Appendix B1

Amended Tres Rios North Levee

Phase 1A & 1B Design Documentation Report (DDR)

US Army Corps of Engineers

Los Angeles District
Geotechnical Branch
Dam and Levee Safety Section

NATIONAL FLOOD INSURANCE PROGRAM, LEVEE SYSTEM EVALUATION REPORT (NLSER) FOR TRES RIOS NORTH LEVEE, MARICOPA COUNTY, ARIZONA

Center: Tres Rios North Levee looking downstream.
Lower Left: Downstream end of interior drainage outlet flap gates.
Upper Right: Near upstream end on levee crest looking upstream.

by
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Appendix B

Amended Tres Rios North Levee Phase 1A & 1B Design Documentation Report (DDR)

Appendix B

U.S. Army Corps
of Engineers
Los Angeles District

TRES RIOS ENVIRONMENTAL RESTORATION PROJECT

AMENDED
DESIGN DOCUMENTATION REPORT (DDR)
FOR
FLOOD CONTROL NORTH LEVEE
PHASE 1A & 1B

MARICOPA COUNTY, ARIZONA

FINAL SUBMITTAL

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July 2012

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SYLLABUS

This Design Documentation Report (DDR) is volume I of multiple volumes of the Tres Rios Environmental Restoration Project. It presents the basis of design for Phases 1A and 1B of the Flood Control North Levee. The Feasibility Report completed in April 2000 describes and outlines project alternatives that were considered for the Tres Rios Environmental Restoration Project. The project recommended plan included the North Levee (Phase I), Pump Station (Phase II), Regulating and Overbank Wetlands (Phase II), Riparian Corridors (Phase III), Under Ground Reclaimed Water Pipe (Phase IV) and Open Water Marsh (Phase V).

This report addresses the basis of design for the flood control North Levee including interior drainage features. It serves as a main DDR to cover phase 1A and Phase 1B of the North Levee. The recommendation was to construct the North Levee with height varying from less than 1 foot to about 9 feet above the current existing ground surface and numerous interior drainage features.

Based on the study and analysis of hydraulics and hydrology and input from the local sponsor; the City of Phoenix (COP), and the project stake holders; the Flood Control District of Maricopa County (FCDMC) and the Holly Acres Community's representative, a detailed study was conducted to determine types and numbers of features needed to support the levee system (Phases 1A and 1B). The study recommended the construction of several collector channels and detention basins to capture overland flows and excessive irrigation water and modifications to numerous existing concrete irrigation canals (CIC) to convey irrigation water. It also called for construction of nine (9) guide dikes along the entire levee to divert the flood flows from impinging on the levee. Multi-celled, concrete box culverts (RCB) conveying storm drain runoff and excessive irrigation waters from detention basins to the river were considered in the design.

A 40- hour Value Engineering Study/Workshop took place from August 14-18, 2000 to discuss the Design Refinement Plan (DRP). The Final Report, dated September 2000, contained a series of recommendations and suggestions for reducing costs and providing an improved design. In the Steering Committee Meeting held in February 2002, it was stated that the Value Engineering Final Report was reviewed thoroughly and recommendations were discussed and considered for implementation in design, such as: locate levee interior drains to support habitat development and locate all open water marshes in areas with high groundwater to avoid soil lining as much as possible. It was also noted that local sponsor, the FCDMC and the USACE had considered implementation of design suggestions F-36 through V-19 outlined in the Value Engineering Study Final Report dated September 2000, titled U.S. Army Corps of Engineers, Los Angeles District, "Tres Rios Value Engineering Study-Final Report", September 2000.

The North Levee (Phase I) presented in this report consists of an approximately 4.25-mile long levee, two collector channels totaling about 2.64 miles, two detention basins with storage of 23.5 acre-feet and several 3-foot by 5-foot (3X5) reinforced concrete box (RCB) culverts. In addition, nine (9) guide dikes, several access ramps and access roads located along the entire levee that make up the levee system.

Within the 4.25-mile long levee, there is a 1.23-mile section (Holly Acres Levee) that needs to be modified and improved to meet the USACE's 100-yr flood protection level. Detention basins control the 100-year flood with release rates that can be accommodated by collector and storm drain channels. The basins are excavated to a maximum of 3 feet deep and graded to drain toward the RCB culvert inlets. The RCB culverts in turn convey water into the Salt River. Each RCB outlet is equipped with a metal flap gate to keep water from entering back into the basins. Operation and Maintenance (O&M) access roads are provided for operation and maintenance of the levee, detention basins, collector and storm drain channels and RCB culverts. Access ramps on landside and riverside of the levee are furnished.

REPORTS PREVIOUSLY ISSUED

Reports previously issued by the U. S. Army Corps of Engineers and others are:

a. "Tres Rios Arizona Feasibility Study", Corps of Engineers, Los Angeles District, California, April 2000.

b. "Tres Rios Phoenix, Arizona, Value Engineering Study", Robinson, Stafford & Rude, Inc., Independence, Missouri, September 2000.

c. "Preconstruction Engineering and Design (PED) Hydraulic Design of Tres Rios North Levee-2D Model Analysis", WEST Consultants, Inc., Tempe, Arizona, September 2003.

REFERENCES

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2. Highway Research Board, "Design of Culverts, Energy Dissipator and Filter System", 8 Reports.
3. U.S. Army Corps of Engineers, Los Angeles District, "Engineering Design of Flood Control Channels", May 1998.
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17. American Concrete Institute, "Building Code Requirements for Reinforced Concrete, ACI 318-99 and Commentary, ACI 318-99.
18. American Institute of Steel Construction (AISC), "Manual of Steel Construction", ASD, Ninth Edition, 1989.
19. Waterways Experimental Station (WES), Corps of Engineers Computer Program, "Design or Investigation of Orthogonal Culverts (CORTCUL)", February 1995.
20. Waterways Experimental Station (WES), Corps of Engineers Computer Program, "Concrete Strength Investigation and Design (CASTR)", May 1987.
21. Waterways Experimental Station (WES), Corps of Engineers Computer Program, "Analysis of Retaining and Flood Walls (CTWALL)", 30 October 1993.

PERTINENT DATA

CONSTRUCTED FEATURES	FEATURE STATION (Ft)	RIVER STATION (Miles)	DESCRIPTION
Phase 1A North Levee (Improved Existing Holly Acres Levee and New Levee)	Begins 153+72.90 Ends 224+62.57	199.19 to 200.53	Height above existing ground: 0.10 ft to 9.30 ft. Top width: 14 ft to 18 ft. Side slopes: 3H:1V Riverside slope protection: 15-in riprap over bedding layer over geotextile fabric Landside slope protection: 3-in rock mulch Freeboard: 3ft.
Improved Exist. Holly Acres Levee	153+72.90 to 168+00	199.19 to 199.46	Levee enlargement. Toe of slope (riverside) revetment: 12-in x 18-ft gabion mattress
New Levee	New Levee 167+80 to 172+00 172+00 to 174+00 174+00 to 224+62.57	199.47 to 199.55 199.55 to 199.59 199.59 to 200.55	Toe of slope (riverside) revetment: 12-in x 24-ft gabion mattress over 15-in launch stone
Drainage Ditch /Detention Basin			
115th Avenue Drainage Ditch.	0+00.00 to 8+58.000	199.31	Earthen Trapezoidal Ditch Length: 858 ft. Side slope: 3H:1V Depth: 2.5 ft Bottom width: 10 ft
115th Avenue Detention Basin	0+00 to 12+00	199.28 to 199.55	Earthen Basin (See Flood Storage Basins Table - page 8)
RCB Culverts			
a. 115th Ave. RCB Culvert	0+00 to 1+08.79	199.25 to 199.31	5-celled 3-ft x 5-ft RCB With Flap Gate and Trash Rack
b. 113th Ave. RC Transition Box Culvert	0+35 to 0+80	199.46 to 199.47	1-celled 4-ft x 18-ft RCB Without Flap Gate and Trash Rack
Guide Dikes			
a. 95th Ave.	0+00 to 4+71.97	201.70 to 201.79	Compacted Earth-Fill Dike Height: 1 ft to 4 ft. Length: 471.91 ft. Top width: 10 ft. Side slope: 2H:1V Side slope protection: 33" riprap over bedding layer Toe protection: 1-ft x 30-ft gabion mattress.
b. East 113th Ave.	0+00 to 2+82.57	199.55 to 199.62	Compacted Earth-Fill Dike Height: 5 ft to 17 ft.

			Length: 282.57 ft. Top width: 10 ft. Side slope: 2H:1V Side slope protection: 27" riprap over bedding layer Toe protection: 1-ft x 30-ft gabion mattress
c. West 113th Ave.	0+00 to 2+82.57	199.44 to 199.47	Compacted Earth-Fill Dike Height: 15 ft. Length: 282.57 ft. Top width: 10 ft. Side slope: 2H:1V Side slope protection: 27" riprap over bedding layer Toe protection: 1-ft x 30-ft gabion mattress
d. East 115th Ave.	0+04.62 to 2+82.57	199.62 to 199.69	Compacted Earth-Fill Dike Height: varies (12 ft to 14 ft) Length: 282.57 ft. Top width: 10 ft. Side slope: 2H:1V Side slope protection: 27" riprap Toe protection: 1-ft x 30-ft gabion mattress

FEATURES	FEATURE STATION	RIVER STATION	DESCRIPTION
Phase 1B North Levee (Improved Existing Holly Acres Levee and New Levee)	Begins 0+00.00 Ends 153+72.90	198.35 to 199.18	Height above exist ground: 0.10 ft to 9.30 ft. Top width: 16 ft. Side slope: 3H:1V Riverside slope protection: 15-in riprap over bedding layer over geotextile fabric Landside slope protection: 3-in rock mulch Freeboard: 3 ft.
Improved Exist. Holly Acres Levee	111+17.72 to 153+72.90	198.33 TO 199.18	Levee enlargement. Toe of slope (riverside) revetment: 12-in x 18-ft gabion mattress
New Levee	0+00.00 to 9+58.32	198.35 to 198.33	Toe of slope (riverside) revetment: 12-in x 24-ft gabion mattress over 15-in launch stone
Channels/Detention Basin			
a. El Mirage Rd. Collector Channel	7+60.00 to 48+85.96	198.50 to 199.18	Reinforced Concrete Trapezoidal Channel Side Slope: 2H:1V, Bottom Width: 14 ft – 16 ft, Depth: 2 ft 3 ft.
b. El Mirage Rd. Diversion Channel	0+00.00 to 2+29.51	198.35 to 198.36	15-inch Grouted Stone Trapezoidal Channel Side Slope: 2H:1V, Bottom Width: 14 ft, Depth: 2 ft.
El Mirage Rd. Detention Basin	0+00.00 to 7+20.71	198.37 to 198.50	Earthen Basin (See Flood Storage basins Table-Page 8)
RCB Culverts			
a. 115th Ave. RCB Culvert	0+00 to 1+48.47	198.38 to 198.39	5-celled 3 ft x 5ft RCB With flap gate and trash rack
b. El Mirage Rd. RCP Cuvert	0+23.05 to 1+00.55	198.34 to 198.36	4 – 24-in diameter RCP's under El Mirage Road Without flap gate and trash Rack
Guide Dikes			
a. West 121st Ave.	0+00 to 2+82.57	198.52 to 198.53	Compacted Earth-Fill Dike Height: 13 ft to 15 ft. Length: 282.57 ft. Top width: 10 ft. Side slope: 2H:1V Side slope protection: 27-in riprap over bedding layer Toe protection: 1-ft x 30-ft gabion mattress

b. West 119th Ave.	0+04.94 to 2+82.57	198.65 to 198.66	Height: 12 ft. Length: 282.57 ft. Top width: 10 ft. Side slope: 2H:1V Side slope protection: 27-in riprap over bedding layer Toe protection: 1-ft x 30-ft gabion mattress
c. Improved Exist. East 119th Ave.	0+04.62 to 2+82.57	198.80	Height: varies Added 18-ft x 1-ft Gabion Mattress to exist. 12-ft x 9-in gabion mattress around guide dike. Dike Slope: 2H:1V, Crest Width = 10-ft.
d. Improved Exist. West 117th Ave.	0+04.62 to 2+82.57	199.06	Height: varies Added 18-ft x 1-ft Gabion Mattress to exist. 1-ft'x 9-in gabion mattress around guide dike. Dike Slope: 2H:1V, Crest Width = 10-ft.

FLOOD STORAGE BASINS

Basins.	Average Depth (feet)	100-Yr Capacity (acre-feet)	100-Yr Peak Discharge (cfs)	Outlet Size (ft)	Drainage Area (sq mi)
115th Ave.	3.00	15	380	5 – 3-ft x 5-ft RCB	0.549
El Mirage Ave.	3.00	8.5	363	5– 3-ft x 5-ft RCB	0.405

1. INTRODUCTION

GENERAL

1.1 The U.S. Army Corps of Engineers Los Angeles District, in coordination with the City of Phoenix Waste Water Engineering Department and the Flood Control District of Maricopa County, completed the Feasibility Report and Environmental Impact Statement (EIS) for the Tres Rios Ecosystem Restoration Project in April 2000. The recommended plan addresses Flood Control North Levee, Pump Station, Diurnal Flow Regulating Wetlands, Overbank Wetlands, Riparian Corridors and Open Water Marsh.

1.2 A Value Engineering study was conducted by the firm of Robinson, Stafford and Rude, Inc., in August 2000 and the final report was published in September 2000. The report recommended a number of modifications and design changes to the project to reduce costs and improve the design. The U.S. Army Corps of Engineers, Los Angeles District, and the local sponsor agreed to consider and accept or conditionally accept most of the concepts identified in the final report. Some of the recommendations for modifications and design changes were rejected due to site-specific constraints, future operation and maintenance costs, and habitat benefits.

OVERALL PROJECT DESCRIPTION

1.3 The Tres Rios Ecosystem Restoration project was conceived to provide flood control in combination with environmental restoration. The project consists of:

- A 4.25-mile long flood control North Levee extending along the existing river north bank from 105th Avenue to El Mirage Road. The levee height ranges from less than 1 foot to 9.30 feet high.
- A 300-million gallon per day (mgd) pump station to pump treated effluent from the current 91st Avenue Wastewater Treatment Plant (WWTP) to the Diurnal flow wetlands (regulating wetlands) and a piping system to transport treated effluent.
- A 184-acre regulating wetland to even out the diurnal flow from the WWTP pump station before discharging the treated wastewater through a series of constructed wetlands (overbank wetlands). Each wetland will have gate valves to control the flow in and out of the basin through a pipe.
- A 128-acres constructed wetland (overbank wetlands) along the riverside of the new north bank levee system. The flows through these wetlands are then conveyed by a piping system to the west end of the project to irrigate the new riparian corridors and open water marsh.
- Cottonwood/willow riparian corridors and open water marsh areas along the north and south sides of the river.
- Water conveyance system to transport treated wastewater and water from overbank wetlands and WWTP's dewatering wells.

PROJECT PHASING

1.4 The Tres Rios Ecosystem Restoration Project was developed in five phases. The first phase or Phase I involves the design and construction of the Flood Control North Levee. Due to time constraints, this first phase was divided into Phase1A, Phase1B and Phase 1C. ***Phase 1C (concrete flood wall along west side of El Mirage Road) was eliminated. See Appendix B –Hydraulic Analysis in this report. It is also worth mentioning the north levee upstream and downstream boundaries were eliminated from 95th to 105th Avenue and from El Mirage to Aqua Fria River Berm respectively. Elimination of the north levee upstream boundary (about 1.2 miles-95th to 105th Avenue) was the result of further hydraulic studies and analyses of the 100-year flood events , review of historical aerial photography and updated topography. Elimination of about 3-mile levee at the downstream boundary (El Mirage Road to Aqua Fria River Berm) was the result of further study of 100-year flood events in conjunction with Phase 3 river grading consisting of open water marsh, ponds, riparian corridors and open channels in the river as well as an existing Circle "H" Sand and Gravel pit.***
A 500-ft section of Phase 1B near EL Mirage Road was also improved by raising it 6 inches to meet FEMA requirement of 3-ft free board and to have 95% confidence in Risk and Uncertainty Analysis.

1.5 Phase II of the project consists of the Pump Station, Piping System, Flow Regulating Wetlands and Overbank Wetlands. Riparian Corridors, Open Water Marsh and Conveyance Channels located along north side of the Salt River are proposed for Phase III. Phase IV comprises of Well Water Distribution systems consisting of submersible pumps and pipelines and Under Ground Reclaimed Water Pipe to provide water for Phase 5. ***Further studies and analysis of the constructed project features (Wetlands and Riparian Corridors) and ground water table lead to elimination of Phase IV. In addition, it was indicated by the project stake holder; Gila River Indian Community (GRIC) it would provide well(s) to supply water for Phase 5 if needed.*** Open Water Marsh along south side of the Salt River belongs to Phase 5.

PROJECT LOCATION

1.6 The study area is located at the confluence of the Salt, Gila, and Aqua Fria Rivers, west of the City of Phoenix, Arizona. Because of the confluence of the three rivers within this close proximity, the project has been identified as "Tres Rios." In Spanish language, Tres Rios means "three rivers".

1.7 Tres Rios is located approximately nine miles west of downtown Phoenix. The upstream boundary of the project is located at 87th Avenue, about 2,500 feet upstream (east) from 91st Avenue Waste Water Treatment Plant. The study area extends west from the treatment plant for approximately seven miles through the confluence of both the Gila and Agua Fria Rivers and ends near Bullard Road. Plate 1 presents the overview of the project.

PROJECT AUTHORIZATION

1.8 The Tres Rios Environmental Restoration Project was authorized in accordance with the provisions of Section 101(b)(4) of Water Resources Development Act of 2000 (WRDA 2000), Public Law 106-541 (PL 106-541), and under authority given in Section 6 of Public Law 761, Seventy-fifth Congress, June 28, 1938, which reads in part as follows:

> ***"The Secretary of War (now Secretary of the Army) is hereby given authorized and directed to cause preliminary examination and surveys for flood control ...at the following named localities –Gila River and tributaries, Arizona and New Mexico."***

PURPOSE AND SCOPE OF STUDIES

General

1.9 The purpose of the Design Documentation Report (DDR) is to provide back-up and supporting information related to design drawings submitted in the 100% Design Package. It includes an overview of the project, a summary of proposed project features, calculations supporting the final design, and copies of related documents and reports that were used in the preparation of the 100% Plans and Specifications. It also provides the basis and results of civil design effort, the estimated construction cost and the schedule for the North Levee Phase 1A and 1B. Design data and calculations were developed sufficient to determine the technical and economical feasibility.

Surveying and Mapping

1.10 Mapping was based on aerial topography flown in 2001 at a scale of 1 inch = 50 feet with 1-foot contour interval. At the confluence of Gila and Salt Rivers where extreme dense vegetation limited the accuracy of aerial topography, additional cross-sections were field-surveyed to supplement the topography for the project. The mapping datum is NAD 1983 and NGVD 1929. The 1993 topographic map of the Flood Control District of Maricopa County was also utilized for hydraulics and hydrology work.

Field survey information gathered by the City of Phoenix was used to supplement the as-built drawings for the existing side drains and utilities.

Site Explorations

1.11 The subsurface investigations were performed for the design of Phase 1A and 1B Flood Control North Levee and are presented in the Geotechnical Appendix.

Coordination with Others

1.12 Extensive coordination of the design of the project was conducted. Monthly Design coordination meetings have been held since the Phase 1 design began. Items discussed included interior drainage, levee horizontal alignment, sectional geometry and takeline, impact to existing utility and structures, utility relocations, mapping, as-builts, rights-of-way, easements, quantities of spoiled material, real estate, preservation of existing vegetation, potential sources of water, disposal sites, and operation and maintenance features.

a. Coordination with the Local Sponsor.
The local sponsors for Phase 1 of the project are the City of Phoenix (COP) and the Flood Control District of Maricopa County (FCDMC).
The local sponsor for Phase 2 through Phase 4 is the City of Phoenix Waste Water Treatment Plant.

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i. Interior Drainage. In cooperation with the FCDMC, the COP WWTP and Holly Acres Community's representative, USACE conducted a detailed study of the interior drainage. A refinement of the interior drainage plan was developed for incorporation into the project including collector channels; catch basins and storm water channels.
ii. Levee horizontal alignment, sectional geometry, slope protection and toe down were discussed and agreed for implementation.
iii. Concrete Irrigation Canals Removal. Impact to the existing concrete irrigation canals including Salt River Project (SRP), St. Johns and others will be removed by local sponsor.
iv. Utility Relocations. Utility relocations required for the project were determined by the COP WWTP based on project limits required. Interfering utilities included electrical transmission and telephone lines, power and telephone poles and a 20-inch diameter El Paso natural gas line. Where possible, relocations were accomplished in advance of the construction.
v. Other Removal/Relocations. A number of structures were removed as a result of this project, including trailers and buildings located between 115th and 113th Avenue, 109th and 107th Avenue, and 95th and 105th Avenue.
vi. Rights-of-Way (R/W). The northern, the eastern and the western boundaries of the project are fairly well defined along the existing streets and the existing COP's rights-of-way indicated on plates 4 through Plate 6. The southern boundary is assumed at be along the existing river south

bank. The R/W plans developed in this memorandum are based on the USACE's topographic mapping obtained in 2001 and requirements of design features in the 90% Plans and Specifications submittal. Rights-of-way requirements for regulating wetlands and pump station will be established in details and included in the Phase 2 project.

vii. Contractor staging areas and disposal sites were selected and provided by the local sponsor. A memorandum dated September 24, 2003 by the COP's consulting engineers confirmed the locations of, and described the requirements for disposal areas.

viii. Maintenance Items. *Operation and Maintenance (O&M) Access Roads, Ramps and Turnarounds.*
Required maintenance features have been coordinated with the COP WWTP and the FCDMC.
Two 14-foot wide, 3-inch-ABC roadways for maintenance access were provided to access top of the levee and on landside along the levee toe trace. Access Ramps to and from the levee were also provided on both sides of the levee allowing access from both landside, and water side. Turnarounds were provided at reasonably close intervals as suggested by the FCDMC.

b. Coordination with Other Agencies.

Arizona Department of Water Resources, Dam Safety Section.

Arizona Department of Games and Fish.

Utility Companies

Existing Work by Others

1.13 The existing 1.3-mile Holly Acres Levee, modified in 1983, and currently operated by FCDMC, was improved to provide the 100-year flood protection level. About ¼ mile of this Holly Acres Levee belongs to Phase 1A (station 153+72.90 to station 168+00), and about 1.1 miles belong to Phase 1B (station 103+00.00 to station 153+72.90).

2. DESCRIPTION OF FEASIBILITY REPORT DESIGN

FLOOD CONTROL NORTH LEVEE

2.1 Three levee alternatives with numerous variations of each were considered and studied by the design team. Alternative 3.5 of the overall project was the recommended one since this alternative would induce flooding at a short reach on the left bank looking upstream. This alternative also requires less excavation and earthwork compared to other alternatives. The levee was designed to contain flows up to 100-year event. The

duration of inundation was studied and calculated using the HEC-RAS geometric model with a modified flow data model.
The minimum levee elevations were based on uncertainty analysis. In this case, 100-year, 95% confidence levee elevations correspond with the 100-year computed water surface elevations plus two standard deviations of uncertainty. (Tres Rios Technical Appendices Feasibility Report April 2000, Appendices A & B).

2.2 The levee's horizontal alignment follows the Salt River north bank from 91st Avenue to the existing Holly Acres Levee at 113th Avenue. It then follows the existing Holly Acres Levee alignment from 113th Avenue to El Mirage Road. The levee continues along the existing Gila River north bank from El Mirage Road to Dysart Road and eventually turns north where it terminates at Southern Avenue.

2.3 The levee height ranges from 0.1 feet to 9.3 feet above the existing ground surface. The riverside and landside slopes have a ratio of 1V:2H. A required 15-inch thick stone armor layer was considered sufficient for protection of the riverside slope. Depth of 7 feet to 15 feet below the existing ground surface and was preliminarily established for design of toe-down.

INTERIOR DRAINAGE

2.4 A detailed interior drainage study was completed by the USACE-LAD in coordination with the Maricopa County Flood Control District, the City of Phoenix Wastewater Treatment Plant and Holly Acres Community. In addition, results from a previous study done by Dibble and Associates for the FCDMC and information generated to determine the quantity of urban runoff for the Rio Salado Study were used to formulate a preliminary interior drainage analysis. The estimated interior area peak discharge and associated 24-hour runoff volume were based upon drainage area versus discharge relationships.

