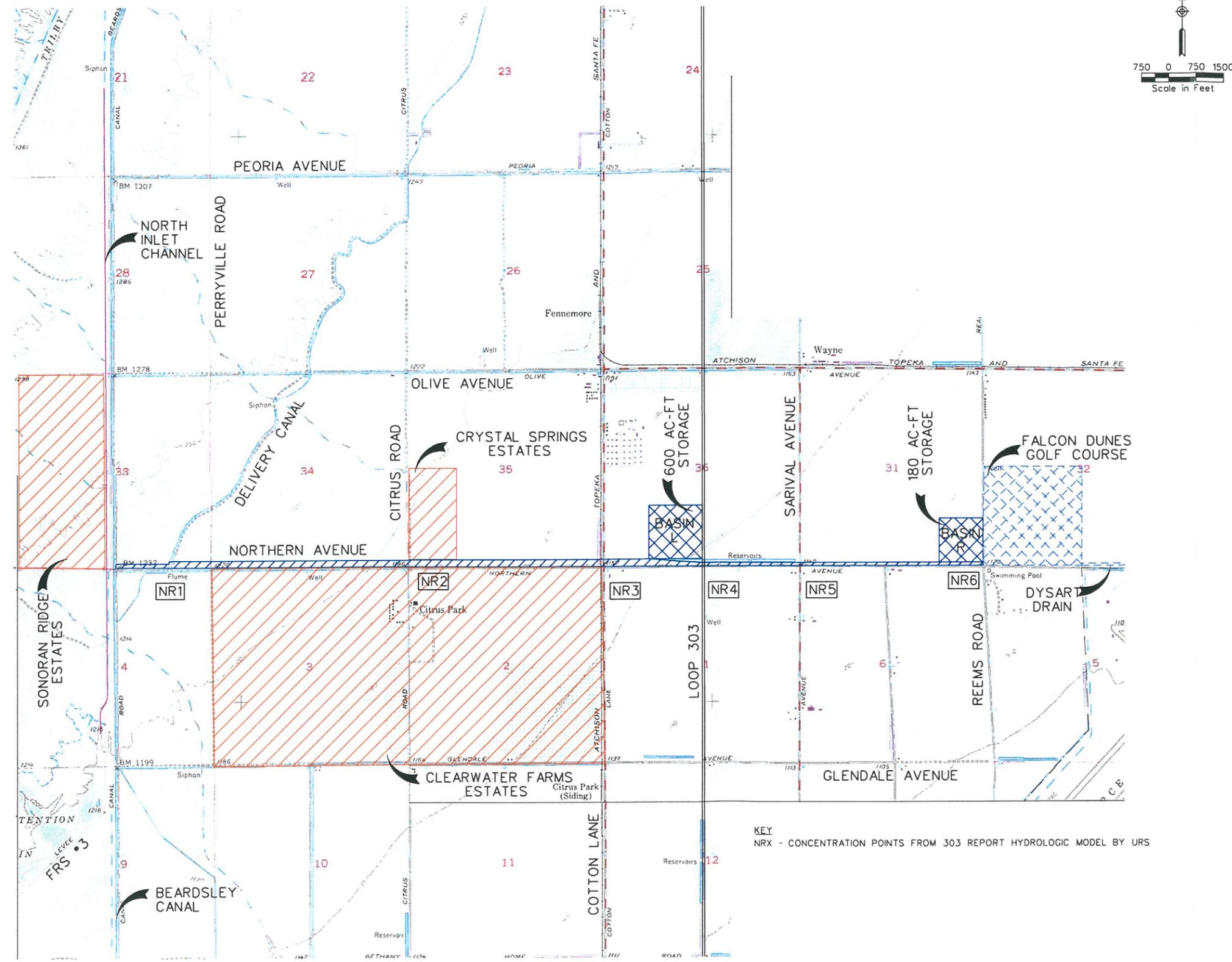
WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

DRAWING NO.	WP* 011315.03 CONTRACT FCD 2000 C 036	SHEET OF 3 3
-------------	--	-----------------

TWO WORKING DAYS
BEFORE YOU DIG, CALL
863-1100
BLUE STAKE



V:\2001\011315\Concept\alt4p3.dgn



TWO WORKING DAYS
BEFORE YOU DIG, CALL
263-1100
BLUE STAKE

LEGEND

-  Existing Subdivisions
-  Proposed Detention Basin
-  Existing Detention Facility
-  Proposed Channel

NORTHERN AVENUE DIVERSION ALTERNATIVE

3			
2			
1			
NO.	REVISION	BY	DATE

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
ENGINEERING DIVISION

WHITETANKS FRS #3
NORTH INLET CHANNEL
PRE-DESIGN STUDY

	BY	DATE
DESIGNED	J. SIMS	03/02
DRAWN	R. MCKASKLE	03/02
CHECKED	A. PATEL	03/02



WOOD, PATEL & ASSOCIATES, INC.
2051 WEST NORTHERN, SUITE 100
PHOENIX, ARIZONA (602) 335-8500

DRAWING NO.	WP 011315.03 CONTRACT FCD 2000 C 036	SHEET OF 1 1
-------------	---	-----------------