3. ALTERNATIVES EVALUATED AFTER THE FEASIBILITY REPORT

DESIGN REFINEMENT PLAN

Flood Control North Levee

3.1 The design refinements to the recommended plan resulted from monthly design Coordination meeting action items, the local sponsor, FCDMC and local input to the project, and in-depth study performed by the USACE and Consulting Engineers (the WEST Consultants).

a. Levee slopes ratio. It was recommended that the flood control north levee should have landside and riverside slopes ratio of 1V: 3H armored with 15-inch layer of rounded-ungrouted stone on the riverside slope and 2-inch thick gravel mulch on the landside slope.

b. Levee toe-down depth. Levee toe-down alternatives developed after the Feasibility Report was performed by the WEST Consultants. This evaluation/calculation called for average levee toe-down depth of 38 feet below the current existing ground surface. Considering the massive amount of excavation and large quantities of stone required for levee toe that would affect the construction cost, this alternative was re-evaluated. Further investigation and research of historical flood information in the project area was conducted by the USACE and the WEST Consultants. Based on information researched and data obtained from the Hydraulics and Hydrology Section, it was determined that the required levee toe-down depth varies from 2.5 feet to 3.47 feet for Phase 1A and 3.47 feet to 4.28 feet for Phase 1B. The Hydrologic and Hydraulic Analysis Appendix and Plate 4 provide details of required toe-down depths.

c. Levee east (upstream) end. In the design coordination meeting held in the Los Angeles District office, it was determined that levee east end will have to be re-aligned to avoid impact on the existing vegetation that exists along the river's north bank and considered as VFZ (Vegetation Free Zone). Re-alignment of the levee east end is required about 100 feet offset north from the current riverbank and terminates at approximately 120 feet east from the 95th Avenue where elevation of top of levee meets the existing ground surface. It is also noted that area between the 95th and 91st Avenue adjacent to the current riverbank extending approximately 80 feet to 100 feet north consists of unsuitable filled material. This area was filled with construction debris taken during construction of the city of Phoenix WWTP (Waste Water Treatment Plant). The re-aligned levee east end does not conflict this un-engineered fill area. The levee east end alternative provides an 80-feet buffer for the levee.

d. Levee west (downstream) end. Hydraulics study and analysis (the computer program HEC-RAS) concluded that levee downstream end will be terminated at the Buckeye Canal where WSE of the 100-yr flood event matches elevation of the Buckeye Canal banks.

e. Flood wall south of Southern Avenue and parallel to El Mirage Road (Phase 1C). It was recommended that in addition to the flood wall, 4 stop log access points be provided for the farmer to access his farm land. These stop logs serve as flood containing structures. Approach slabs (at each stop log location) were also required for vehicle passage.

VALUE ENGINEERING (VE) STUDY

3.2 A Value Engineering Study was conducted to evaluate potential project modifications resulting in cost savings and an improved project. In January 2002, a meeting was conducted by members of the USACE design team. The purpose of the meeting was to review the results of the Value Engineering Follow-up Memorandum, dated August 2001. A report entitled, "Tres Rios Value Engineering: Proposed Actions for Final Value Engineering Recommendations," was the result of the meeting. Recommendations in the report that pertain to Phases 1A and 1B that the USACE agreed to be studied further and adopted, if reasonable, were the following:

- Recommendation 1 (F-16) –Flatten levees and replace riprap with cobble excavated from the river. There may be site-specific constraints that would make this less appropriate at certain locations than others, such as locations where high groundwater exists within the toe-down depth. The flattened slopes will still require cobble protection and the thickness of the cobble protection may need to be thicker than riprap.
- Recommendation 2 (F-42) – Locate levee interior drains to support habitat. The interior drainage routing design will require that an adequate point of disposal be determined on the south side of the levee for each penetration. However, there is not a lot of flexibility since the interior drainage is somewhat locked in to existing flow paths due to existing natural terrain condition. There may be some limited opportunities to provide some supplemental water for the habitat with the storm drain runoff.
- Recommendation 3 (H-27) – Increase levee height and reduce the scheduled maintenance. The Corps will provide a cost estimate to the sponsor to go from a 100-year level of protection to a 500-year level of protection. The sponsor could then buy this additional level of protection. The higher levee may result in water surface elevation issues on the south side of the river that have not been evaluated beyond the 100-year event.
- Recommendation 4 (H-87) – Vary the soil type from the top to the bottom of the levee.
- Recommendation 5 (H-107) – Use topsoil excavated from salt cedar areas for levee core material to contain the salt if it is simple and will not compromise the integrity of the levee and add a lot of extra costs.

ADDITIONAL ALTERNATIVES EVALUATED

3.3 In addition to the recommendation presented in the feasibility report, two alternatives were considered and are listed below.

3.3.1 Horizontal Launch Stone.

3.3.2 Deep Levee Toe-Down (Vertical Launch Stone).

4. SELECTED PLAN

GENERAL

4.1 The selected plan for the North Levee Phase 1A and Phase 1B consists of improvement of the existing Holly Acres Levee and construction of several access ramps, two collector channels, two detention basins, nine guide dikes, two operation and maintenance roads, interior drainage including RCB culverts. It also calls for installation of four-wire right-of-way fence.

HOLLY ACRES LEVEE MODIFICATIONS

4.2 The existing levee can accommodate 115,000 cfs of flow with 3 feet freeboard – far less than the 100-year flow at the Salt River/Gila River confluence. About 1 mile of the existing Holly Acres Levee is required for modifications, extending from El Mirage Road to 115th Avenue (now Avondale Boulevard – see Plates 3 - 11).

ACCESS RAMPS

4.3 Three access ramps including turnarounds, to provide access for invert/toe to levee crest are needed for Phase 1A. Three access ramps including turnarounds, to provide access for invert/toe to levee crest are necessary for Phase 1B. (See Phase 1A Plates 12-14, and Phase 1B Plates 13-15). All access ramps compose of a 14-foot wide, 3-inch ABC. In all cases, upper slopes of the ramp is required to have 15-inch stone slope protection, and lower slopes of the ramp be the same slope protection as for the levee. In cases where access ramps are located on the landside, lower slopes needs to have 2-inch thick gravel mulch protection as a minimum.

COLLECTOR CHANNELS

4.4 For Phase 1A, there is a 1.1-mile long reinforced concrete trapezoidal channel extending from 105th Avenue to 113th Avenue. For Phase 1B, there is a 1-mile long reinforced concrete trapezoidal channel extending from El Mirage Road to 115th Avenue. (See Phase 1A Plates 22-27, and Phase 1B Plates 26-32).

DETENTION BASINS

4.5 A 15 ac-ft earthen detention basin located between 113th Avenue berm and Avondale Boulevard (115th Avenue) and an 8.5 ac-ft. earthen detention basin situated at the north east corner of the modified Holly Acres Levee and the El Mirage Road are proposed for Phase 1A and Phase 1B respectively (see Phase 1A Plates 28-29, and Phase 1B Plates 34-35).

GUIDE DIKES

4.6 There are four compacted earth-fill guide dikes armored with 27-inch and 33-inch riprap for Phase 1A. Three of them are oriented at a 90-degree angle with respect to the levee centerline. One is located near 95th Avenue. There are four compacted earth-fill guide dikes armoring with riprap and gabion mattresses for Phase 1B. These guide dikes are also oriented at a 90-degree angle with respect to the levee centerline. (See Phase 1A Plates 15-18, and Phase 1B Plates 16-19).

O & M ROADS

4.7 Two Operation and Maintenance (O&M) Roads are required for each phase. One is located on top of the levee, along the levee crest and the other is situated between the toe of the levee landside slope and the collector channel. (See Phase 1A Plates 19-21, and Phase 1B Plates 21-25). These O&M roads consist of 3-inch thick Aggregate Base Course (ABC), and 14-foot wide cross section, where feasible, turn-arounds will be provided.

RCB CULVERTS

4.8 One of the two Reinforced Concrete Box (RCB) culverts that belong to Phase 1A must have a trash rack and flap gate to convey outflows from the detention basin and discharge them into the Gila River. The one without trash rack and flap gate carries inflows from the Collector Channel into the detention basin. There is also an 858-foot long earthen trapezoidal ditch (115th Avenue Drainage Ditch) that conveys nuisance flows from the detention basin through the RCB culvert into the Gila River and is located on the riverside of the levee. For Phase 1B, there is a five-cell RCB with a trash rack and flap gate. There is also a 15-inch grouted stone diversion channel to convey flows from the RCB culvert to the river via four 24-inch diameter RCP's buried underneath the El Mirage Road. (See Phase 1A Plates 31-34, and Phase 1B Plates 20 & 33).

UTILITIES

4.9 The utilities to be relocated and/or removed include power and telephone transmission lines, and power and telephone poles. The existing utilities are shown in Table 4.1.

Table 4.1 Utilities		
Location	Size	Actions
Phase 1A		
Power/Telephone Lines		
195+50 across levee		Remove
Sta. 206+50 to Sta. 208+50		Remove
Power/Telephone Poles		
206+50 south side of levee		Remove
207+50 south side of levee		Remove
208+00 south side of levee		Remove
209+50 south side of levee		Remove
Phase 1B		
none		

SIDE DRAINS

4.10 There are several existing concrete irrigation canals to be demolished and replaced for connection to the proposed collector channels. (See Table 4.2.)

Table 4.2 Side Drains

Station	Length (ft)	Proposed
Phase 1A		
Sta. 168+00 to Sta. 168+75 (113th Ave.)	75	Remove and Relocate
Sta. 181+50 (East 111th Ave.)	75	Remove and Relocate
Sta. 194+00 (East 109th Ave.)	75	Remove and Relocate
Sta. 209+50 (East 107th Ave.)	75	Remove and Relocate
Sta. 210+00 (West 107th Ave.)	75	Remove and Relocate
Sta. 224+00 (East 105th Ave.)	75	Remove and Relocate
Phase 1B		
Sta. 126+25 (West 119th Ave.)	75	Remove and Relocate
Sta. 128+50 (East 119th Ave.)	75	Remove and Relocate
Sta. 141+50 (117th Ave.)	75	Remove and Relocate

CARE OF TRAFFIC DURING CONSTRUCTION

4.11 The staging area will be located between 107th and 105th Avenue or immediately west of 91st Avenue. Access to the construction site will be by temporary maintenance access roads to be constructed. Flagmen, warning signs, and traffic control may be required during construction of the majority of the project, especially in the vicinity of 115th Avenue when construction of 115th Avenue Catch Basin takes place.

CARE AND DIVERSION OF WATER DURING CONSTRUCTION

4.12 Surface flows within the construction area will be controlled by temporary dikes, diversion berms and channels.

DISPOSAL OF MATERIALS

4.13 There are optional permanent disposal sites for the excessive soils and spoiled material to be disposed of as indicated in the attached Phase 1A, Plate 3A

REAL ESTATE PLAN

4.14 The Real Estate Plan was prepared by the USACE for inclusion with the Feasibility Report.

5. HYDROLOGIC AND HYDRAULIC BASIS FOR DESIGN

5.1 Detailed descriptions of the assumptions, inputs, methodologies and results, along with tables and graphics are provided in the Hydrology and Hydraulic Analysis Appendix "B".

6. GEOTECHNICAL BASIS FOR DESIGN

6.1 Detailed descriptions of the assumptions, inputs, methodologies and results, along with tables and graphics are provided in the Geotechnical Appendix "C".

7. STRUCTURAL BASIS OF DESIGN AND CALCULATIONS

7.1 Detailed descriptions of the assumptions, inputs, methodologies and results, along with tables and graphics, are provided in the Structural Appendix "D".

8. OPERATION, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION (OMRR&R)

GENERAL

8.1 The operation, maintenance, repair, replacement, and rehabilitation of the flood control features will be accomplished by Flood Control District of Maricopa County in accordance with provisions of Title 33, Flood Control Regulation, Maintenance and Operation of Flood Control Work, approved by the Secretary of the Army, August 9, 1944. The general intent of the regulation is as follows: "…the structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits."

FLOOD CONTROL FACILITIES

8.2 The operation, maintenance, repair, replacement, and rehabilitation of the facilities will include, but not be limited to, the issuance of permits, periodic inspections, removal of sediment and debris, repair of eroded areas, repair of damages to structures, and maintenance of all esthetic and mitigation features and facilities.

8.3 Maintenance and inspection of the flood control facilities will be performed by individuals on foot or utilizing vehicular equipment, as needed, operating (1) on maintenance roads, (2) within the detention basins, and (3) other areas, as appropriate. Disturbance to the habitat and/or preservation areas shall be avoided.

OPERATION, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION MANUAL (OMRR&R) MANUAL

8.4 Operation, Maintenance, Repair, Replacement, and Rehabilitation Manuals are required for Phase 1A and Phase 1B for the local sponsor (Flood Control District of Maricopa County) to operate and maintain the constructed facilities.

9. COST ESTIMATES

FIRST COSTS

9.1 The estimated first costs were developed using October 2001 price levels for phase 1A and 1B. They include estimates for construction and restoration, flood control, relocations, permanent operating equipment, planning, engineering and design, and construction management.

9.2 Unit costs were derived from the known unit costs for similar work in the Maricopa County area. Contingency allowances were assigned for each item of the cost estimate. The lands and damages costs were not included. Costs for planning, engineering and design, and construction management are based on estimated costs to complete the project.

A summary of first costs for flood control is presented in Table 9.1 below.

Table 9.1 Design Documentation Report Cost Estimate
(October 2001 Price Level)

Acct. No.	Description	Amount (thousands)
01	Lands and Damages	$1,117
02	Relocations	$2,440
06	Fish and Wildlife Facilities	$2,252
09	Channel and Canals	$10,135
30	Engineering and Design (9%)	$878
31	Supervision and Administration (6%)	$585
	Total (02, 06, 09, 30, & 31)	$16,290
	Project Cost	$17,407

ANNUAL OPERATION, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION COSTS

9.3 There will be annual operation, maintenance, repair, replacement, and rehabilitation costs for permits, periodic inspections, irrigation of the landscape areas, sediment/debris removal, repair of eroded areas, and repair of damage to structures. Operation and maintenance efforts will be required to remove sediment and/or debris deposits within the detention basins. Given the arid nature of the region, several years may pass with little or no sediment/debris removal followed by a group of major events requiring significant efforts.

9.4 An operation and maintenance (O&M) manual will be prepared after construction of the flood control levee and its features is completed in accordance with ER 1130-2-304 "Project Operations" and the applicable provisions of ER 1150-2-301 "Local Cooperation." The local sponsor will be responsible for the operation and maintenance of the flood control improvements. The major items of operation and maintenance and their estimated average annual costs are included in the following table.

Table 9.2 Estimated Annual Operation and Maintenance Cost	
Item	Annual Cost (October 2000 Price Level)
Operation	$14,725
Administration	$14,275
Inspection and Evaluation	$7,363
Irrigation	$2,945
Maintenance	$36,812
Routine (fence, riprap, debris cleanup, etc.)	$7,363
Repair of Damaged Concrete Structures	$4,416
Plants, Turf, and Irrigation System	$2,945
Major Replacement	$41,230
Access Road (30-year life)	$7,363
Fencing (30-year life)	$7,363
Total	**$147,250**

REVIEW OF COST EFFECTIVENESS OF DESIGN

9.5 In accordance with Section 911 of the Water Resources Development Act of 1986 (P.L. 99-662), the recommended improvements of the overall project were subjected to a throughout review in 2000. In that review, it was found that no land constraints involved and the project levee is co-linear and aligned along the river north bank.

10. PLAN RESPONSIBILITIES

COST APPORTIONMENT

10.1 The following table presents the apportionment of first costs between Federal and Non-Federal interests for the Flood Control North Levee and its features.

Table 10.1 Cost Apportionment (October 2007 Price Level)				
Acct. No.	Description	Federal ($1000)	Non-Federal ($1000)	Amount ($1000)
01	Lands and Damages		56,633	56,633
02	Relocations			
09	Channel and Canals	1,773	954	2,727
30	Engineering and Design	11,739	6,309	18,048
31	Supervision and Administration	7,684	4,138	11,822
	Total	**21,196**	**68,034**	**89,230**

FEDERAL RESPONSIBILITIES

10.2 The Federal Government will be responsible for the following:

- Provide detailed design and construction administration necessary for implementation of flood control and recreation improvements (if recreation is implemented);
- Evaluate and determine applicability of credit against local sponsor's costs for the project pursuant to Section 104 of P.L. 99-662. The amount of credit, where applicable, will be dependent on the actual construction cost of the project and verification of costs for those items submitted by local sponsors for credit; and
- Develop a management plan for operation, maintenance, and rehabilitation of fish and wildlife mitigation and enhancement features of the project.

NON-FEDERAL RESPONSIBILITIES

10.3 The Non-Federal interest will be:

- Pay 5 percent of the cost in cash of the project assigned to flood control during construction of the project;
- Provide all lands, easements, rights-of-way, and dredged and excavated material disposal areas;
- Perform all alterations and modifications of highways, roads, streets, highway bridges, utilities, and irrigation and drainage facilities required in connection with the project;
- Contribute 50 percent of the cost for recreation development. Maintain and operate all project recreation facilities after completion in accordance with regulations prescribed by the Secretary of the Army;
- Provide, without cost to the United States, all relocations of existing recreational facilities. Obtain the approval of the Secretary of the Interior to relocate, as necessary for project construction, those recreation properties which were acquired or developed with assistance from Land and Water Conservation Fund Act monies;
- Assure access to all people on equal terms for approved recreational use;
- Manage and maintain all eligible National Register of Historic Places properties in accordance with a treatment plan developed in coordination with the Federal Advisory Council on Historic Preservation and the State Historic Preservation Office
- Administer the operation, maintenance, and rehabilitation of fish and wildlife mitigation and fish and wildlife enhancement features of the project in accordance with a management plan to be developed and approved by the Secretary of the Army. The cost of operation, maintenance, and rehabilitation for mitigation lands will be borne entirely by the Non-Federal interests. The costs for operation, maintenance, and rehabilitation of enhancements lands will be shared 75 percent by the Government and 25 percent by the Non-Federal interests;

- Give the Government a right to enter upon, at reasonable times and in a reasonable manner, lands which Counties own or control, for access to the project for the purpose of inspection, and for the purpose of repairing and maintaining the project if such inspection shows that the local sponsors for any reason are failing to repair and maintain the project in accordance with the assurances hereunder and have persisted in such failure after a reasonable notice in writing by the Government delivered to the responsible local official. No repair or maintenance by the Government in such event shall operate to relieve the local sponsors of responsibility to meet their obligations as set forth in this Agreement, or to preclude the Government from pursuing any other remedy by law or equity;
- Hold and save the United States free from damages due to the construction, operation, and maintenance of the project, excluding damages due to fault or negligence of the United States or its contractors; and
- Hold and save the United States free from all damages arising from water rights claims resulting from construction, maintenance, and operation of the project.

11. IMPLEMENTING THE PLAN

GENERAL

11.1 A Project Management Plan for the Tres Rios Project was prepared in November 2000 and is currently being implemented.

PREPARATION OF PLANS AND SPECIFICATIONS

11.2 The preparation of Phases 1A and 1B, Plans and Specifications will take approximately 14 months, and 12 months respectively, to complete.

SCHEDULE OF DESIGN AND CONSTRUCTION

11.3 Phase 1A as advertised for construction in June 2005 and awarded in August 2005. Phase 1B as advertised in June 2006 and constructed in September 2006. The contract for Phase 1A scheduled for 12 months and was completed by the end FY 2006 for phase 1A. The contract for phase 1B scheduled for 18 months, was completed by early 2008.

PROJECT COOPERATION AGREEMENT (PCA)

11.4 The City of Phoenix Water Services Department has provided a Letter of Intent acknowledging sponsorship requirements for the Tres Rios Project. Prior to the start of construction, the Local Sponsor and the USACE jointly signed the PCA on 14 April 2004. The signed PCA requires the Local Sponsor to enter into an agreement with the Federal Government that it will comply with Section 221 of the Flood Control Act of 1970 (P.L. 91-611), and the Water Resources Development Act of 1986 (P.L. 99-662).

RECOMMENDATIONS

11.5 This report describes in detail the general design, including departures from the previously approved plan, of this portion of the Tres Rios Project. This report provides the basis and recommendations for the development of plans and specifications for the construction of the Flood Control North Levee.

11.6 The rounded combined Federal and Non-Federal first costs of the recommended Tres Rios North Levee were estimated at $12,000,000 based on July 2005 price levels.

PLATES

PHASE 1A

U.S. Army Corps of Engineers – Los Angeles District

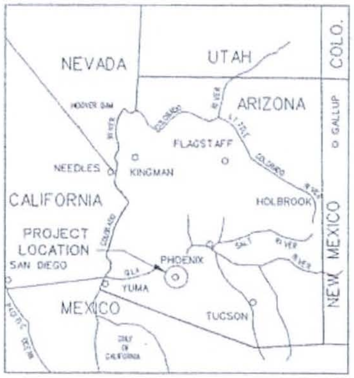
in cooperation with

The City of Phoenix

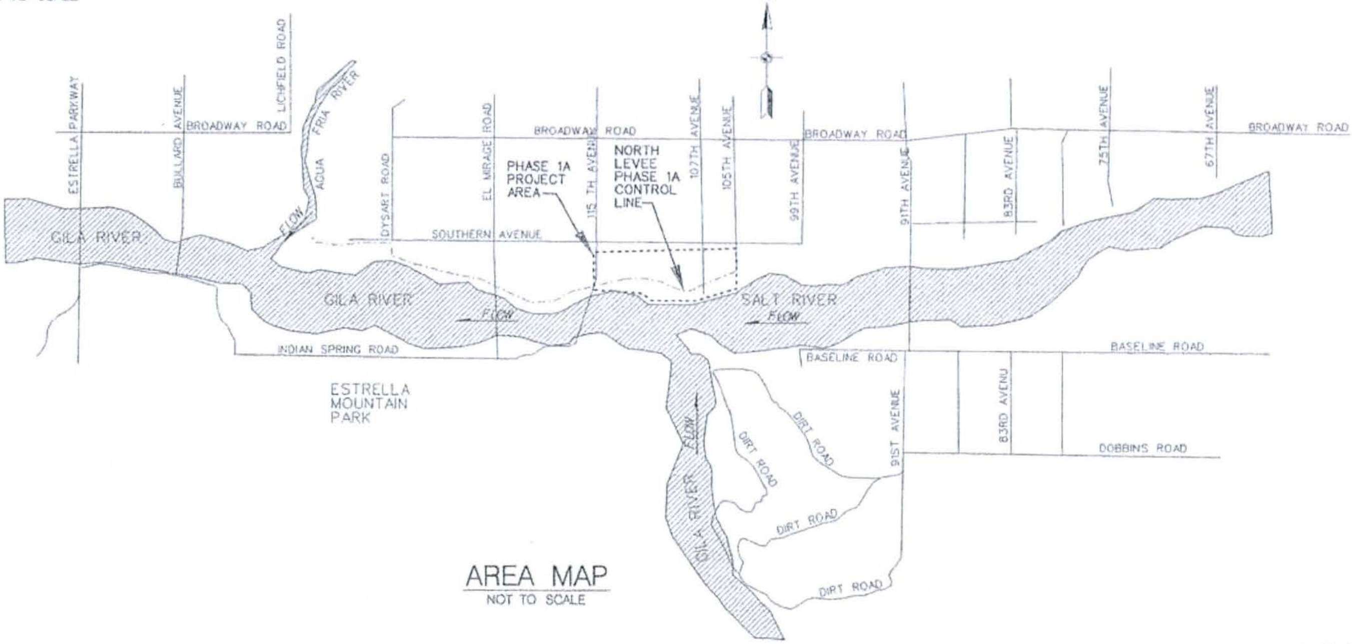
Tres Rios Environmental Restoration

Flood Control North Levee
Phase 1A (115th Ave. to 105th Ave.)

FEBRUARY 2005



VICINITY MAP
NOT TO SCALE



AREA MAP
NOT TO SCALE

AS-BUILT

VALUE ENGINEERING PAYS

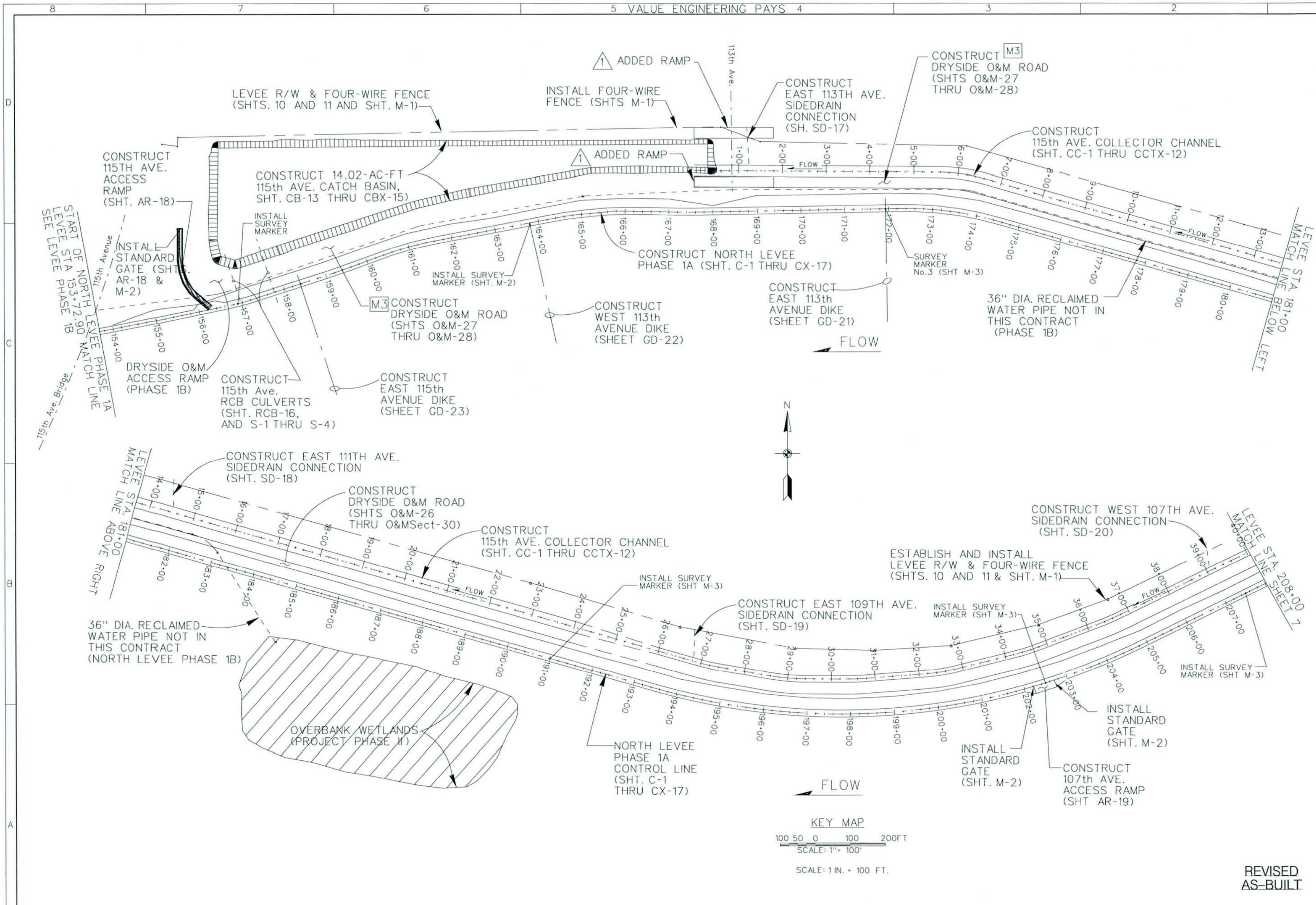
SAFETY PAYS

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
PROJECT AREA AND VICINITY MAPS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

COLONEL ALEX C. DORNSTAUDER
DISTRICT ENGINEER



SYMBOL	DESCRIPTIONS	DATE	APPROVAL
M3	Deleted the Original Call-out Note And Inserted the New One	21Aug06	F.O.
1	Added Ramps	17Oct07	MJH

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

KEY MAP SHEET 1

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

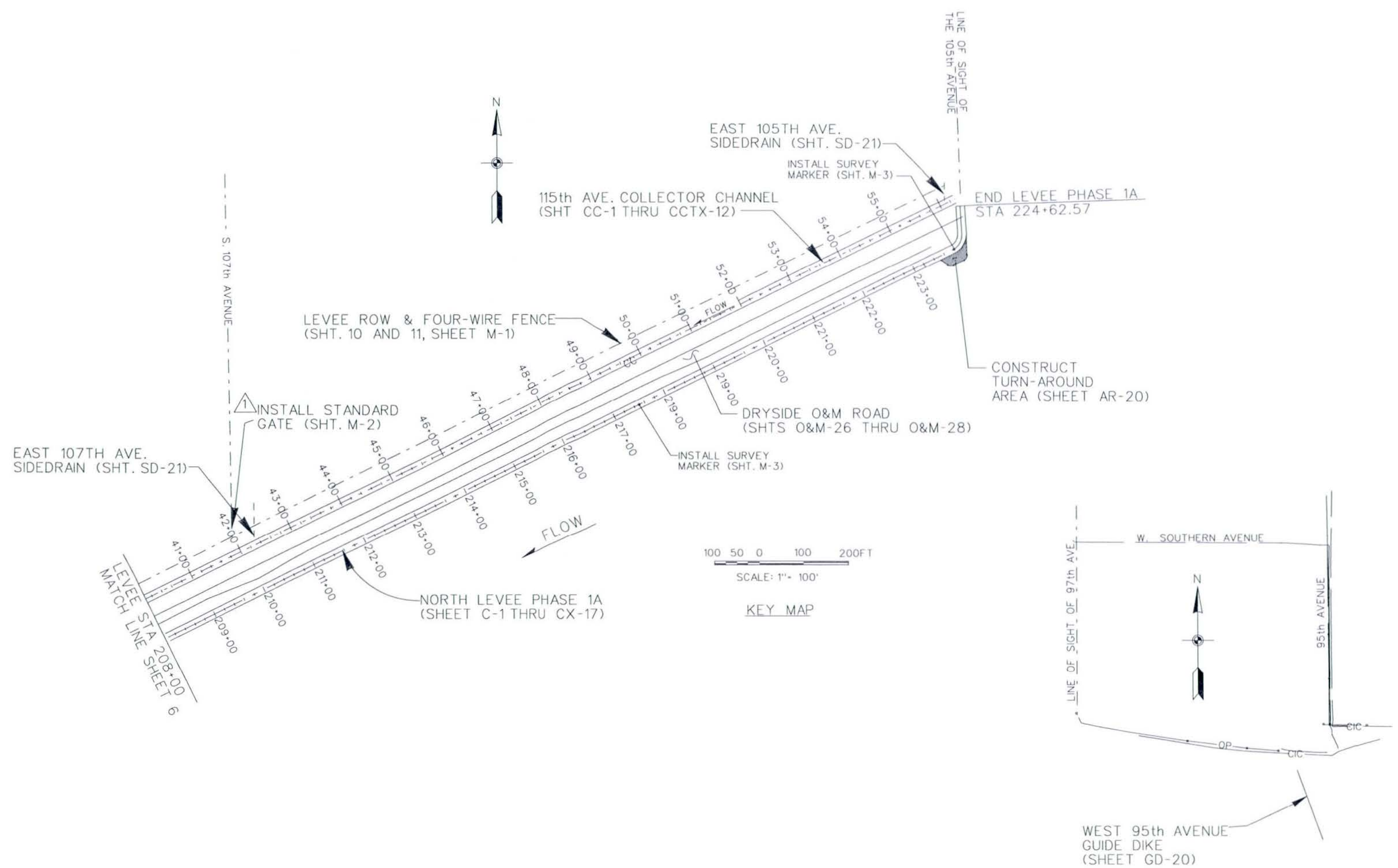
KeyMap1

SPEC NO. W912PL-05-B0004

DISTRICT FILE No. 203/316

SCALE: 100'

PLATE 2



SYMBOL	DESCRIPTIONS	DATE	APPROVAL
1	Moved Standard Gate to 107th Ave.	11Dec07	MJH

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

KEP MAP SHEET 2

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

Keymap2

SPEC. NO. W912PL-05-B0004

DISTRICT FILE No. 203/317

SCALE: 100:1

PLATE 3

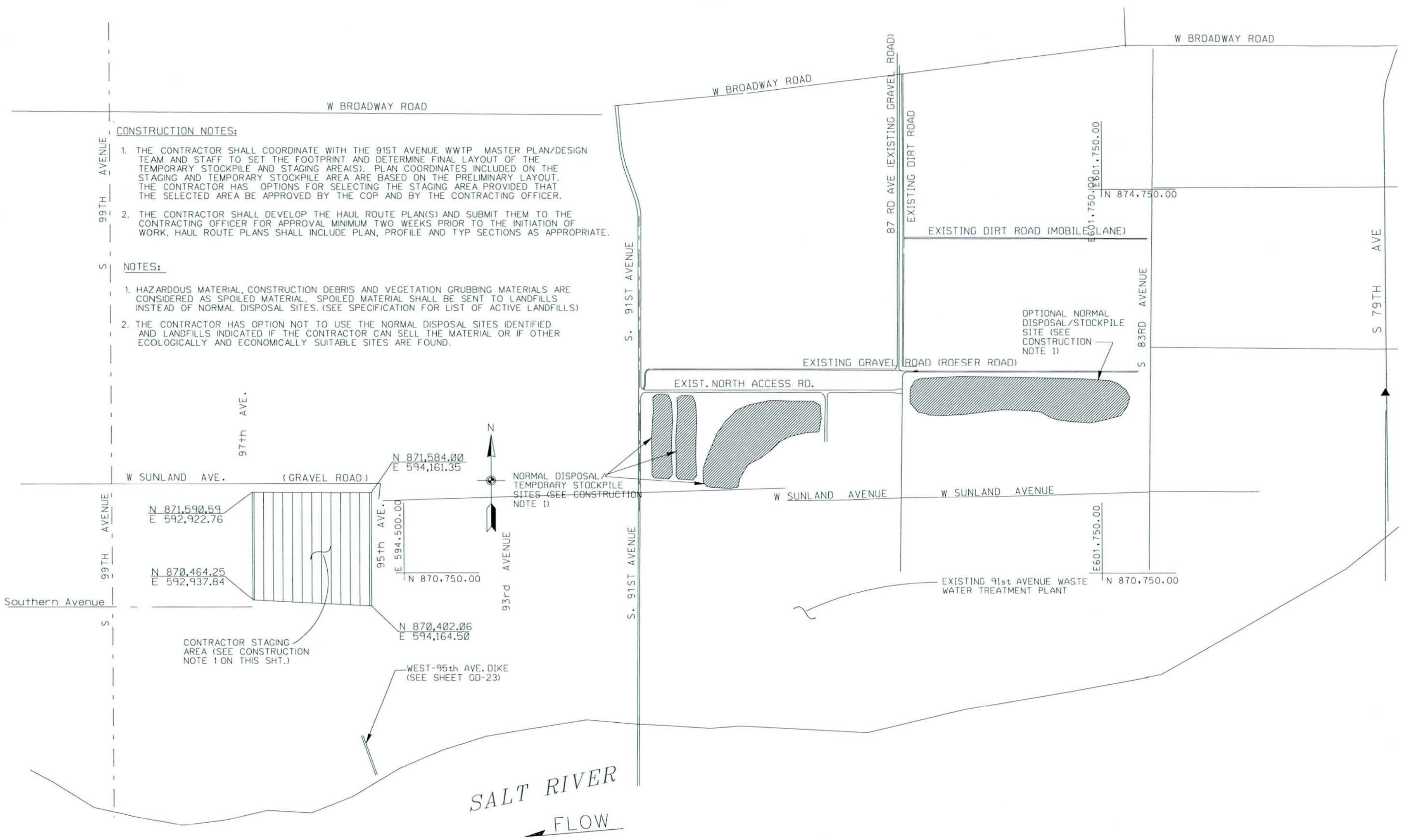
REVISED
AS-BUILT

CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH THE 91ST AVENUE WWTP MASTER PLAN/DESIGN TEAM AND STAFF TO SET THE FOOTPRINT AND DETERMINE FINAL LAYOUT OF THE TEMPORARY STOCKPILE AND STAGING AREA(S). PLAN COORDINATES INCLUDED ON THE STAGING AND TEMPORARY STOCKPILE AREA ARE BASED ON THE PRELIMINARY LAYOUT. THE CONTRACTOR HAS OPTIONS FOR SELECTING THE STAGING AREA PROVIDED THAT THE SELECTED AREA BE APPROVED BY THE COP AND BY THE CONTRACTING OFFICER.
2. THE CONTRACTOR SHALL DEVELOP THE HAUL ROUTE PLAN(S) AND SUBMIT THEM TO THE CONTRACTING OFFICER FOR APPROVAL MINIMUM TWO WEEKS PRIOR TO THE INITIATION OF WORK. HAUL ROUTE PLANS SHALL INCLUDE PLAN, PROFILE AND TYP SECTIONS AS APPROPRIATE.

NOTES:

1. HAZARDOUS MATERIAL, CONSTRUCTION DEBRIS AND VEGETATION GRUBBING MATERIALS ARE CONSIDERED AS SPOILED MATERIAL. SPOILED MATERIAL SHALL BE SENT TO LANDFILLS INSTEAD OF NORMAL DISPOSAL SITES. (SEE SPECIFICATION FOR LIST OF ACTIVE LANDFILLS)
2. THE CONTRACTOR HAS OPTION NOT TO USE THE NORMAL DISPOSAL SITES IDENTIFIED AND LANDFILLS INDICATED IF THE CONTRACTOR CAN SELL THE MATERIAL OR IF OTHER ECOLOGICALLY AND ECONOMICALLY SUITABLE SITES ARE FOUND.



CONTRACTOR STAGING AREA AND NORMAL DISPOSAL SITES PLAN

SCALE: 1 IN. = 500 FT.

AS-BUILT

Two working days before you dig CALL FOR THE BLUE STAKES 602 263-1100 Blue Stake Center CALL COLLECT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

CONTRACTOR STAGING AREA AND NORMAL DISPOSAL SITES PLAN

U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS

DESIGNED BY: D.P.
DRAWN BY: D.P.
CHECKED BY: P.U.

FILE NAME: StagDispSites.dgn

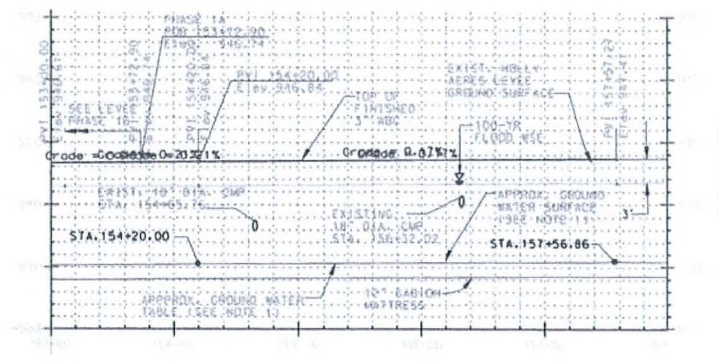
SUBMITTED BY: THOMAS H. SAGE, P.E. CHIEF, DESIGN BRANCH

DISTRICT FILE NO. 203/319

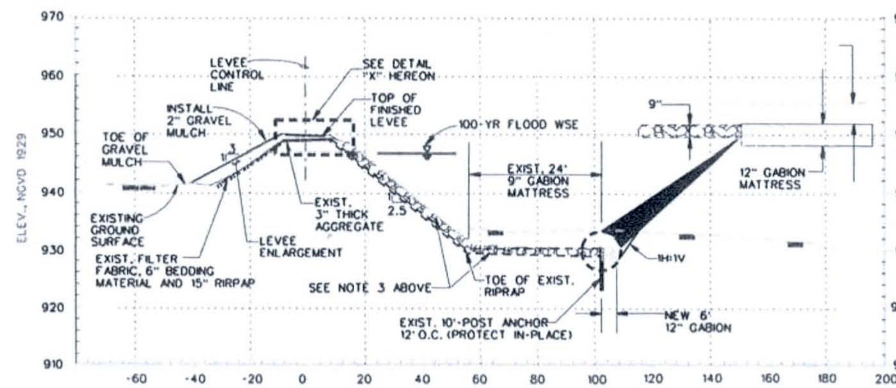
SPEC. NO. W912PL-05-B0004

SCALE:

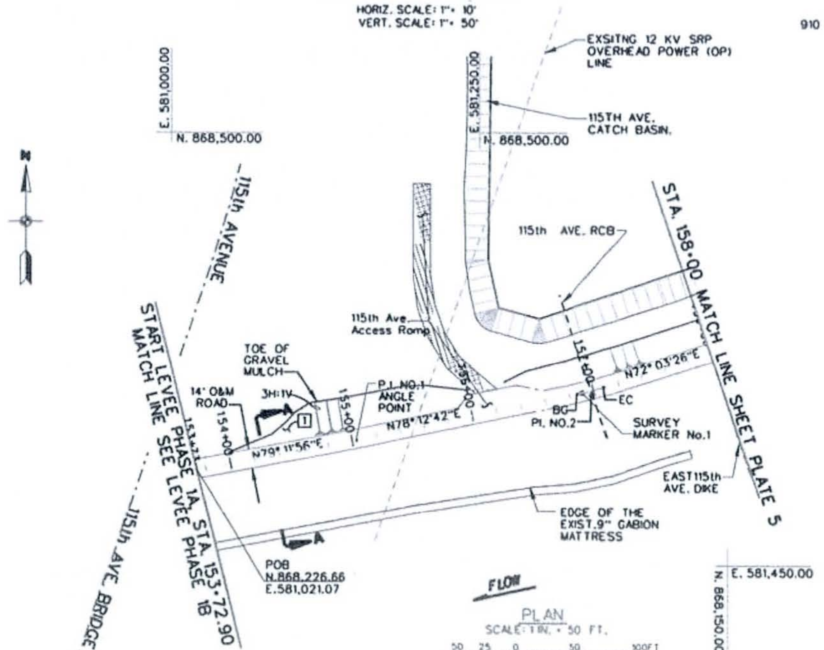
PLATE 3A



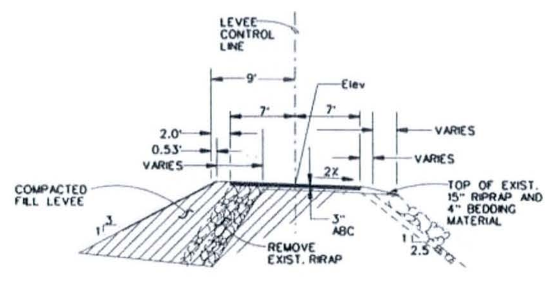
LEVEE CONTROL LINE PROFILE
HORIZ. SCALE: 1" = 10'
VERT. SCALE: 1" = 50'



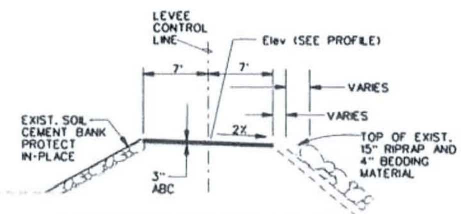
SECTION A-A TYP (STA 154+00 TO 168+00)
N.T.S.



PLAN
SCALE: 1 IN. = 50 FT.



DETAIL X LOOKING EAST
N.T.S.



TYP SECTION STA 153+72.90 TO 154+00
N.T.S.

LEVEE HORIZONTAL CONTROL CURVE AND ANGLE POINT DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(FT.)	T(FT.)	L(FT.)	B.C. Sta	E.C. Sta
1 Sta. 155+03.18	868,251.07	581,149.04	ANGLE PT.	0.00	0.00	0.00	N/A	N/A
2	868,290.80	581,339.41	6°09'15"LT	200.00'	10.75'	21.48'	156+86.90	157+08.38

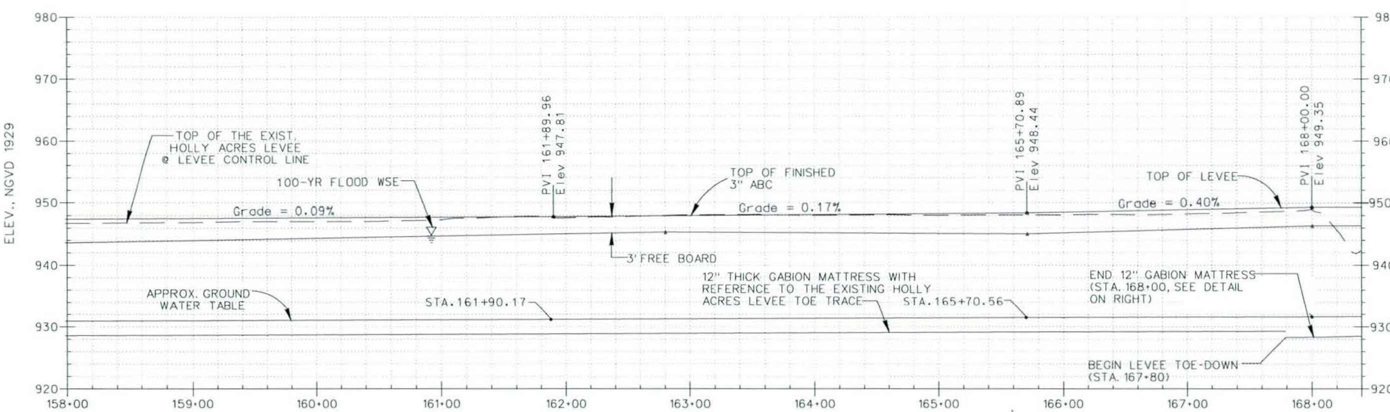
NOTE: EXIST. HOLLY ACRES LEVEE WAS MODIFIED FROM STA 153+72.90 TO 154+00 ON THE LEVEE CREST AND GABION MATTRESS UNLESS DIRECTED. GABION MATTRESS IS NOT SHOWN ON TYP SECTION STA 153+72.90 TO STA 154+00.

AS-BUILT

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
LEVEE PLAN, PROFILE, TYPICAL SECTIONS AND DETAIL
STA. 153+72.90 TO STA. 158+00

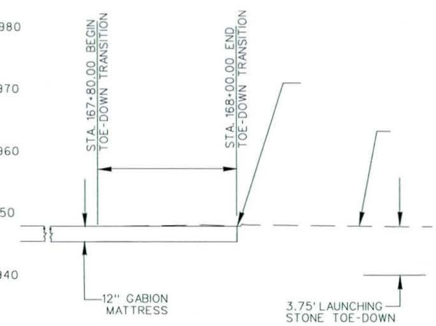
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

5 VALUE ENGINEERING PAYS 4

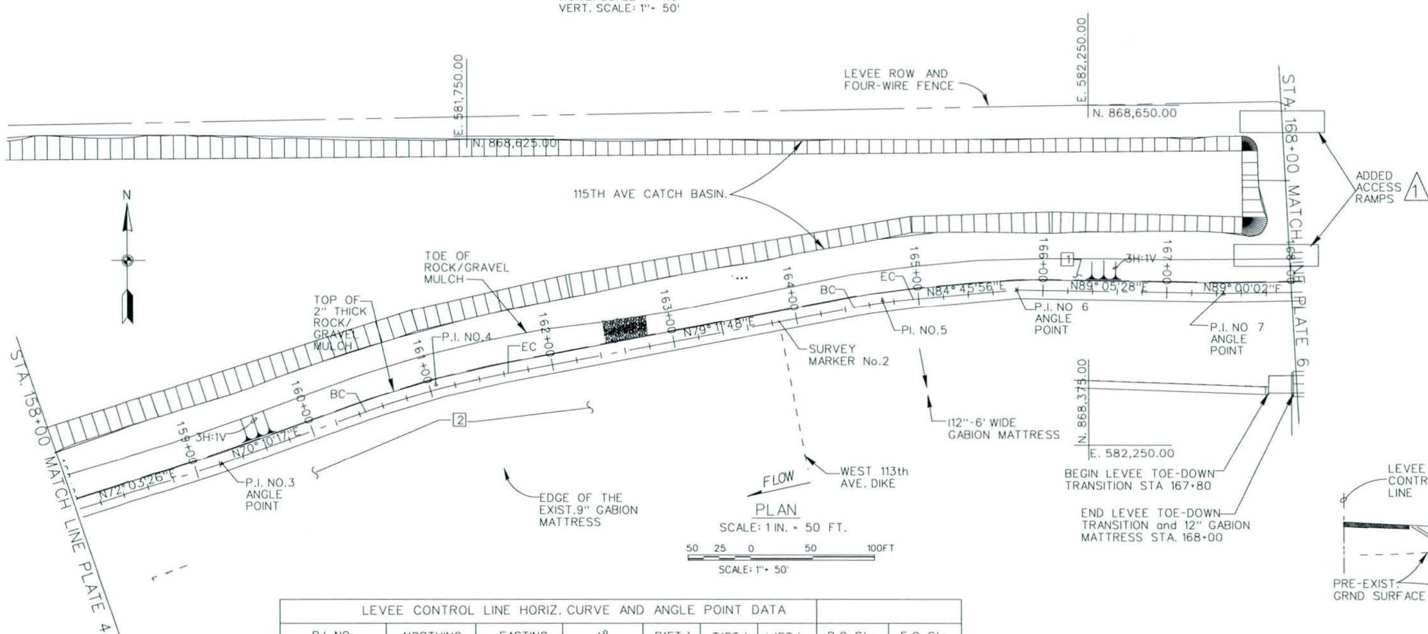


LEVEE CONTROL LINE PROFILE

HORIZ. SCALE: 1"= 10'
VERT. SCALE: 1"= 50'



12" GABION MATTRESS AND 3.75' LAUNCHING STONE LEVEE TOE-DOWN TRANSITION DETAIL



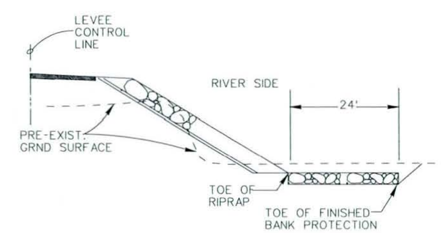
PLAN

SCALE: 1 IN. = 50 FT.

50 25 0 50 100FT

SCALE: 1"= 50'

LEVEE CONTROL LINE HORIZ. CURVE AND ANGLE POINT DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(FT.)	T(FT.)	L(FT.)	B.C. Sta	E.C. Sta
3 Sta. 159+21.75	868,359.84	581,552.63	ANGLE PT.	0.00	0.00	0.00	N/A	N/A
4	868,421.86	581,724.61	9° 01'31"RT	750.00'	59.19'	118.14'	160+45.38	161+63.52
5	868,490.69	582,085.30	5° 34'08"RT	500.00'	24.32'	48.60'	164+47.21	164+95.80
6 Sta. 165+78.87	868,500.48	582,192.24	ANGLE PT.	0.00	0.00	0.00	N/A	N/A
7 Sta. 167+45.13	868,497.85	582,358.48	ANGLE PT.	0.00	0.00	0.00	N/A	N/A



1983 FCDMC AS-BUILTS OF BANK STABILIZATION (TYP)
LOOKING EAST STA.153+72.90 TO 168+00
N.T.S.

REVISED AS-BUILT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
1	ADDED ACESS RAMPS	17Dec07	MJH

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
LEVEE PLAN, PROFILE AND SECTIONS
STA. 158+00 TO STA. 168+00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

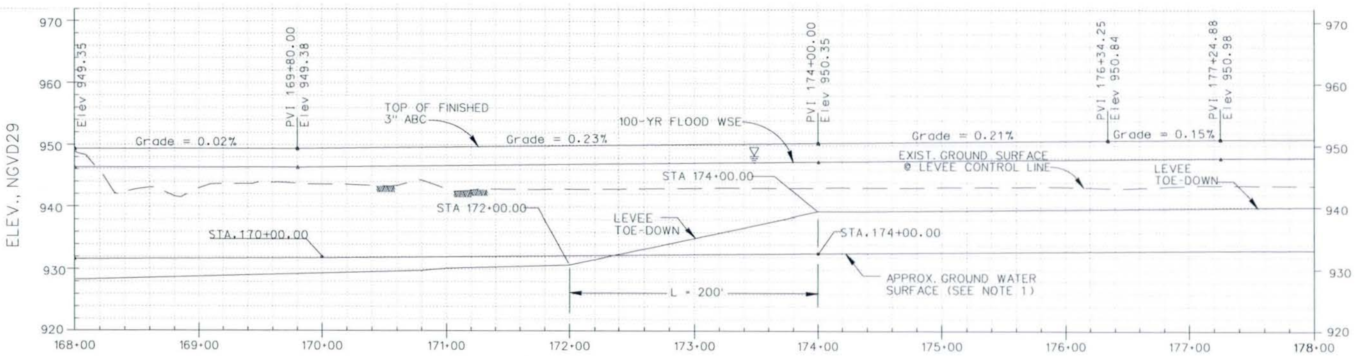
SPEC. NO. W912PL-05-B0004

DISTRICT FILE No. 203/323

SCALE: 501

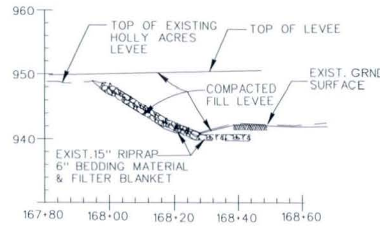
PLATE 5

SAFETY PAYS

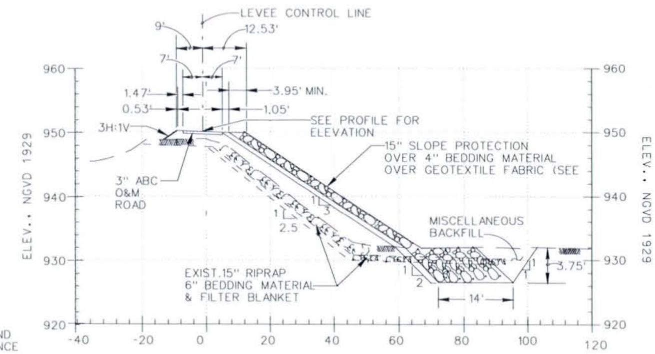


LEVEE CONTROL LINE AND TOE-DOWN PROFILE

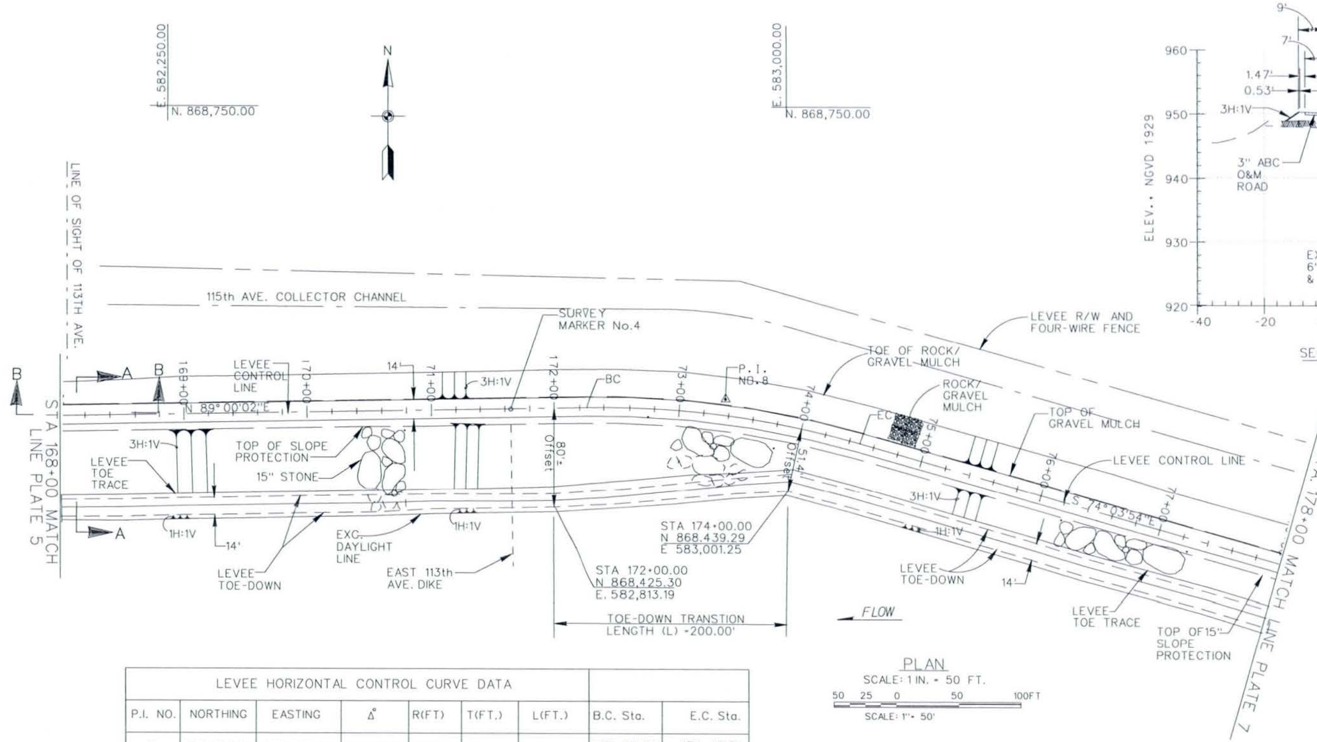
HORIZ. SCALE: 1" = 10'
VERT. SCALE: 1" = 50'



SECTION B-B
N.T.S.



SECTION A-A TYP (STA 168+00 TO STA 168+40)



PLAN
SCALE: 1 IN. = 50 FT.
SCALE: 1" = 50'

LEVEE HORIZONTAL CONTROL CURVE DATA

P.I. NO.	NORTHING	EASTING	Δ	R(FT)	T(FT.)	L(FT.)	B.C. Sta.	E.C. Sta.
8	868,508.21	582,952.54	16° 56' 03"	750.00	111.65'	221.67'	172+27.64	174+49.31

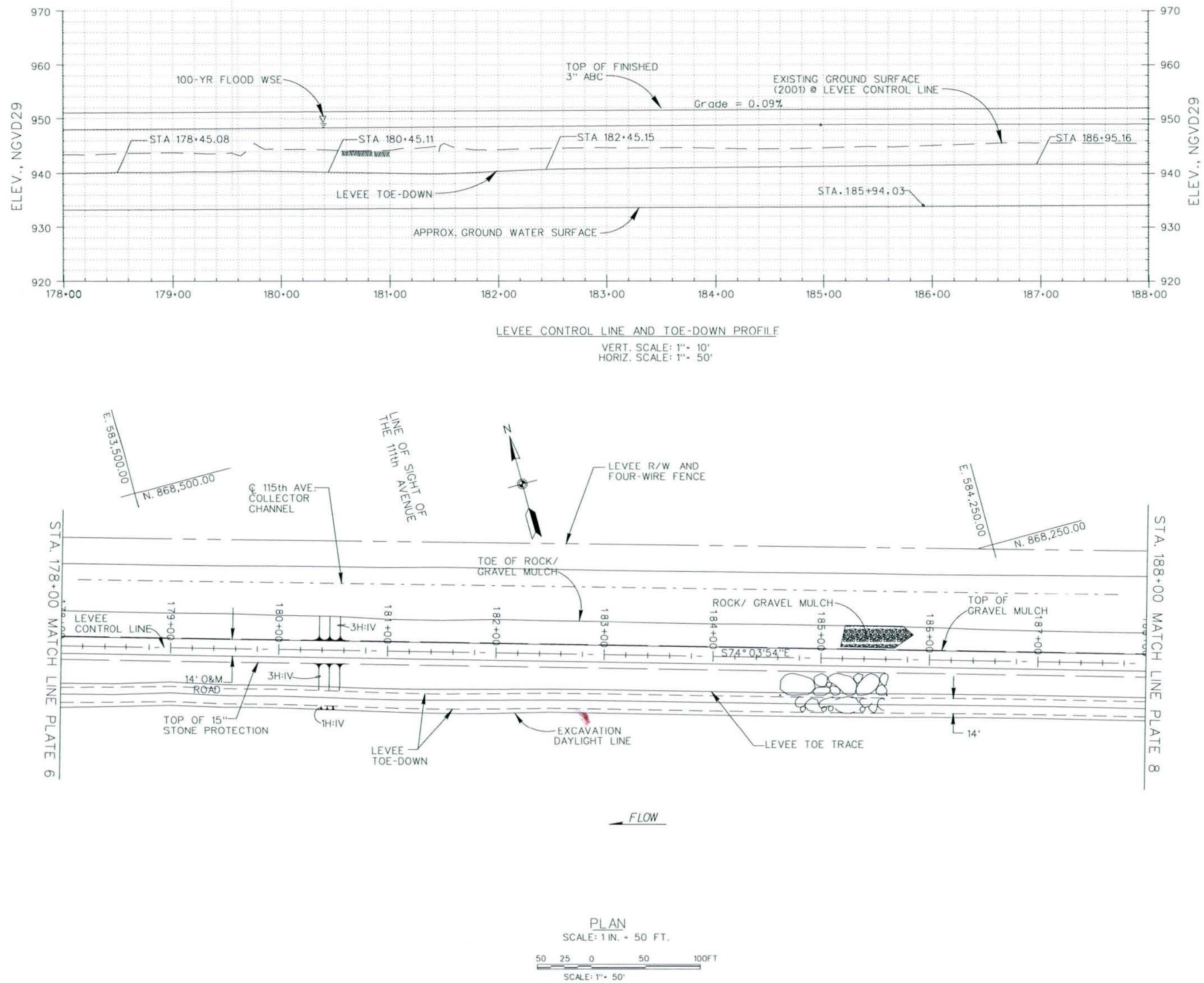
AS-BUILT

SYMBOL | DESCRIPTIONS | DATE | APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
LEVEE PLAN, PROFILE AND SECTIONS
STA. 168+00 TO STA. 178+00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC. NO. W912PL-05-B0004
DISTRICT FILE No. 203/324
SCALE: 50:1
PLATE 6



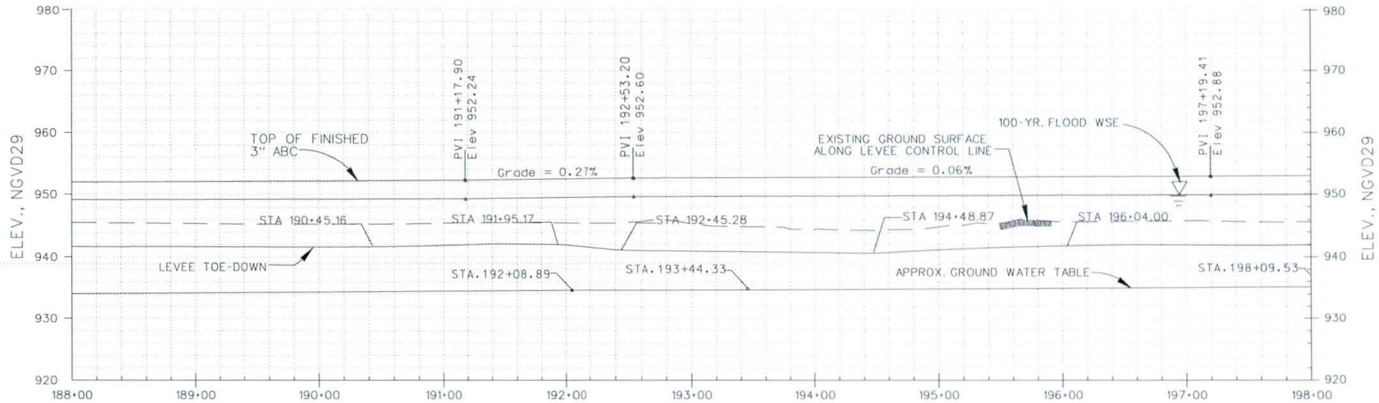
AS-BUILT

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

LEVEE PLAN AND PROFILE
STA. 178+00 TO STA. 188+00

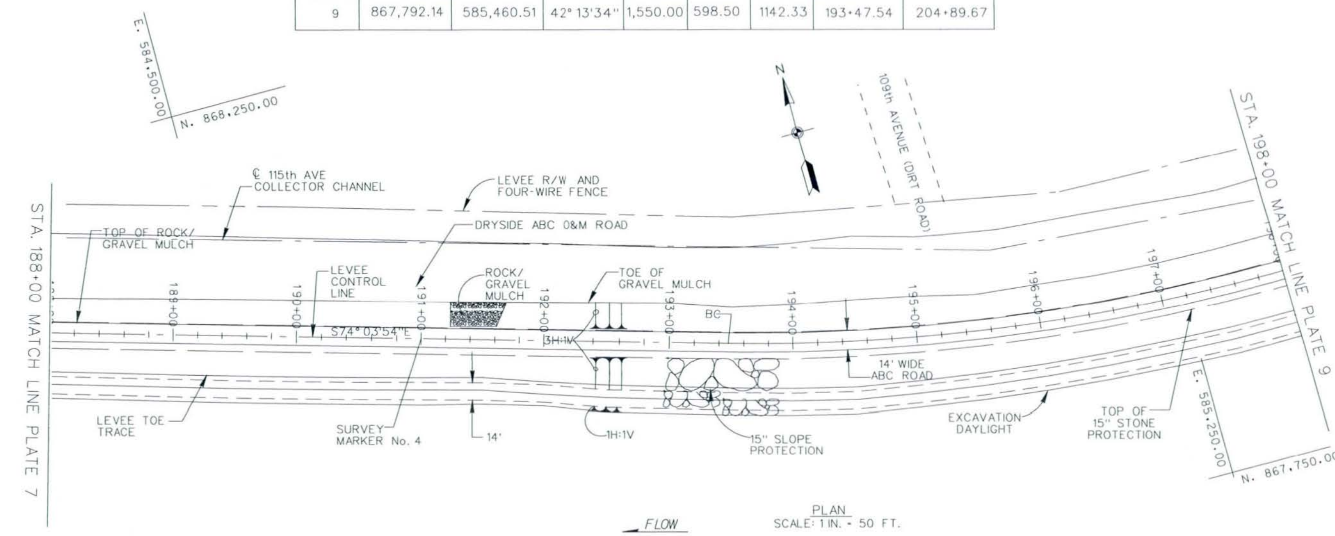
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC. NO. W912PL-05-B0004
DISTRICT FILE No. 203/325
SCALE 50:1
PLATE 7



LEVEE CONTROL LINE AND TOE-DOWN PROFILE
HORIZ. SCALE: 1"= 50'
VERT. SCALE: 1"= 10'

LEVEE CONTROL LINE HORIZONTAL CURVE DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(ft)	T(ft.)	L(ft)	B.C. Sta.	E.C. Sta.
9	867,792.14	585,460.51	42° 13'34"	1,550.00	598.50	1142.33	193+47.54	204+89.67



PLAN
SCALE: 1 IN. = 50 FT.

50 25 0 50 100FT
SCALE: 1"= 50'

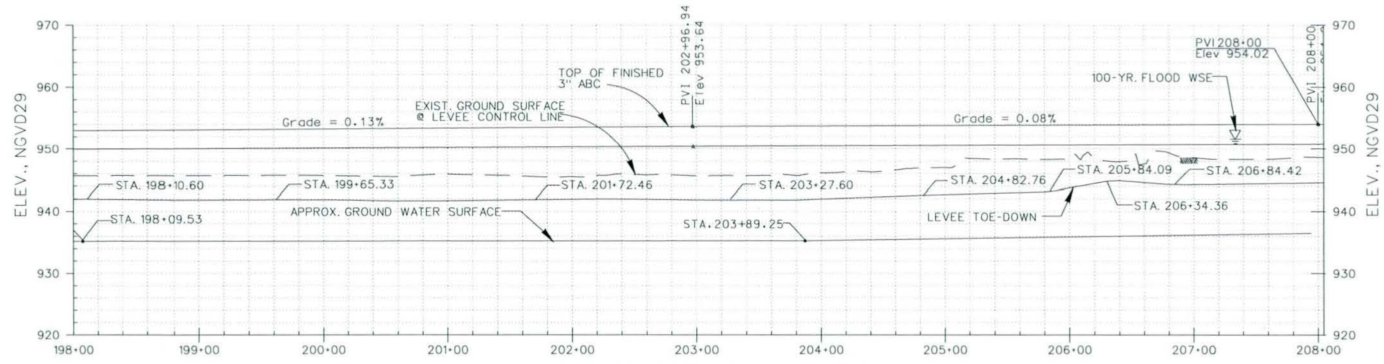
AS-BUILT

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
LEVEE PLAN AND PROFILE
STA. 188+00 TO STA. 198+00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

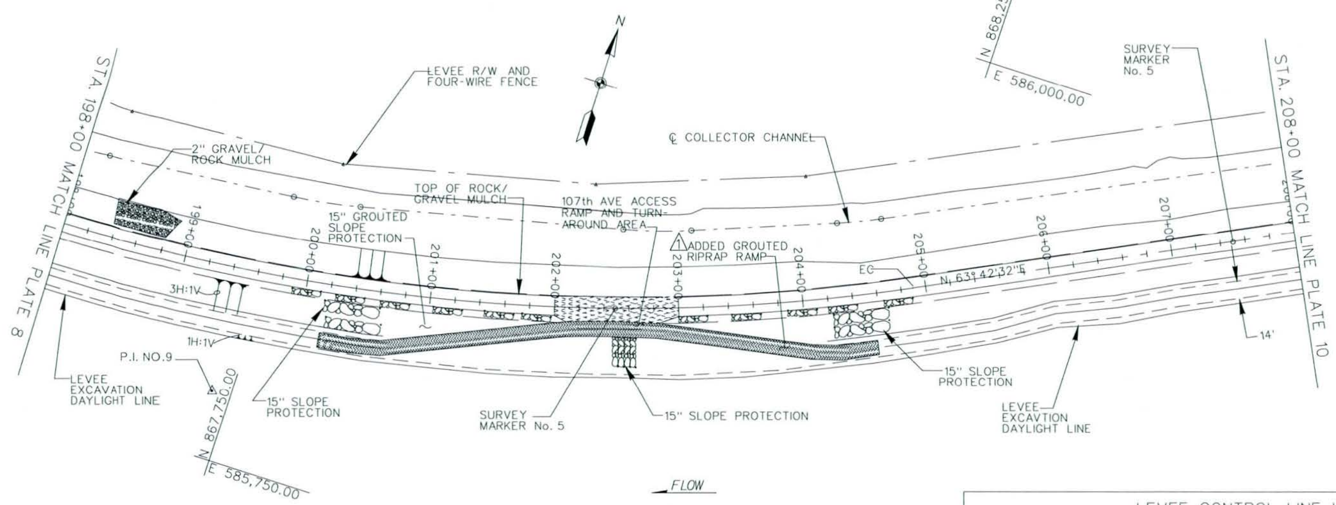
SYMBOL | DESCRIPTIONS | DATE | APPROVAL

SPEC. NO. W912PL-05-B0004
DISTRICT FILE No. 203/326
SCALE: 501
PLATE 8



LEVEE CONTROL LINE AND TOE-DOWN PROFILE

HORIZ. SCALE: 1"= 50'
VERT. SCALE: 1"= 10'



PLAN
SCALE: 1 IN. = 50 FT.

50 25 0 50 100FT
SCALE: 1"= 50'

LEVEE CONTROL LINE HORIZONTAL CURVE DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(ft)	T(ft.)	L(ft)	B.C. Sta.	E.C. Sta.
9	867,792.14	585,460.51	42° 13'34"	1,550.00	598.50	1142.33	193+47.54	204+89.67

REVISED
AS-BUILT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	Removed Grouted Slope Protection Notes		
1	Added Grouted Riprap Ramp	10Dec07	MJH

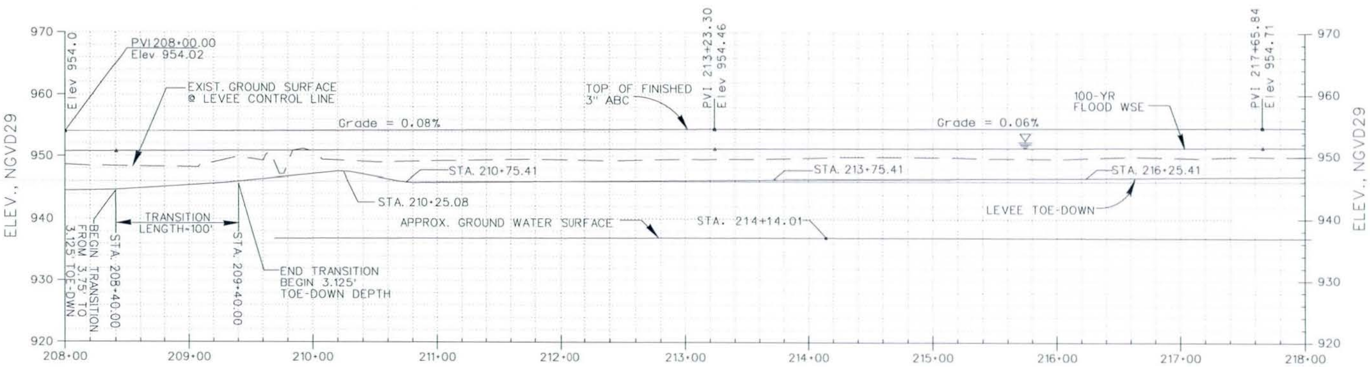
TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

LEVEE PLAN AND PROFILE
STA. 198+00 TO 208+00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC. NO. W912PL-05-B0004
DISTRICT FILE No. 203/327
SCALE 50:1
PLATE 9

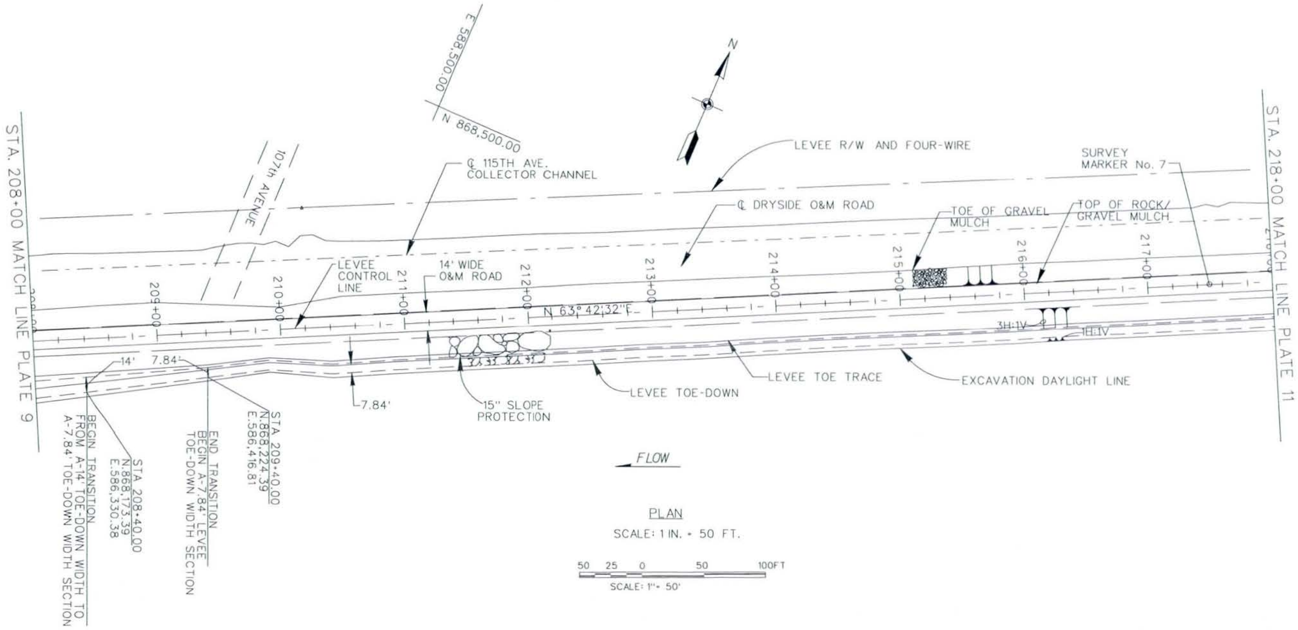
VALUE ENGINEERING PAYS



LEVEE CONTROL LINE AND TOE-DOWN PROFILE

HORIZ. SCALE: 1"= 50'

VERT. SCALE: 1"= 10'



PLAN

SCALE: 1 IN. = 50 FT.

50 25 0 50 100FT

SCALE: 1"= 50'

AS-BUILT

SYMBOL | DESCRIPTIONS | DATE | APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

LEVEE PLAN AND PROFILE
STA. 208+00 TO STA. 218+00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC. NO. W912PL-05-B0004

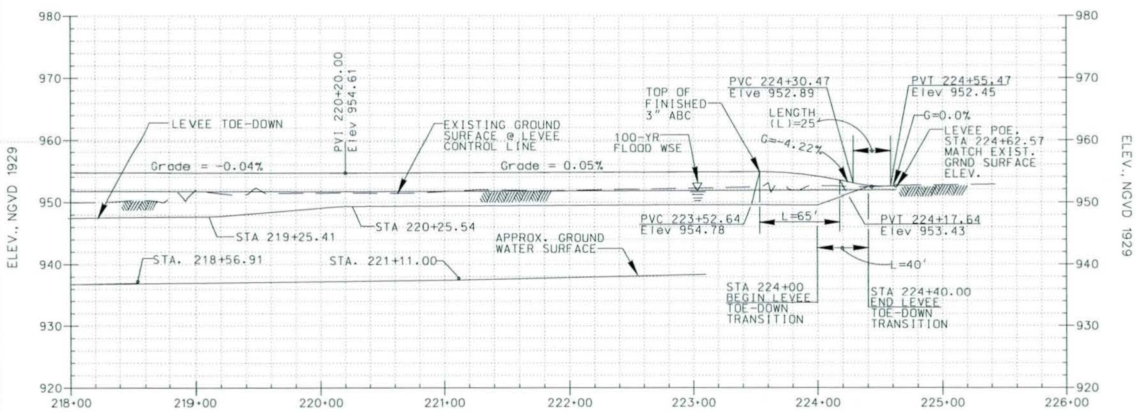
DISTRICT FILE No. 203/328

SCALE: 501

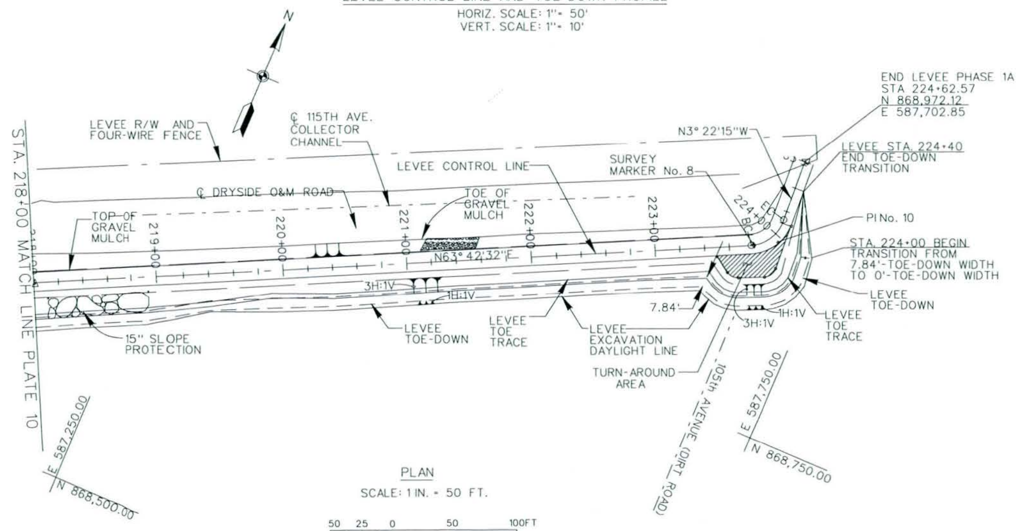
PLATE 10

SAFETY PAYS

5 VALUE ENGINEERING PAYS 4



LEVEE CONTROL LINE AND TOE-DOWN PROFILE
HORIZ. SCALE: 1"= 50'
VERT. SCALE: 1"= 10'



PLAN
SCALE: 1 IN. = 50 FT.
50 25 0 50 100FT
SCALE: 1"= 50'

AS-BUILT

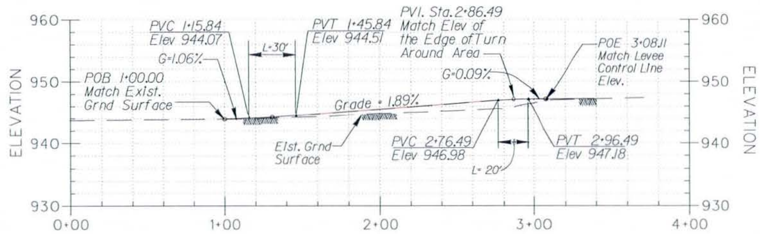
SAFETY PAYS

SYMBOL | DESCRIPTIONS | DATE | APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
LEVEE PLAN AND PROFILE
STA. 218+00 TO STA. 224+62.57

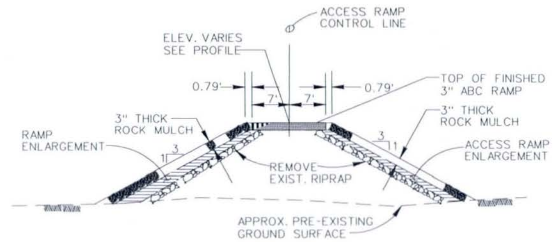
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC. NO. W912PL-05-B0004
DISTRICT FILE No. 203/329
SCALE: 50:1
PLATE 11



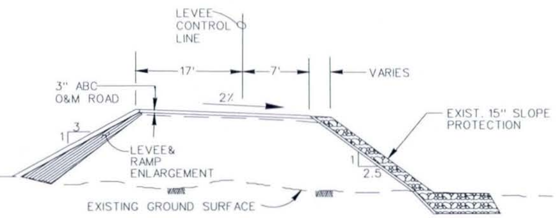
115TH AVE. ACCESS RAMP ℄ PROFILE

SCALE: VERT. 1 IN. = 10 FT.
SCALE: HORIZ. 1 IN. = 40 FT.

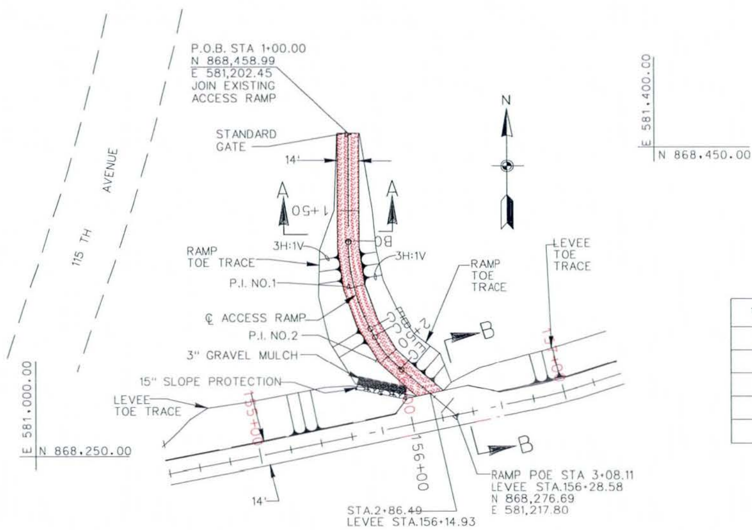


SECTION A-A
N.T.S.

115TH AVE. ACCESS RAMP ℄ HORIZONTAL CONTROL POINT DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(ft)	T(ft.)	L(ft)	B.C. Sta.	E.C. Sta.
1	868,359.38	581,202.42	27° 43'55" LF	120.00	29.62	58.08	1+69.99	2+28.07
2	868,315.39	581,225.52	22° 22'58" LT	70.00	13.58	27.35	2+34.29	2+61.63



SECTION B-B
LEVEE STA. 156+00 TO STA 156+40
N.T.S.

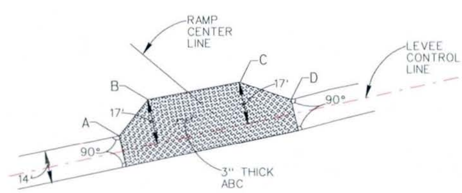


115TH AVE. ACCESS RAMP PLAN

SCALE: 1 IN. = 40 FT.

40 20 0 40 80FT
SCALE: 1''= 40'

115TH AVE. TURN AROUND HORIZ CONTROL POINTS DATA			
POINT	LEVEE STA.	NORTHING	EASTING
A	155+90.00	868,277.10	581,323.30
B	156+00.00	868,287.49	581,240.35
C	156+40.00	868,295.66	581,279.50
D	156+60.00	868,291.40	581,300.82



ENLARGED TURNAROUND AREA DETAIL

N.T.S.

AS-BUILT

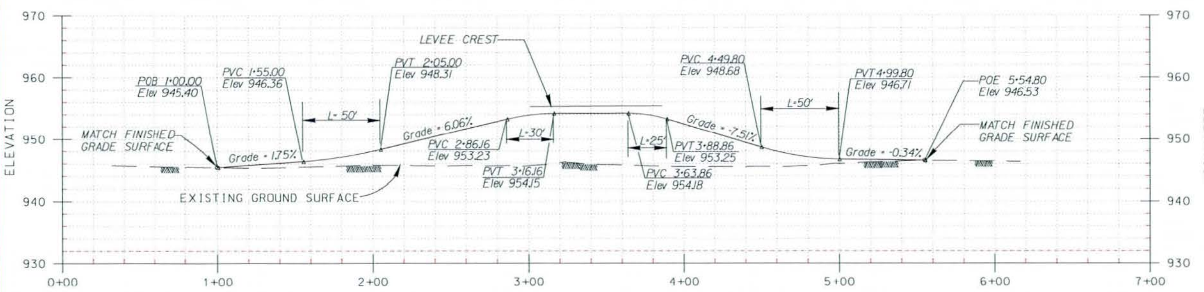
TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

115th AVENUE ACCESS RAMP
PLAN, PROFILE, SECTION AND DETAIL

SPEC NO. W912PL-05-B0004

DISTRICT FILE No. 203/339

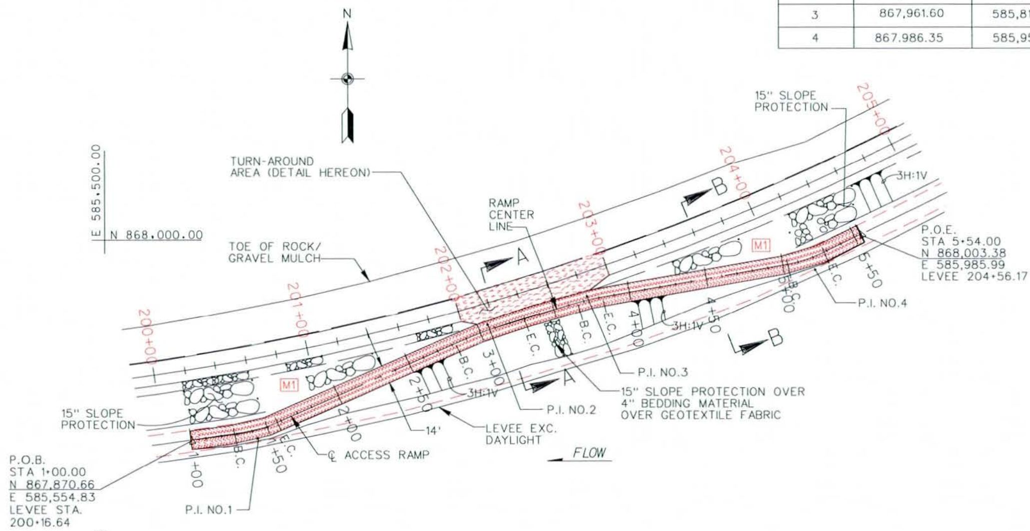
SCALE 401 PLATE 12



107TH AVE. ACCESS RAMP ℄ PROFILE

SCALE: VERT. 1 IN. = 10 FT.
SCALE: HORIZ. 1 IN. = 40 FT.

107TH AVE. ACCESS RAMP ℄ HORIZONTAL CURVE DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(ft)	T(ft.)	L(ft)	B.C. Sta.	E.C. Sta.
1	867,876.33	585,597.80	16° 28'02"LF	100.00	28.88'	28.74'	1+28.88	1+57.62
2	867,942.62	585,746.77	7° 43'35" RT	350.00	124.94	47.20	2+82.56	3+29.76
3	867,961.60	585,811.83	6° 10'51" RT	150.00	36.04	16.18	3+65.80	3+81.98
4	867,986.35	585,951.07	15° 54'26"LF	90.00	120.76	24.99	5+02.74	5+27.72

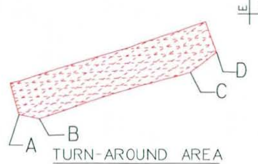


107TH AVE. ACCESS RAMP PLAN

SCALE: 1 IN. = 40 FT.

40 20 0 40 80FT

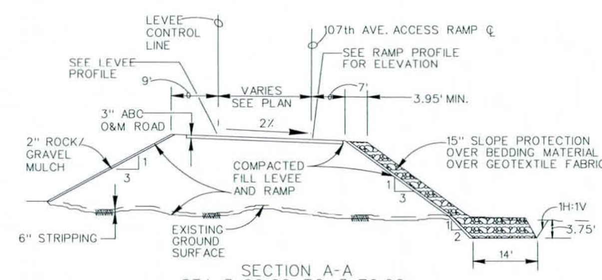
SCALE: 1'' = 40'



TURN-AROUND AREA

N.T.S.

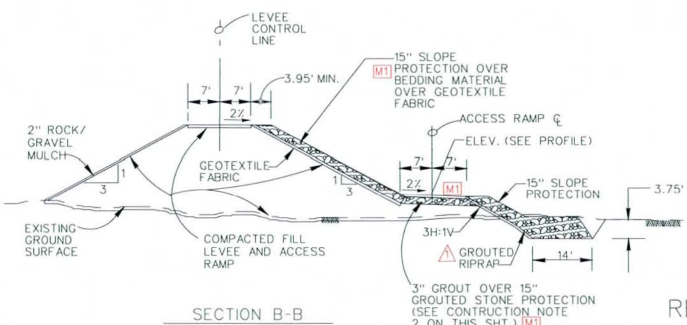
107TH AVE. TURN AROUND HORIZ CONTROL POINTS DATA			
POINT	LEVEE STA.	NORTHING	EASTING
A	202+00.00	867,947.14	585,728.83
B	202+08.67	867,945.38	585,739.08
C	202+84.65	867,967.58	585,812.11
D	203+00.00	867,977.50	585,824.65



SECTION A-A

STA 3+00.00 TO 3+76.00±

N.T.S.



SECTION B-B

N.T.S.

REVISED AS-BUILT

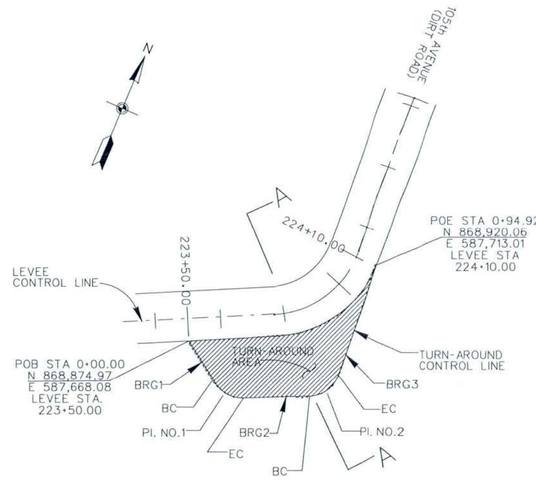
SYMBOL	DESCRIPTIONS	DATE	APPROVAL
△	Added Grouted Riprap Removed Grouted Slope Protection Ramps	3 Sep 07	MJH
M1	MODIFIED THE DWG BY DELETING GROUT AND 3" ABC FOR THE RAMP UPPER SLOPE AND THE O&M ROAD RESPECTIVELY. ADDED 15" GROUTED STONE AND 3" THICK GROUT FOR THE ENTIRE O&M ROAD SURFACE.		

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

107TH AVE. ACCESS RAMP
PLAN, PROFILE AND SECTIONS

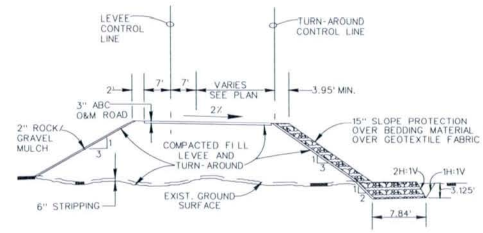
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SCALE: 40:1 | PLATE 13 | DISTRICT FILE No. 203/340 | SPEC. NO. W912PL-05-B0004



TURN-AROUND AREA PLAN

N.T.S.



SECTION A-A TYP

RAMP STA. 00+00.00 TO STA. 0+94.92

LEVEE STA. 223+50.00 TO STA. 224+10.00

N.T.S.

TURN-AROUND CONTROL LINE HORIZONTAL CURVE DATA									BEARING TANGENT	
P.I. NO.	NORTHING	EASTING	Δ°	R(ft)	T(ft.)	L(ft)	B.C. Sta.	E.C. Sta.	BRG1	S54° 40'27"E
1	868,862.81	587,685.23	60° 12'14"LF	10.00	5.80	10.51	0+15.23	0+25.73	BRG2	N65° 07'19"E
2	868,876.84	587,715.49	68° 24'29"LF	10.00	6.80	11.94	0+46.49	0+58.43	BRG3	N3° 17'10"W

AS-BUILT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

105TH AVE. TURN-AROUND AREA PLAN AND SECTION

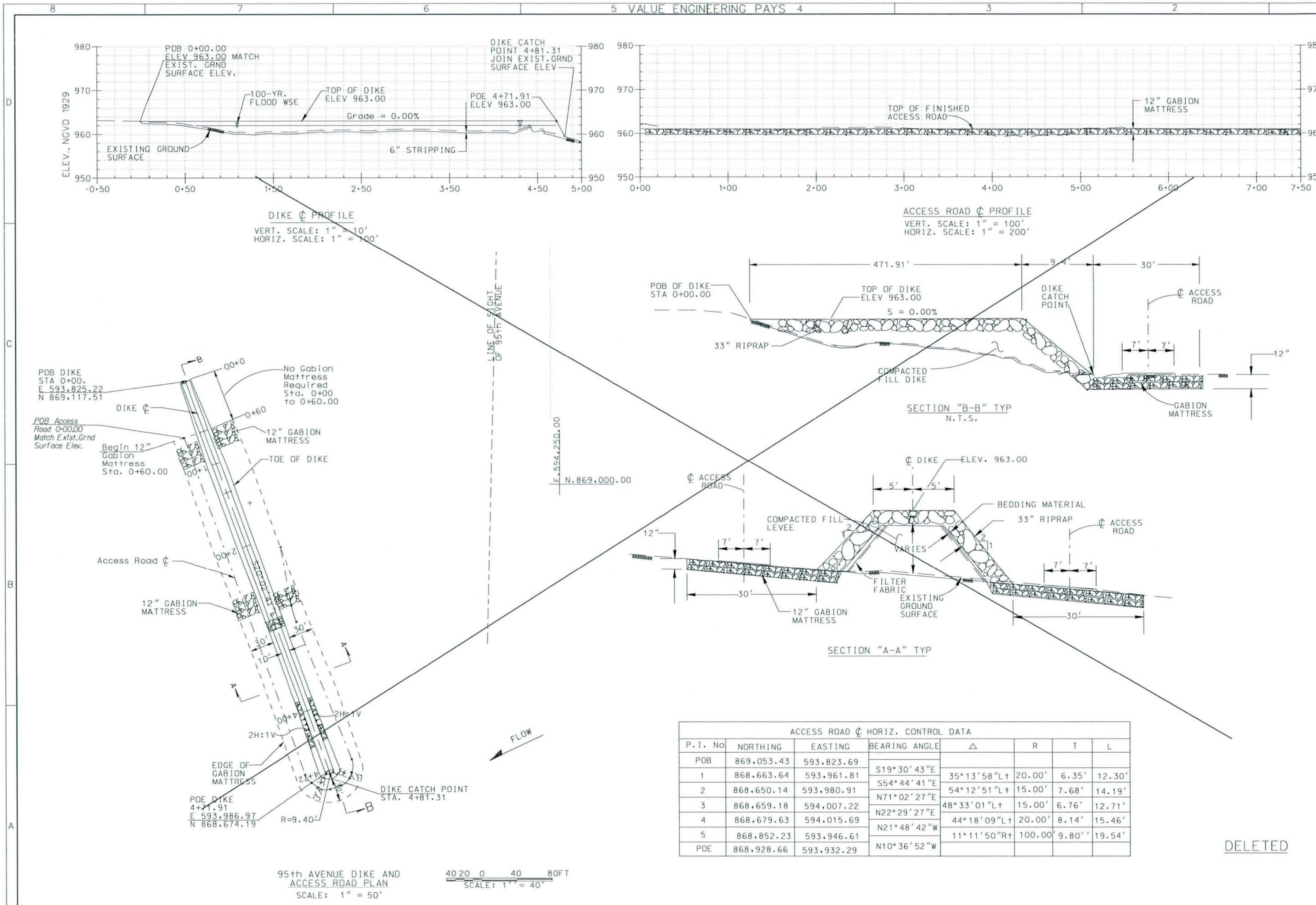
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC. NO. W912PL-05-B0004

DISTRICT FILE No. 203/341

SCALE 50:1

PLATE 14



ACCESS ROAD ℄ HORIZ. CONTROL DATA

P.I. No	NORTHING	EASTING	BEARING ANGLE	Δ	R	T	L
POB	869.053.43	593.823.69					
			S19°30'43"E				
1	868.663.64	593.961.81		35°13'58"Lt	20.00'	6.35'	12.30'
			S54°44'41"E				
2	868.650.14	593.980.91		54°12'51"Lt	15.00'	7.68'	14.19'
			N71°02'27"E				
3	868.659.18	594.007.22		48°33'01"Lt	15.00'	6.76'	12.71'
			N22°29'27"E				
4	868.679.63	594.015.69		44°18'09"Lt	20.00'	8.14'	15.46'
			N21°48'42"W				
5	868.852.23	593.946.61		11°11'50"Rt	100.00'	9.80'	19.54'
			N10°36'52"W				
POE	868.928.66	593.932.29					

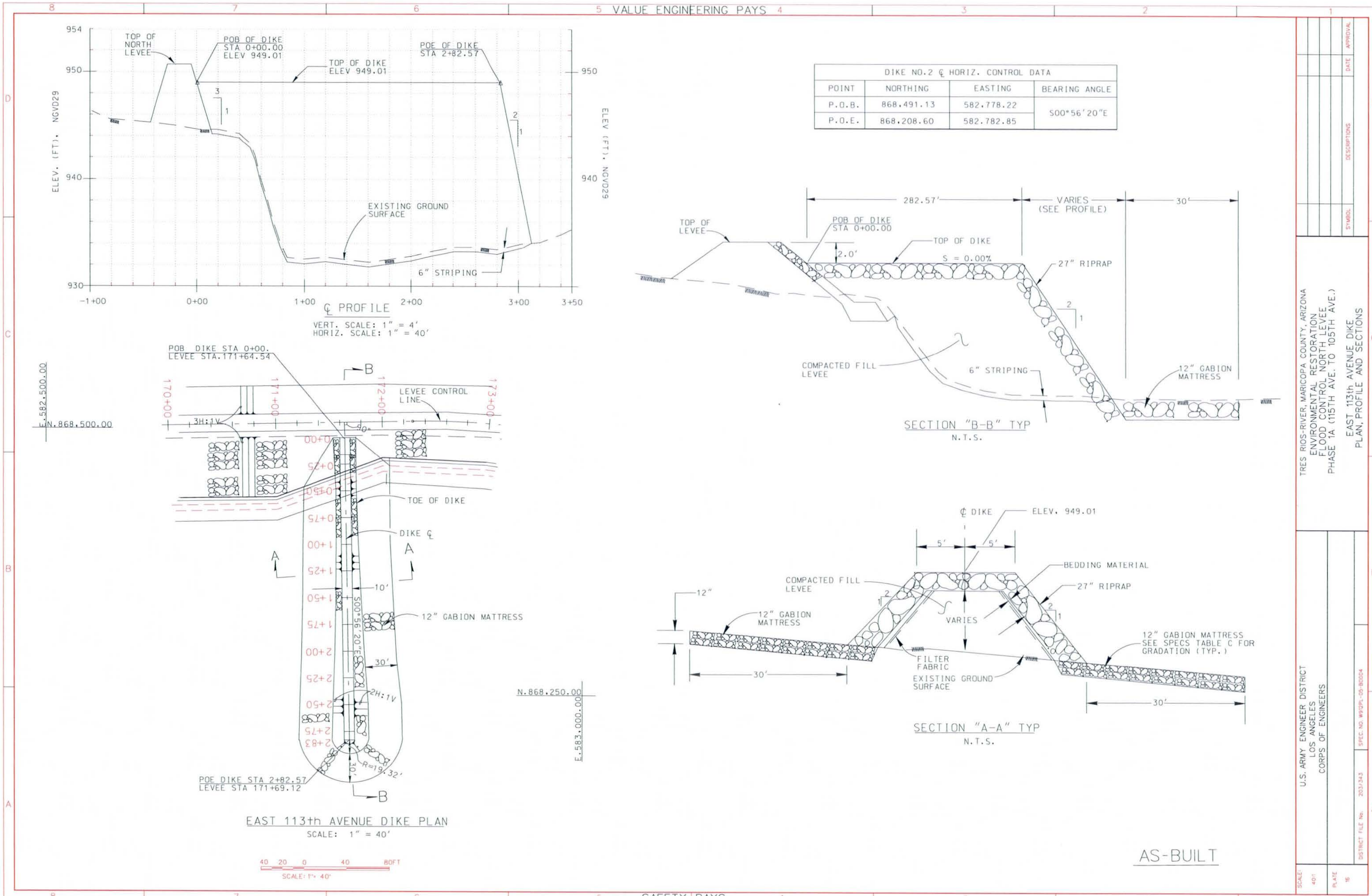
DELETED

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

95th AVENUE DIKE AND ACCESS ROAD
PLANS, PROFILES AND SECTIONS

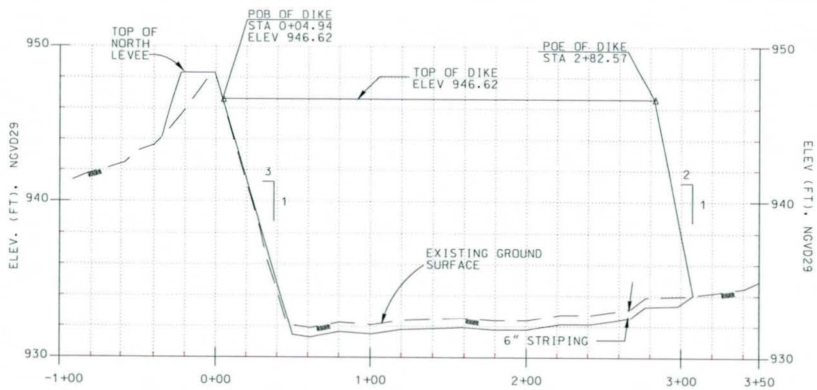
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SCALE: 40:1 | PLATE 15 | DISTRICT FILE No. 203/342 | SPEC. NO. W912PL-05-B0004



DIKE NO.2 ℄ HORIZ. CONTROL DATA			
POINT	NORTHING	EASTING	BEARING ANGLE
P.O.B.	868,491.13	582,778.22	S00°56'20"E
P.O.E.	868,208.60	582,782.85	

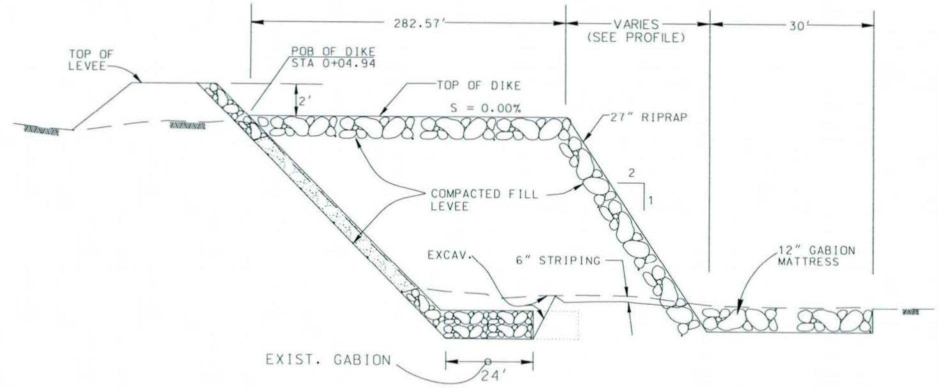
VALUE ENGINEERING PAYS



℄ PROFILE

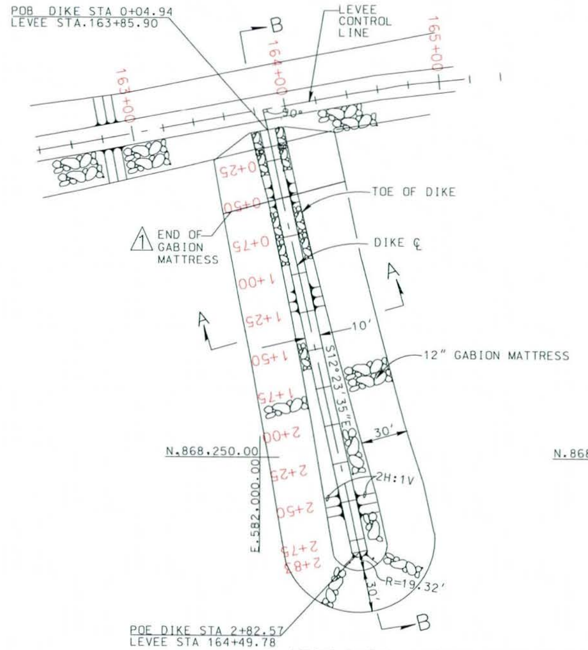
VERT. SCALE: 1" = 4'
HORIZ. SCALE: 1" = 40'

DIKE NO.3 ℄ HORIZ. CONTROL DATA			
POINT	NORTHING	EASTING	BEARING ANGLE
P.O.B.	868,461.53	582,004.18	S12°23'35"E
P.O.E.	868,189.93	582,063.85	



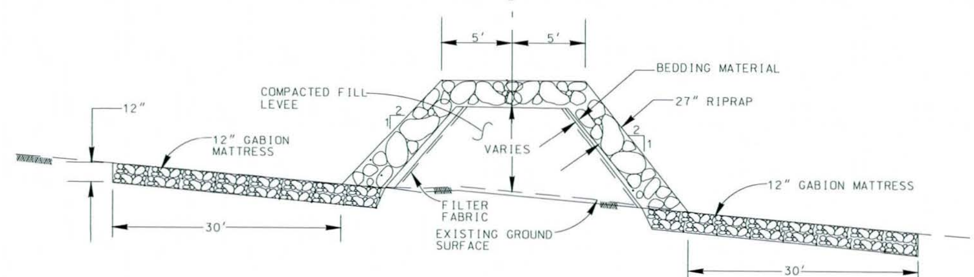
SECTION "B-B" TYP

N.T.S.



WEST 113th AVENUE DIKE PLAN

SCALE: 1" = 40'



SECTION "A-A" TYP

N.T.S.

REVISED AS-BUILT

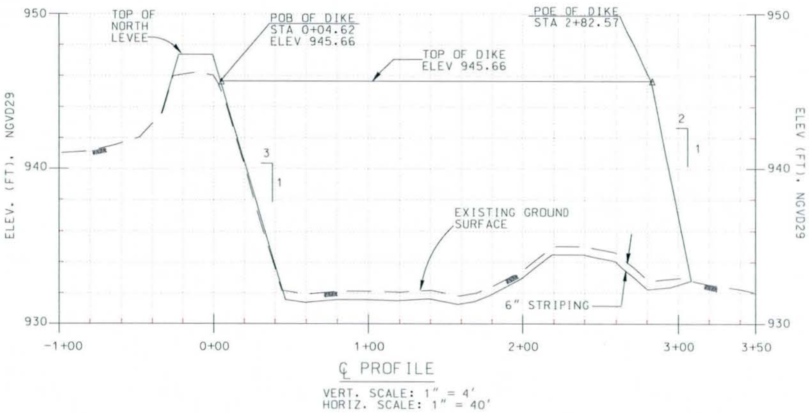
SAFETY PAYS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

WEST 113th AVENUE DIKE
PLAN, PROFILE AND SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

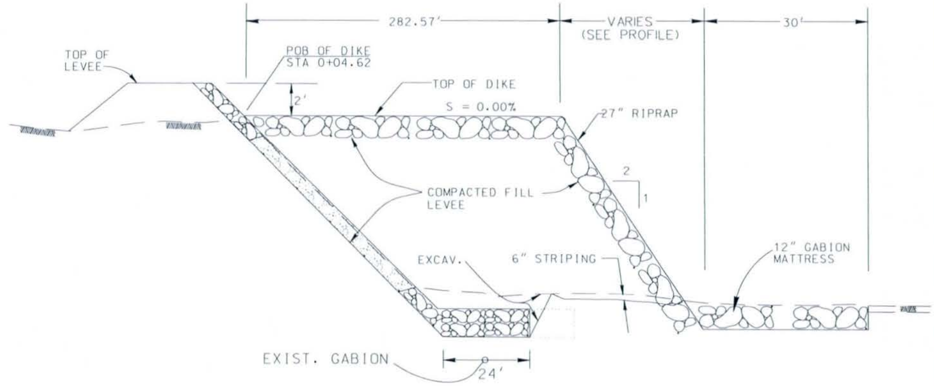
SPEC. NO. W912PL-05-B0004
DISTRICT FILE No. 203/344
PLATE 17



℄ PROFILE

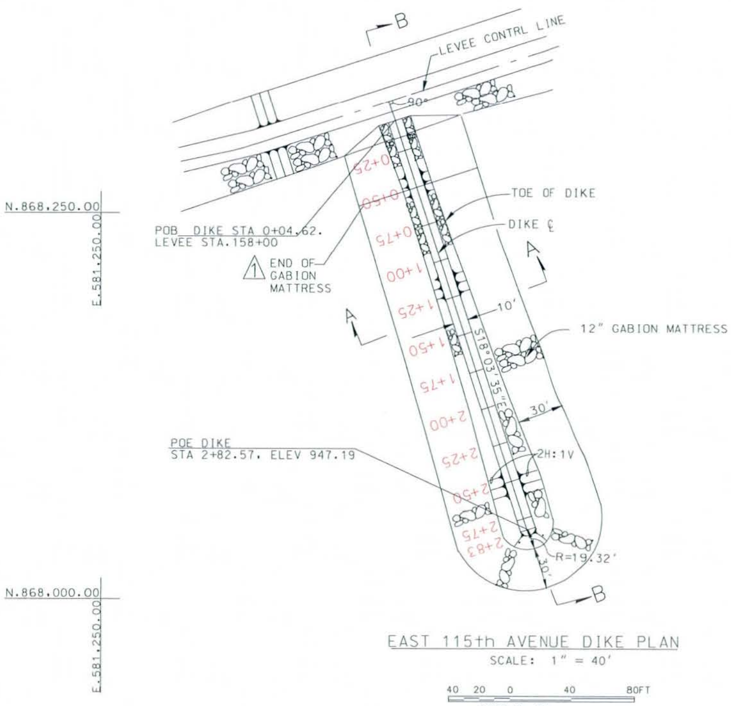
VERT. SCALE: 1" = 4'
HORIZ. SCALE: 1" = 40'

DIKE NO.4 ℄ HORIZ. CONTROL DATA			
POINT	NORTHING	EASTING	BEARING ANGLE
P.O.B.	868,309.86	581,440.84	S18°03'35"E
P.O.E.	868,045.60	581,527.02	



SECTION "B-B" TYP

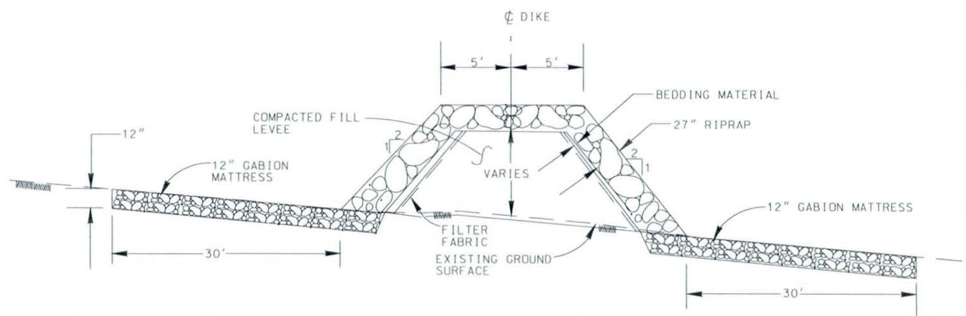
N.T.S.



EAST 115th AVENUE DIKE PLAN

SCALE: 1" = 40'

40 20 0 40 80FT
SCALE: 1"= 40'



SECTION "A-A" TYP

N.T.S.

REVISED AS-BUILT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
1	Revised e. 115th Ave Dike Plan	3Jan08	MJH

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

EAST 115th AVENUE DIKE
PLAN, PROFILE AND SECTIONS

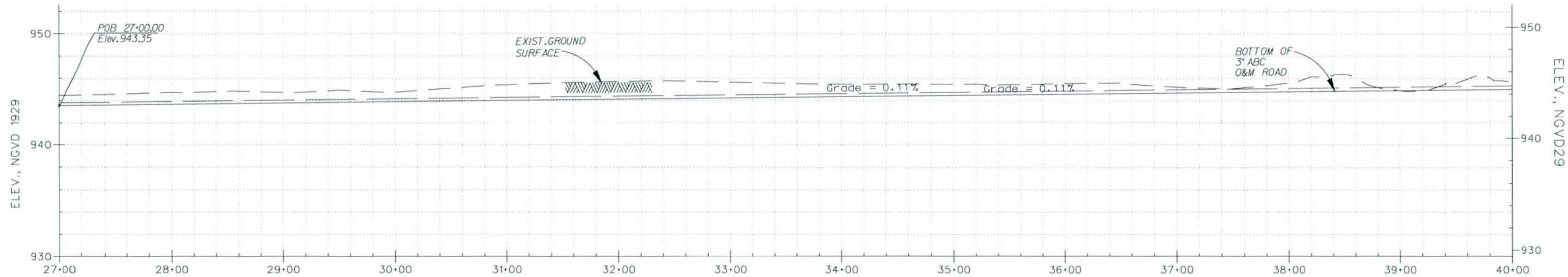
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC NO. W912PL-05-B0004

DISTRICT FILE No. 203/345

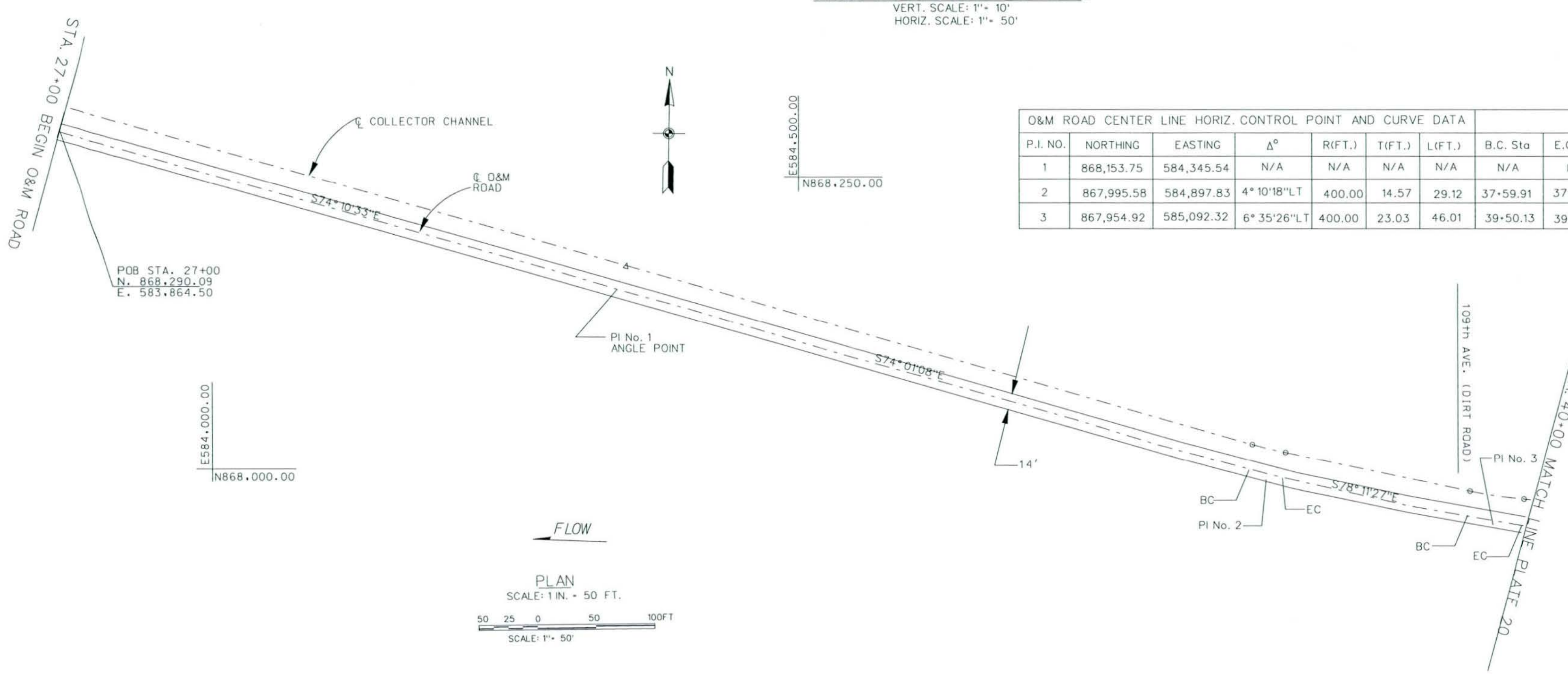
SCALE: 40:1

PLATE 18



DRYSIDE O&M ROAD CENTER LINE PROFILE
VERT. SCALE: 1"= 10'
HORIZ. SCALE: 1"= 50'

O&M ROAD CENTER LINE HORIZ. CONTROL POINT AND CURVE DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(FT.)	T(FT.)	L(FT.)	B.C. Sta	E.C. Sta
1	868,153.75	584,345.54	N/A	N/A	N/A	N/A	N/A	N/A
2	867,995.58	584,897.83	4° 10'18"LT	400.00	14.57	29.12	37+59.91	37+89.03
3	867,954.92	585,092.32	6° 35'26"LT	400.00	23.03	46.01	39+50.13	39+96.14



PLAN
SCALE: 1 IN. = 50 FT.

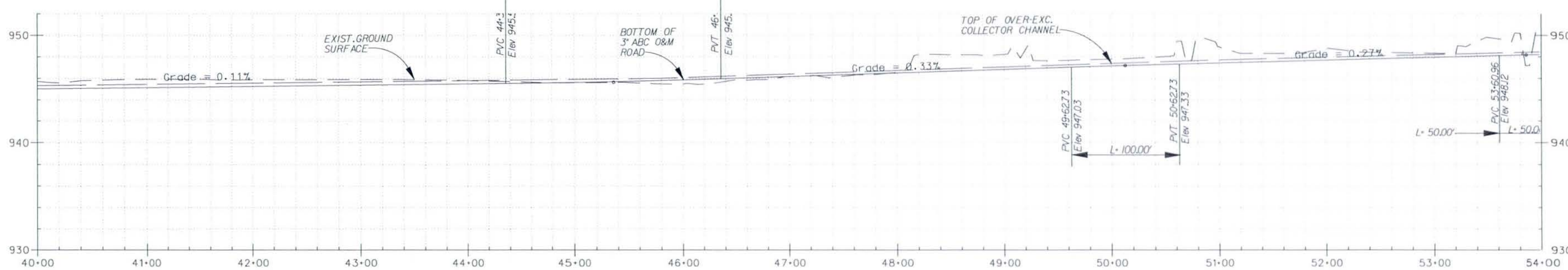
50 25 0 50 100FT
SCALE: 1"= 50'

AS-BUILT

SYMBOL | DESCRIPTIONS | DATE | APPROVAL

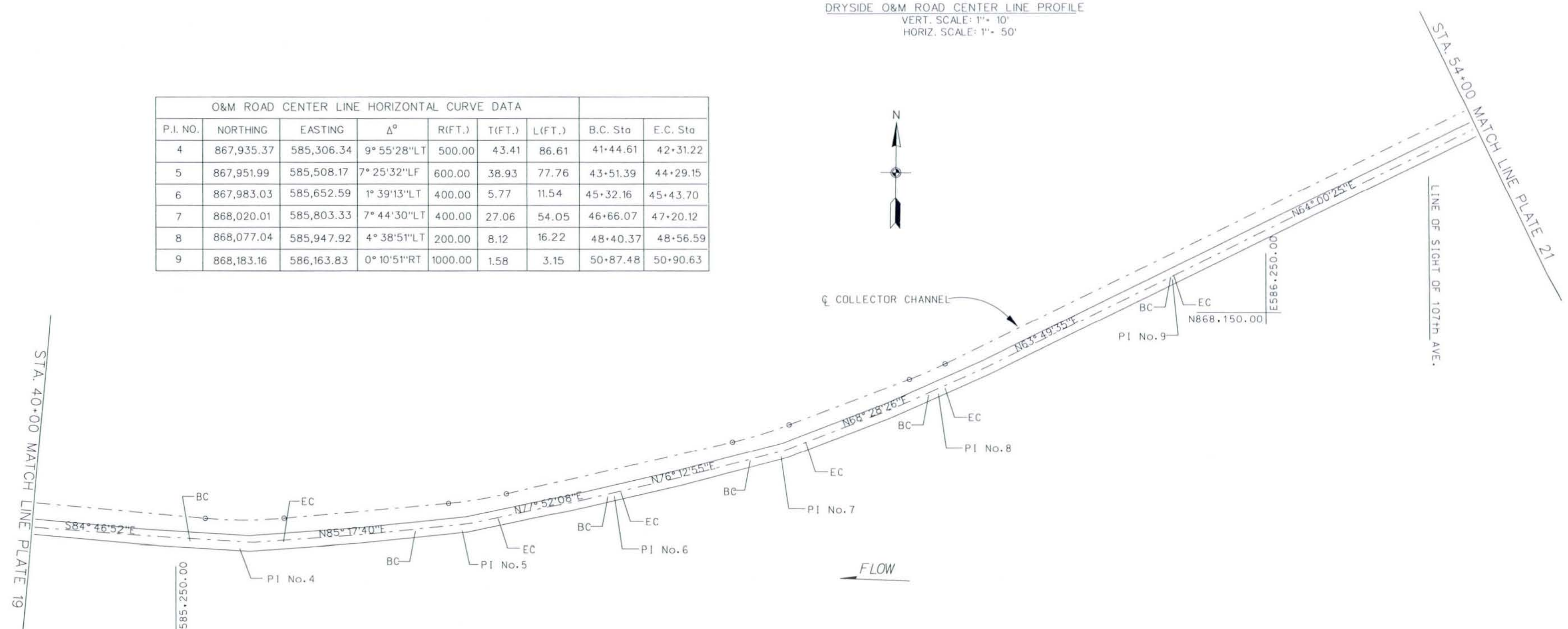
TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
DRYSIDE O&M ROAD
PLAN AND PROFILE
STA. 27+00TO STA. 40+00

SPEC. NO. W912PL-05-B0004
DISTRICT FILE No. 203/346
SCALE: 50:1
PLATE 19



DRYSIDE O&M ROAD CENTER LINE PROFILE
VERT. SCALE: 1"= 10'
HORIZ. SCALE: 1"= 50'

O&M ROAD CENTER LINE HORIZONTAL CURVE DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(FT.)	T(FT.)	L(FT.)	B.C. Sta	E.C. Sta
4	867,935.37	585,306.34	9° 55'28"LT	500.00	43.41	86.61	41+44.61	42+31.22
5	867,951.99	585,508.17	7° 25'32"LF	600.00	38.93	77.76	43+51.39	44+29.15
6	867,983.03	585,652.59	1° 39'13"LT	400.00	5.77	11.54	45+32.16	45+43.70
7	868,020.01	585,803.33	7° 44'30"LT	400.00	27.06	54.05	46+66.07	47+20.12
8	868,077.04	585,947.92	4° 38'51"LT	200.00	8.12	16.22	48+40.37	48+56.59
9	868,183.16	586,163.83	0° 10'51"RT	1000.00	1.58	3.15	50+87.48	50+90.63



PLAN
SCALE: 1 IN. = 50 FT.
50 25 0 50 100FT
SCALE: 1"= 50'

AS-BUILT

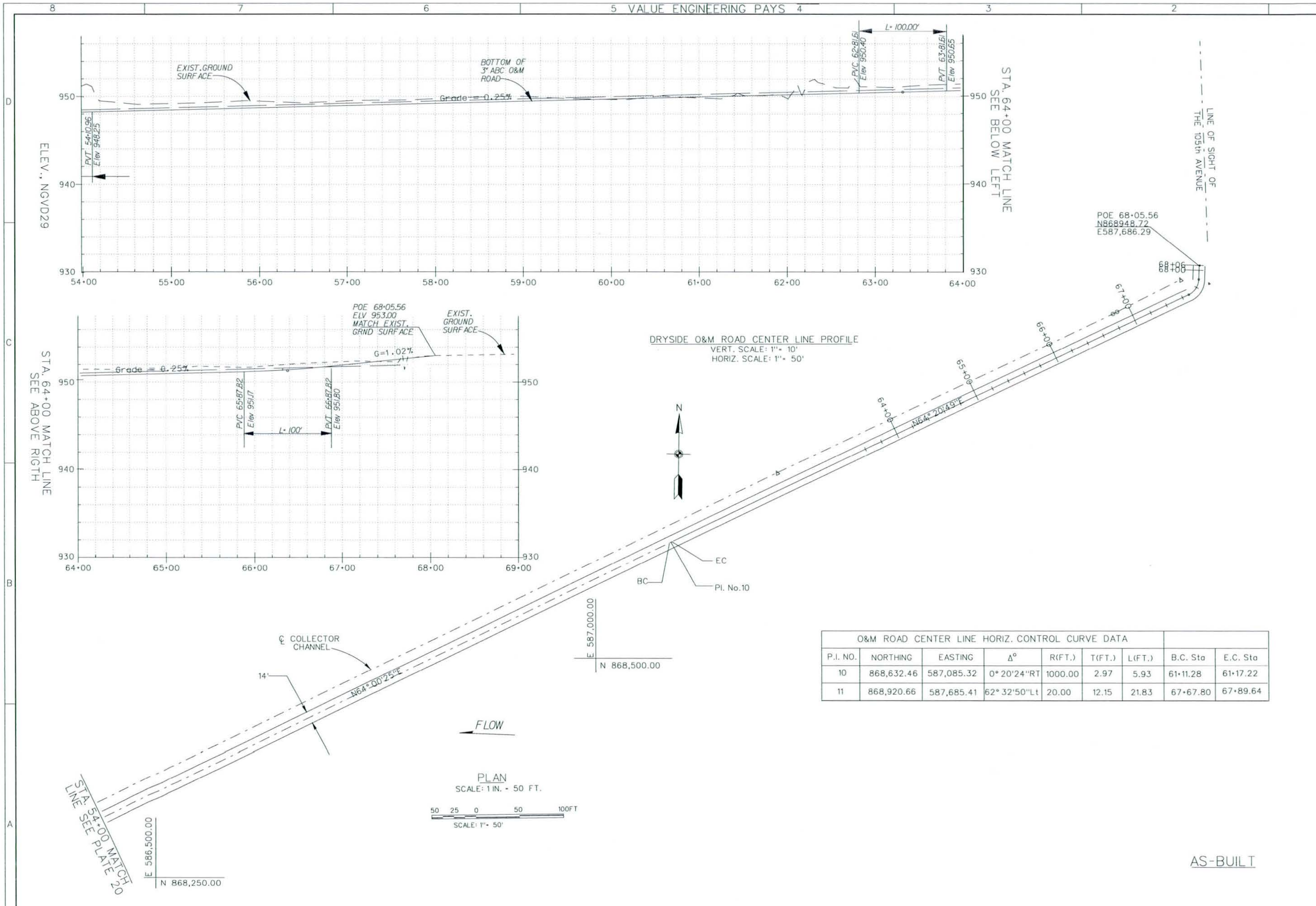
SYMBOL | DESCRIPTIONS | DATE | APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
DRYSIDE O&M ROAD
PLAN AND PROFILE
STA. 40+00 TO STA. 54+00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC NO. W912PL-05-B0004
DISTRICT FILE No. 203/347
SCALE: 50'
PLATE 20

VALUE ENGINEERING PAYS



O&M ROAD CENTER LINE HORIZ. CONTROL CURVE DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(FT.)	T(FT.)	L(FT.)	B.C. Sta	E.C. Sta
10	868,632.46	587,085.32	0° 20'24"RT	1000.00	2.97	5.93	61+11.28	61+17.22
11	868,920.66	587,685.41	62° 32'50"Lt	20.00	12.15	21.83	67+67.80	67+89.64

SYMBOL | DESCRIPTIONS | DATE | APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
DRYSIDE O&M ROAD
PLAN AND PROFILE
STA.54+00 TO STA. 68+05.56

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC. NO. W912PL-05-B0004

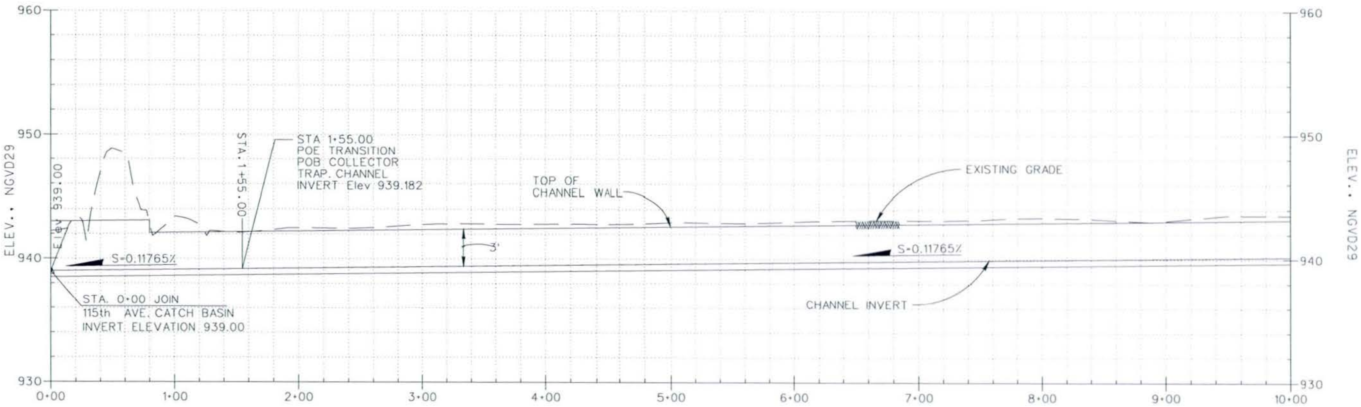
DISTRICT FILE No. 203/348

SCALE 501

PLATE 21

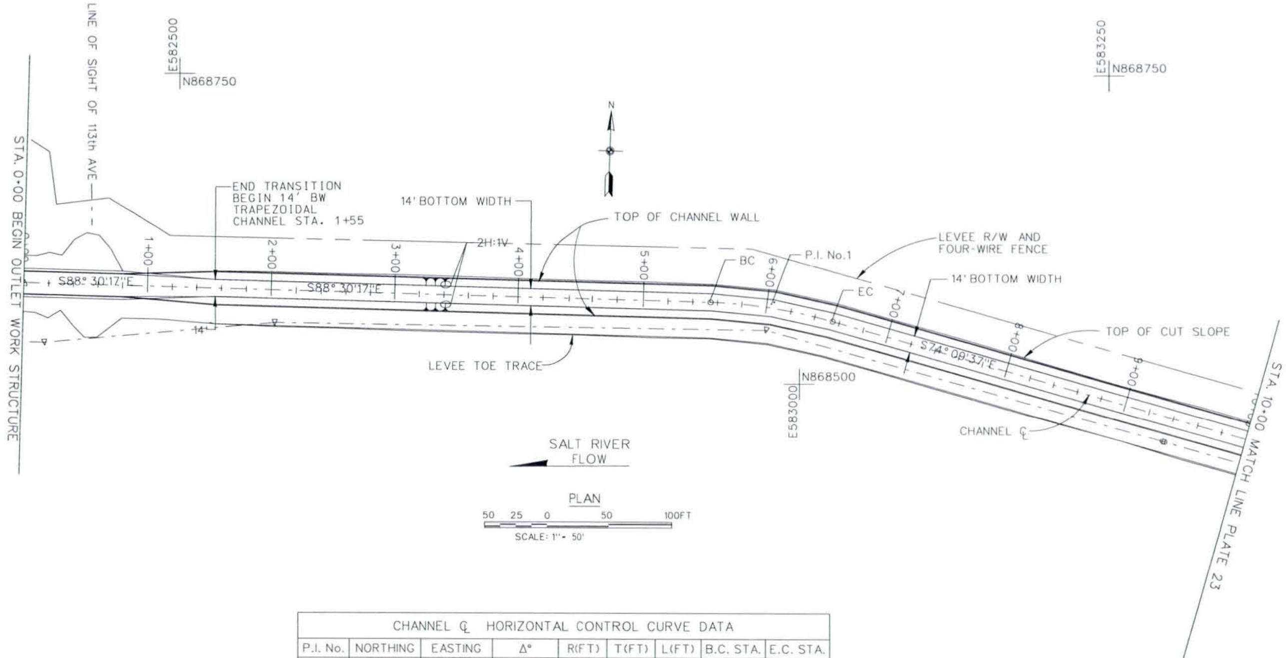
SAFETY PAYS

5 VALUE ENGINEERING PAYS 4



℄ PROFILE

VERT. SCALE: 1in = 5ft
HORIZ. SCALE: 1in = 50ft



PLAN

50 25 0 50 100FT

SCALE: 1" = 50'

CHANNEL ℄ HORIZONTAL CONTROL CURVE DATA

P.I. No.	NORTHING	EASTING	Δ°	R(FT)	T(FT)	L(FT)	B.C. STA.	E.C. STA.
1	868,564.49	582,977.52	14° 20'41"	400.00	50.34	100.14	5+53.66	6+53.80

AS-BUILT

SYMBOL | DESCRIPTIONS | DATE | APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
115th AVE. COLLECTOR CHANNEL
PLAN AND PROFILE
STA. 0+00 TO STA. 10+00

SPEC. NO. W912PL-05-B0004

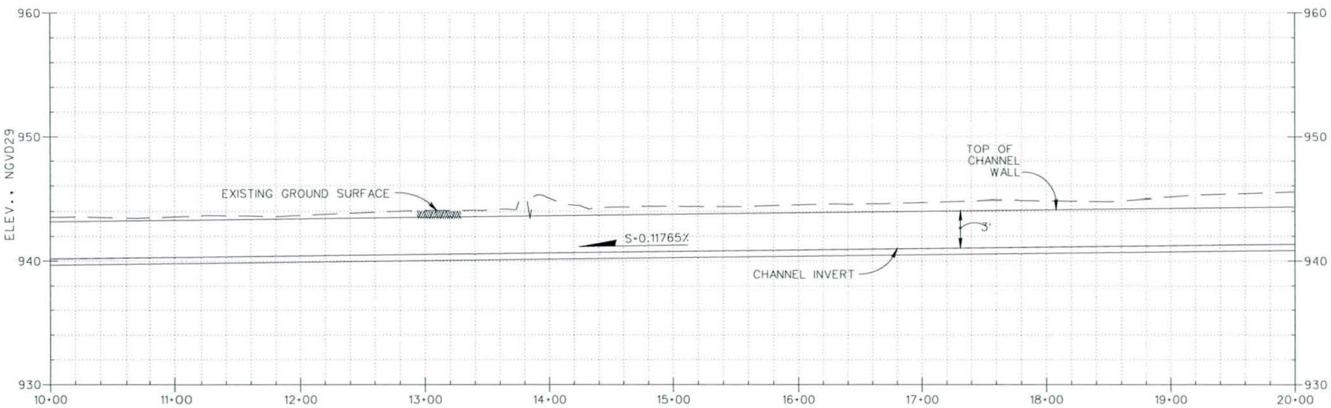
DISTRICT FILE No. 203/352

SCALE: 50:1

PLATE 22

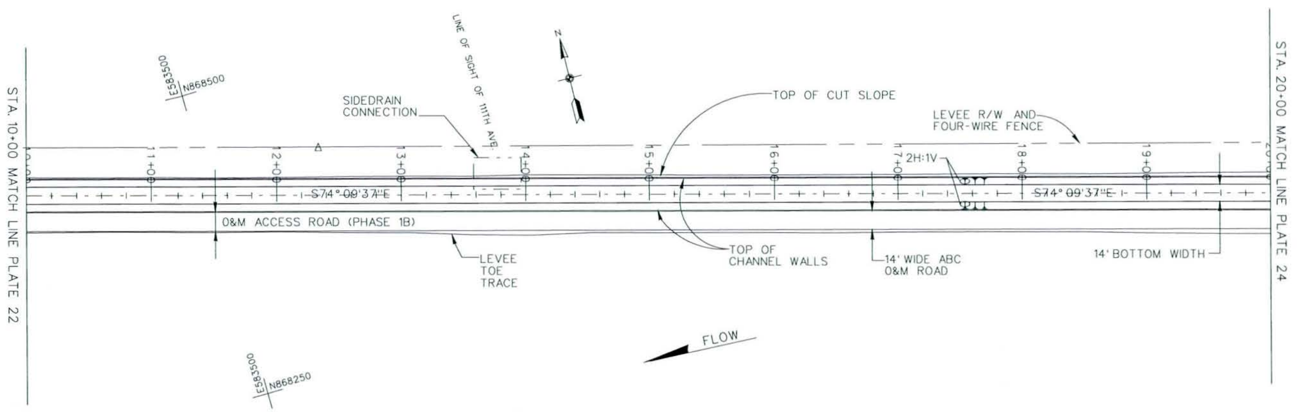
SAFETY PAYS

VALUE ENGINEERING PAYS



CHANNEL ℄ PROFILE

VERT. SCALE: 1in = 5ft
HORIZ. SCALE: 1in = 50ft



PLAN

50 25 0 50 100FT

SCALE: 1"= 50'

AS-BUILT

SAFETY PAYS

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

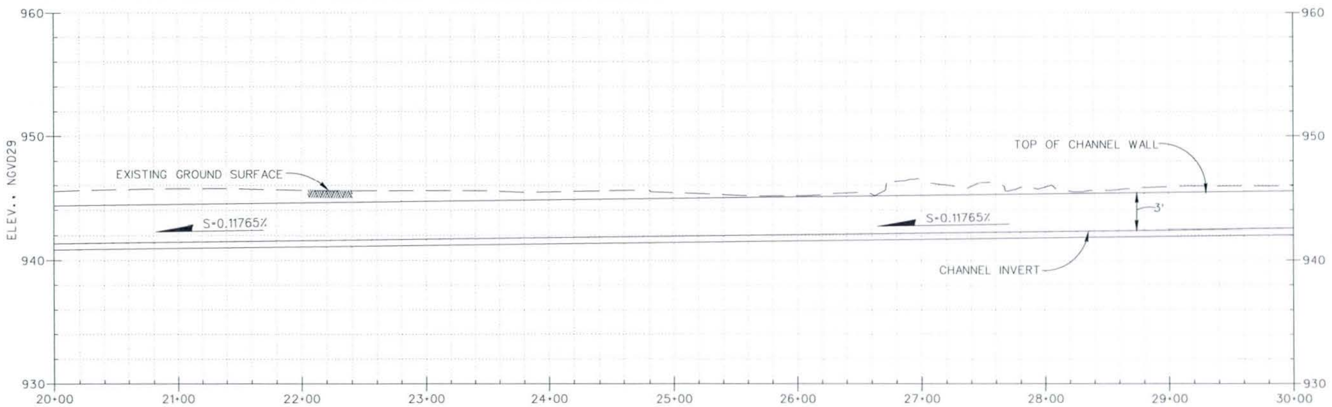
TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
115th AVE. COLLECTOR CHANNEL
PLAN AND PROFILE
STA. 10+00 TO STA. 20+00

SPEC. NO. W912PL-05-B0004

DISTRICT FILE No. 203/352

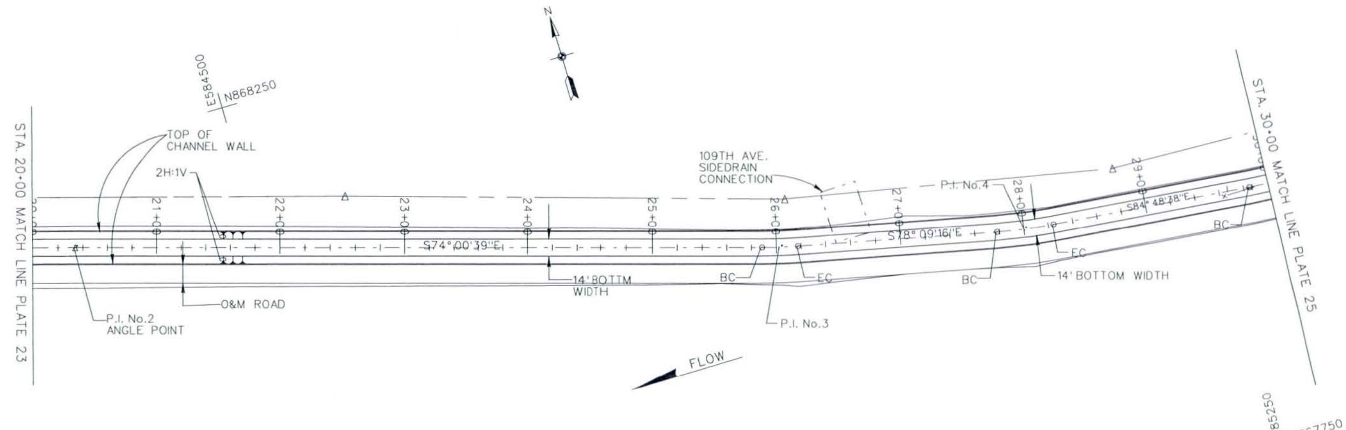
SCALE: 50:1

PLATE 23



CHANNEL ℄ PROFILE

VERT. SCALE: 1in = 5ft
HORIZ. SCALE: 1in = 50ft



PLAN

50 25 0 50 100FT
SCALE: 1"= 50'

CHANNEL ℄ HORIZONTAL CONTROL CURVE DATA								
P.I. No.	NORTHING	EASTING	Δ°	R(FT)	T(FT)	L(FT)	B.C. STA.	E.C. STA.
2	868,174.36	584,352.57	ANGLE PT.	0.00	0.00	0.00	N/A	N/A
3	868017.52	584899.90	4° 08'38"	400.00	14.47	28.93	25+87.68	26+16.61
4	867,976.85	585,093.80	6° 39'22"	400.00	23.26	46.47	27+77.00	28+23.46
5	867,956.94	585,313.05	10° 24'25"	400.00	36.43	72.65	29+83.93	30+56.58

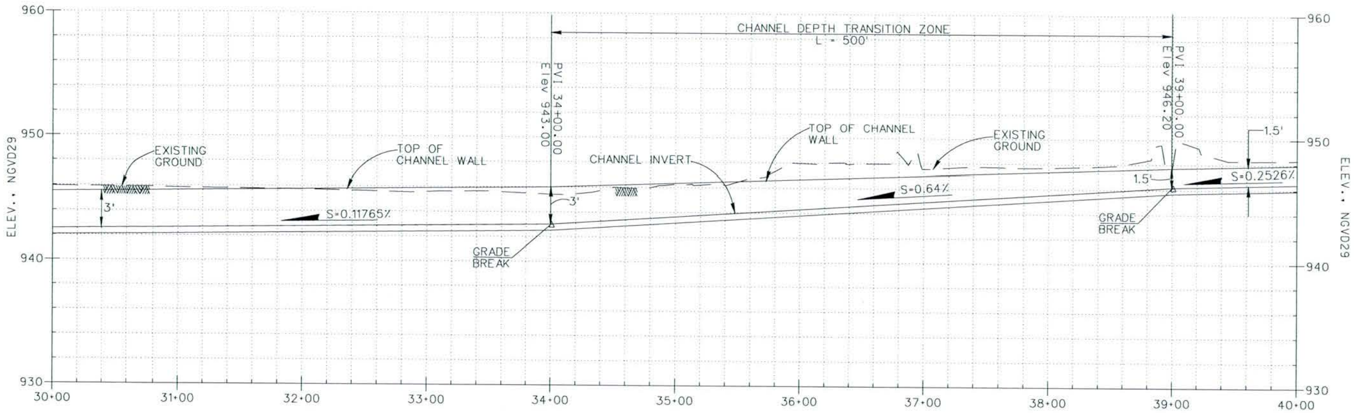
AS-BUILT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
115th AVE. COLLECTOR CHANNEL
PLAN AND PROFILE
STA. 20+00 TO 30+00

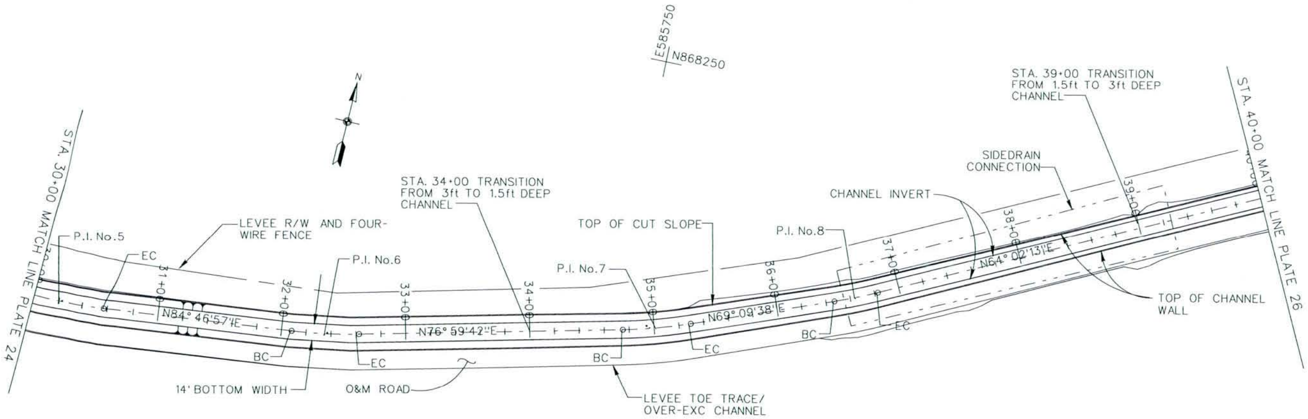
SPEC. NO. W912PL-05-B0004
DISTRICT FILE No. 203/353
SCALE: 50'
PLATE 24

VALUE ENGINEERING PAYS



CHANNEL ℄ PROFILE

VERT. SCALE: 1in = 5ft
HORIZ. SCALE: 1in = 50ft



PLAN

50 25 0 50 100FT

SCALE: 1" = 50'

CHANNEL ℄ HORIZONTAL CURVE DATA

P.I. No.	NORTHING	EASTING	Δ°	R(FT)	T(FT)	L(FT)	B.C. STA.	E.C. STA.
5	867,956.94	585,313.05	10° 24'25"	400.00	36.43	72.65	29+83.93	30+56.58
6	867,976.44	585,526.56	7° 47'15"	400.00	27.23	54.37	32+07.33	32+61.69
7	868,036.52	585,786.71	7° 50'04"	400.00	27.39	54.69	34+74.07	35+28.77
8	868,094.36	585,938.66	5° 07'25"	400.00	17.90	35.77	36+46.07	36+81.84

AS-BUILT

SYMBOL | DESCRIPTIONS | DATE | APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
115th AVE. COLLECTOR CHANNEL
PLAN AND PROFILE
STA. 30+00 TO STA. 40+00

SPEC. NO. W912PL-05-B0004

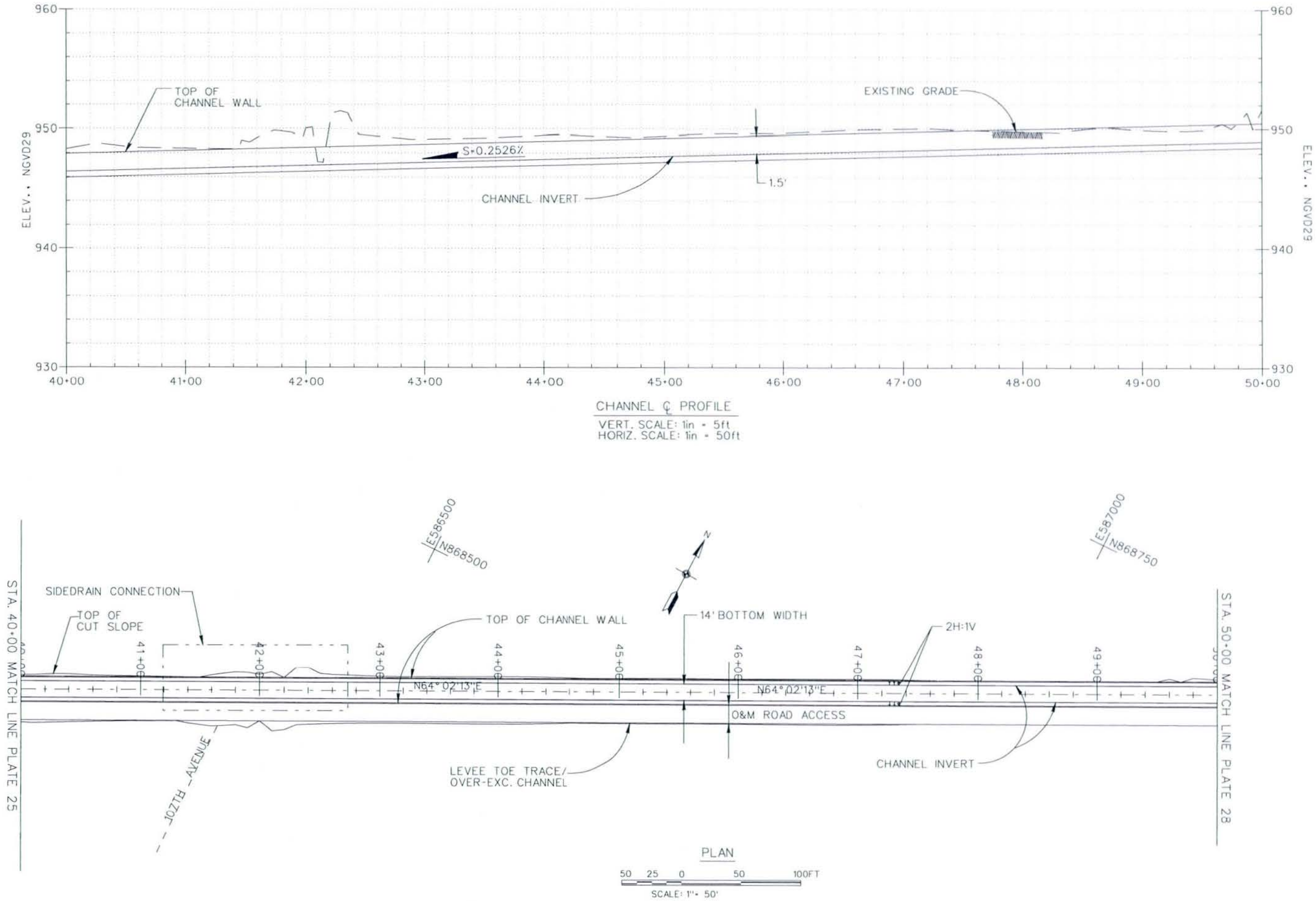
DISTRICT FILE No. 203/354

SCALE: 50'

PLATE 25

SAFETY PAYS

5 VALUE ENGINEERING PAYS 4



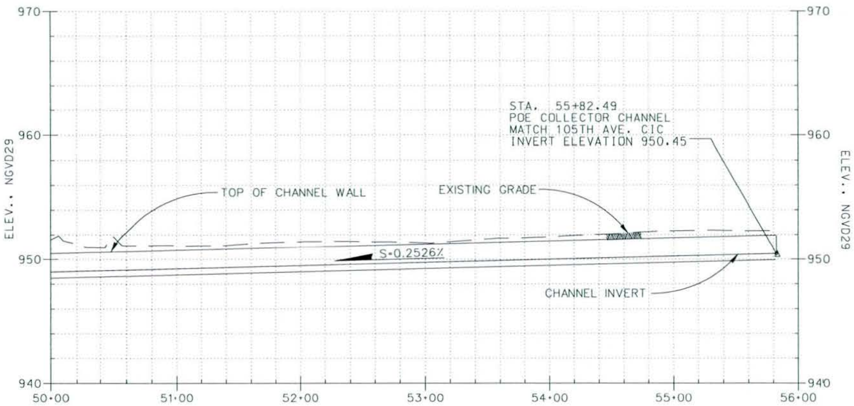
TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
115TH AVE. COLLECTOR CHANNEL
PLAN AND PROFILE
STA. 40+00 TO STA. 50+00

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

SPEC. NO. W912PL-05-B0004
DISTRICT FILE No. 203/355
SCALE: 50:1
PLATE 26

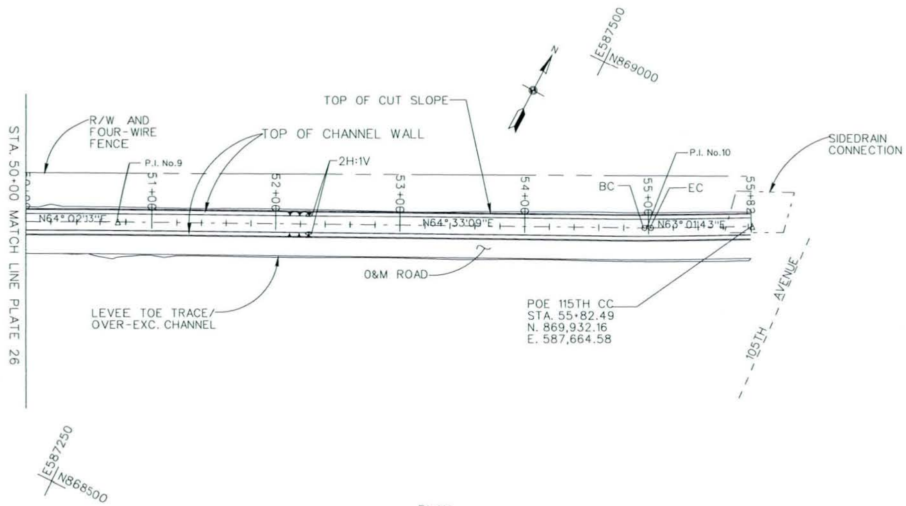
AS-BUILT

SAFETY PAYS



CHANNEL ℄ PROFILE

VERT. SCALE: 1in = 5ft
HORIZ. SCALE: 1in = 50ft



PLAN

50 25 0 50 100FT
SCALE: 1"= 50'

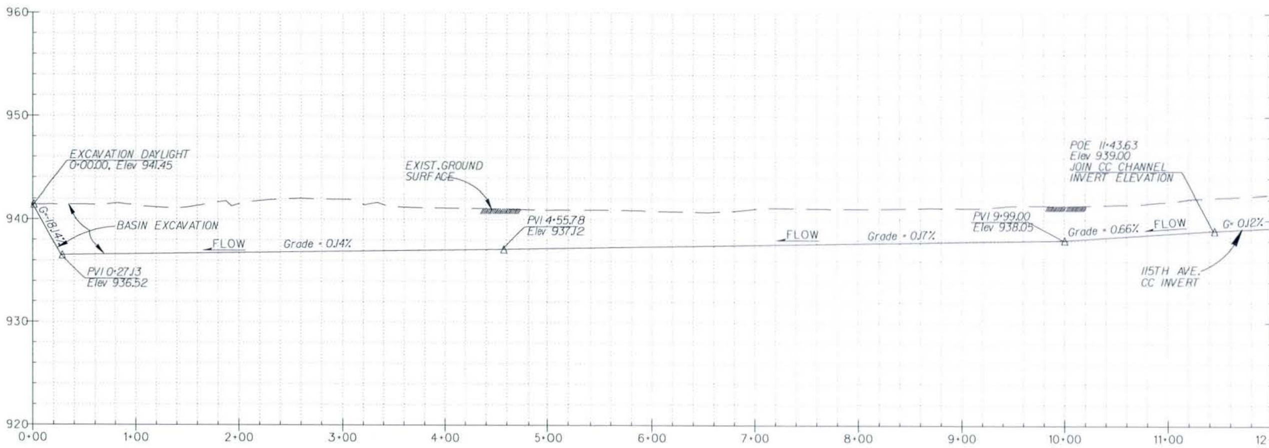
CHANNEL ℄ HORIZONTAL CONTROL CURVE DATA								
P.I. No.	NORTHING	EASTING	Δ°	R(FT)	T(FT)	L(FT)	B.C. STA.	E.C. STA.
9	868,711.45	587,205.95	ANGLE PT.	0.00	0.00	0.00	N/A	N/A
10	868,894.10	587,589.79	1° 31'26"	200.00	2.66	5.32	54+95.91	55+01.23

AS-BUILT

SYMBOL | DESCRIPTIONS | DATE | APPROVAL

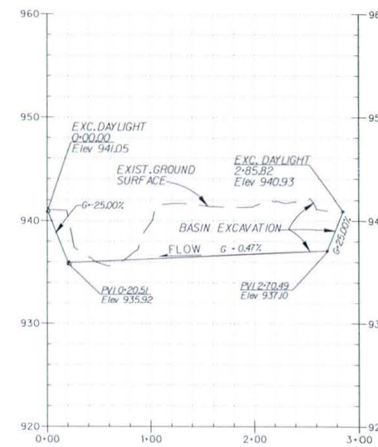
TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
115TH AVENUE COLLECTOR CHANNEL
PLAN AND PROFILE
STA. 50+00 TO STA. 55+82.49

SPEC. NO. W912PL-05-B0004
DISTRICT FILE No. 203/356
SCALE: 50:1
PLATE 27



115TH AVENUE CATCH BASIN E-W CONTROL LINE PROFILE
PROFILE WAS DRAWN LOOKING NORTH

HORIZONTAL SCALE: 1" = 10'
VERTICAL SCALE: 1" = 100'



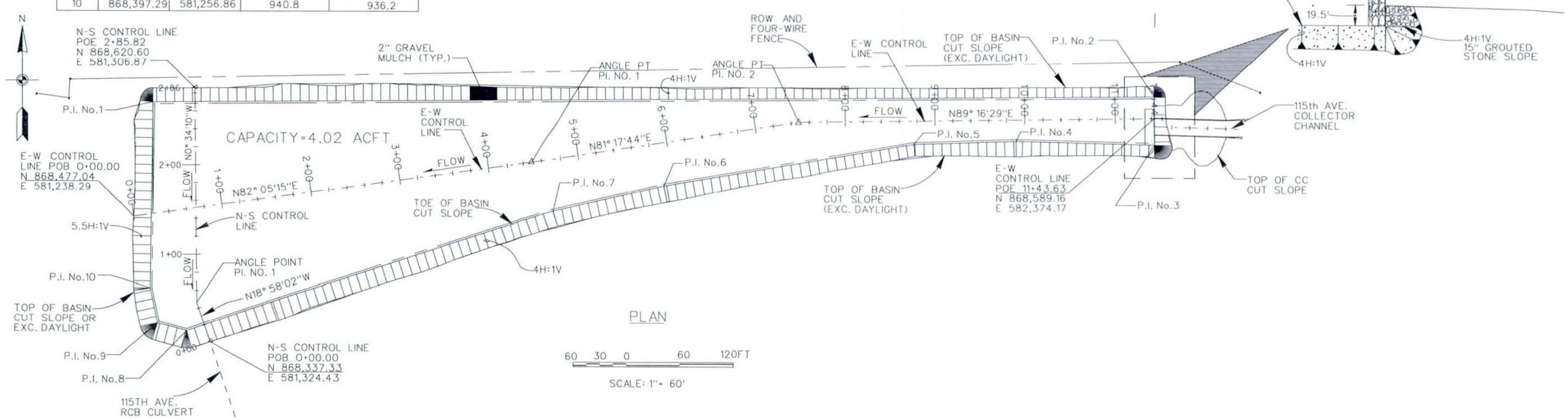
115TH AVENUE CATCH BASIN
N-S CONTROL LINE PROFILE
PROFILE WAS DRAWN LOOKING WEST

HORIZONTAL SCALE: 1" = 10'
VERTICAL SCALE: 1" = 100'

TOE OF BASIN CUT SLOPE (CATCH POINT) P.I. DATA				
P.I. No.	NORTHING	EASTING	EXISTING GRADE ELEV.	FINISHED GRADE ELEV.
1	868,604.91	581,259.79	940.7	937.0
2	868,613.44	582,373.94	941.8	939.0
3	868,559.81	582,374.34	942.5	939.0
4	868,559.92	582,106.79	941.6	938.0
5	868,512.62	581,829.15	941.1	937.0
6	868,484.08	581,705.57	941.0	936.6
7	868,382.79	581,393.72	940.8	936.0
8	868,349.91	581,297.93	935.9	935.9
9	868,358.62	581,265.30	941.0	936.0
10	868,397.29	581,256.86	940.8	936.2

BASIN E-W CONTROL LINE HORIZONTAL CONTROL POINTS DATA			
P.I. No.	STA.	NORTHING	EASTING
1	4+86.58	868,538.79	581,682.60
2	7+48.36	868,584.16	581,978.93

BASIN N-S CONTROL LINE HORIZONTAL CONTROL POINTS DATA			
P.I. No.	STA.	NORTHING	EASTING
1	0+46.71	868,381.51	581,309.25



PLAN

60 30 0 60 120FT
SCALE: 1"= 60'

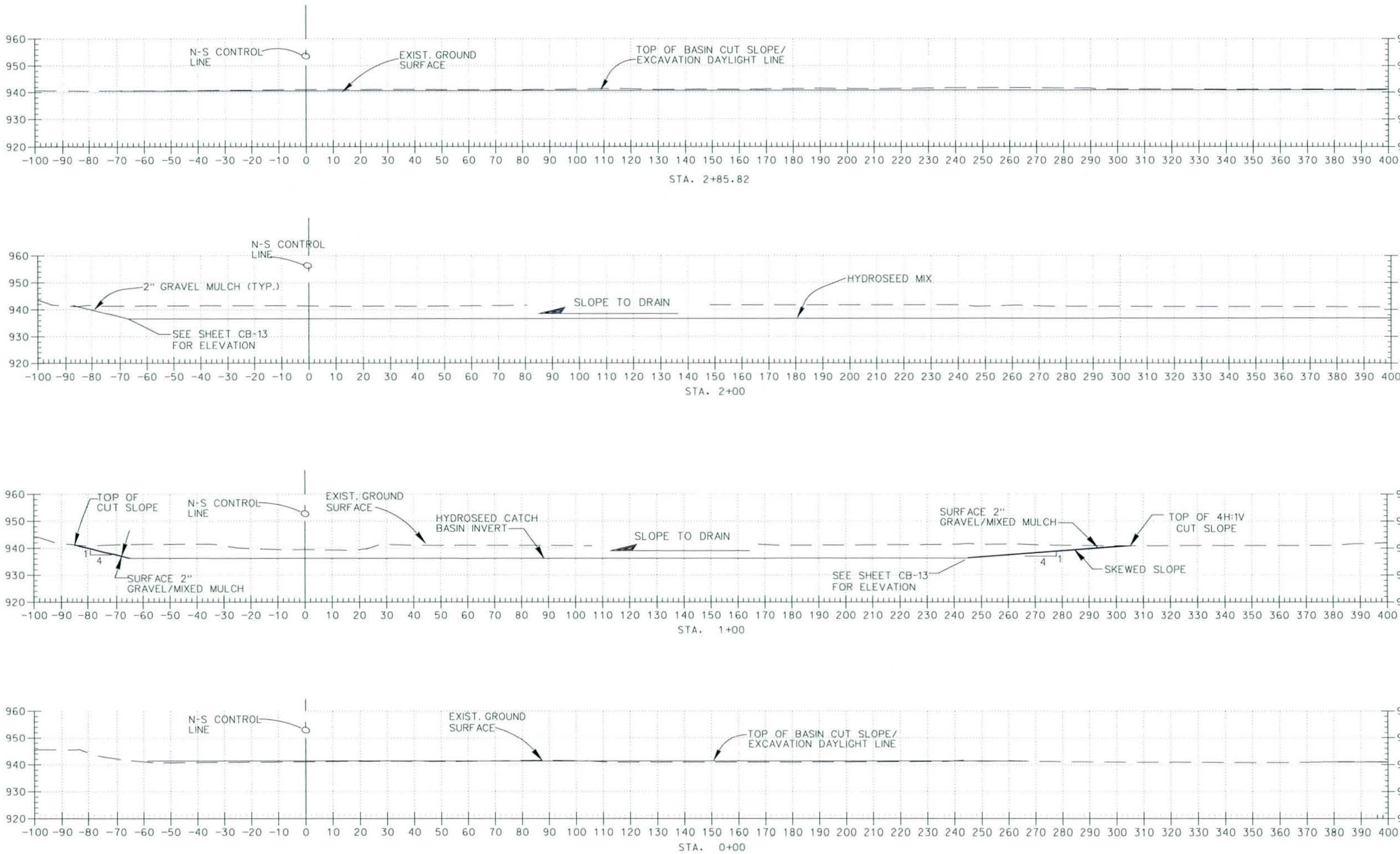
TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
115TH AVENUE CATCH BASIN
PLAN AND PROFILES

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC NO. W912PL-05-B0004
DISTRICT FILE No. 203/364
SCALE: 60'
PLATE 28

AS-BUILT

VALUE ENGINEERING PAYS



AS-BUILT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
115TH AVE. CATCH BASIN
CROSS SECTIONS ALONG NORTH-SOUTH CONTROL LINE
STA. 0+00, 1+00 AND 2+85.82

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC. NO. W912PL-05-B0004

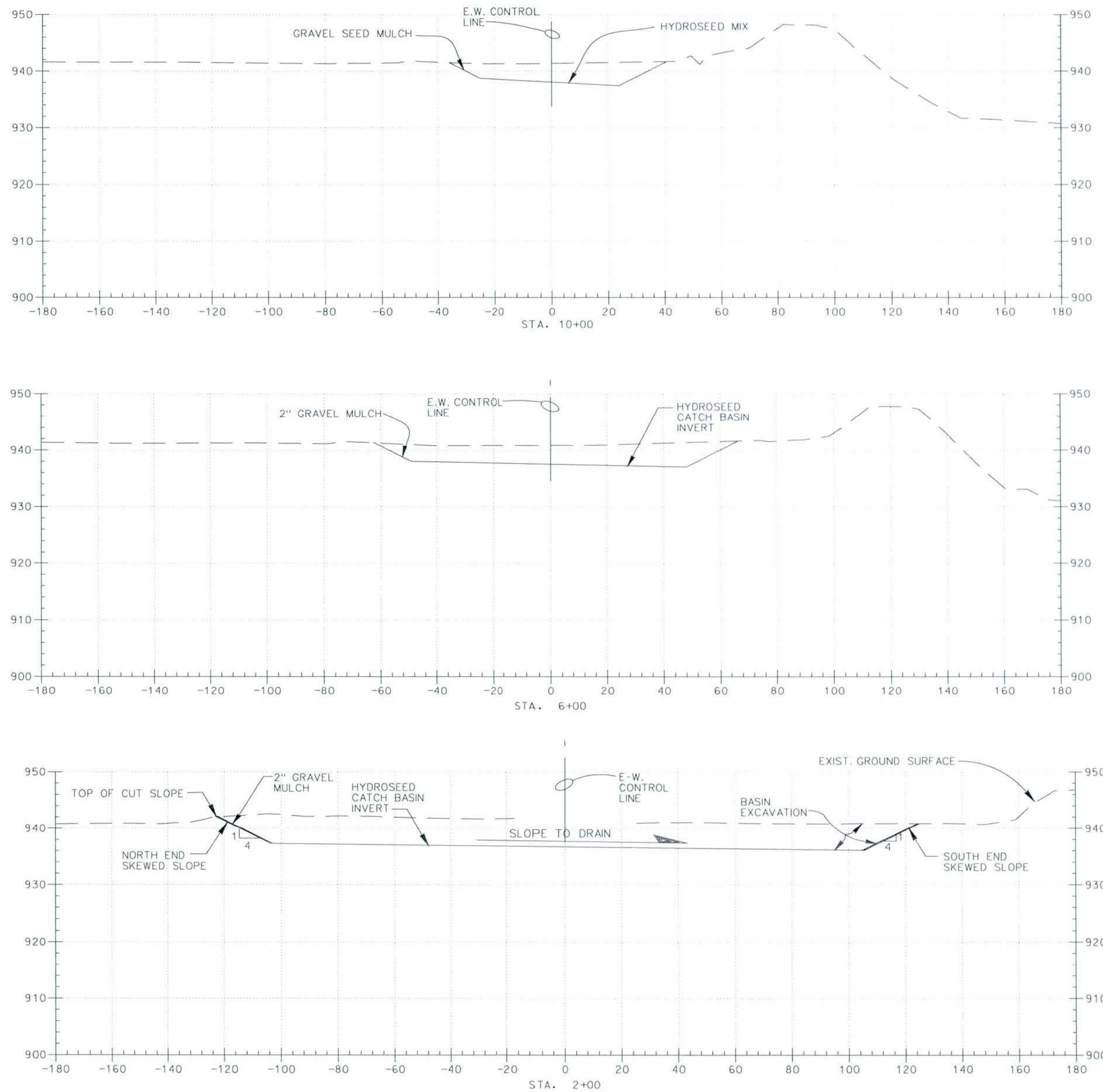
DISTRICT FILE No. 203/365

SCALE: 2011

PLATE 29

SAFETY PAYS

5 VALUE ENGINEERING PAYS 4



AS-BUILT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
115TH AVE. CATCH BASIN
CROSS SECTIONS ALONG EAST-WEST CONTROL LINE
STA. 2+00, 6+00 AND 10+00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

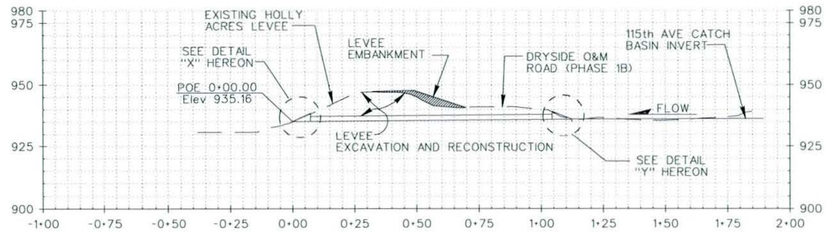
SPEC. NO. W912PL-05-B0004

DISTRICT FILE No. 203/366

SCALE: 201

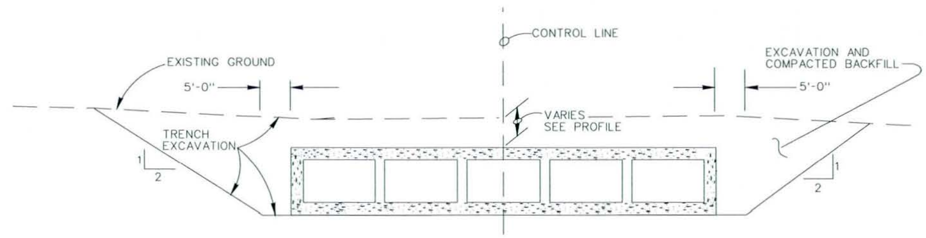
PLATE 30

5 SAFETY PAYS 4

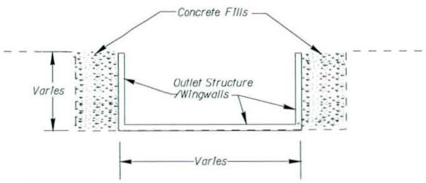


HORIZONTAL in= 50ft
VERTICLE 1in=25ft

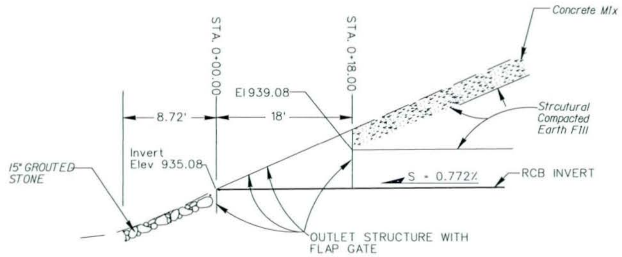
RCB CULVERT CONTROL LINE PROFILE
PROFILE WAS DRAWN LOOKING WEST



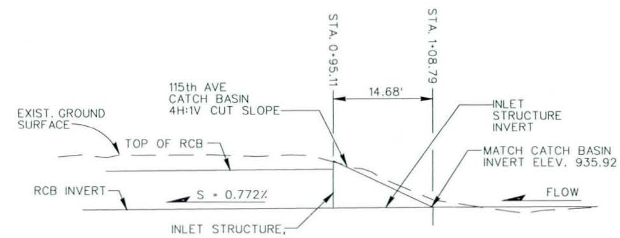
SECTION A-A
N.T.S.



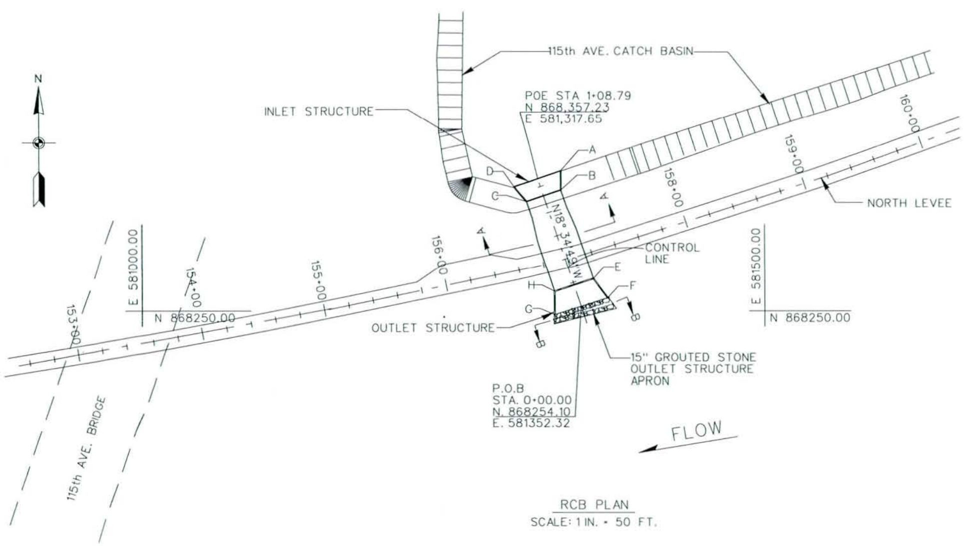
SECTION B-B
N.T.S.



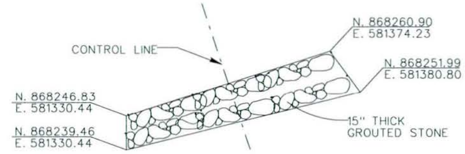
DETAIL "X" TYP
N.T.S.



DETAIL "Y" TYP
N.T.S.



RCB PLAN
SCALE: 1 IN. = 50 FT.



15" GROUTED STONE
OUTLET STRUCTURE APRON PLAN
N.T.S.

INLET STRUCTURE COORDINATES. CONTROL DATA

POINT	NORTHING	EASTING
A	N 868,363.62	E 581,336.25
B	N 868,347.97	E 581,336.23
C	N 868,338.64	E 581,308.42
D	N 868,350.67	E 581,298.54

OUTLET STRUCTURE COORDINATES CONTROL DATA

POINT	NORTHING	EASTING
E	N. 868,276.31	E. 581,362.23
F	N. 868,260.74	E. 581,373.73
G	N. 868,247.04	E. 581,330.94
H	N. 868,265.91	E. 581,330.92

AS-BUILT

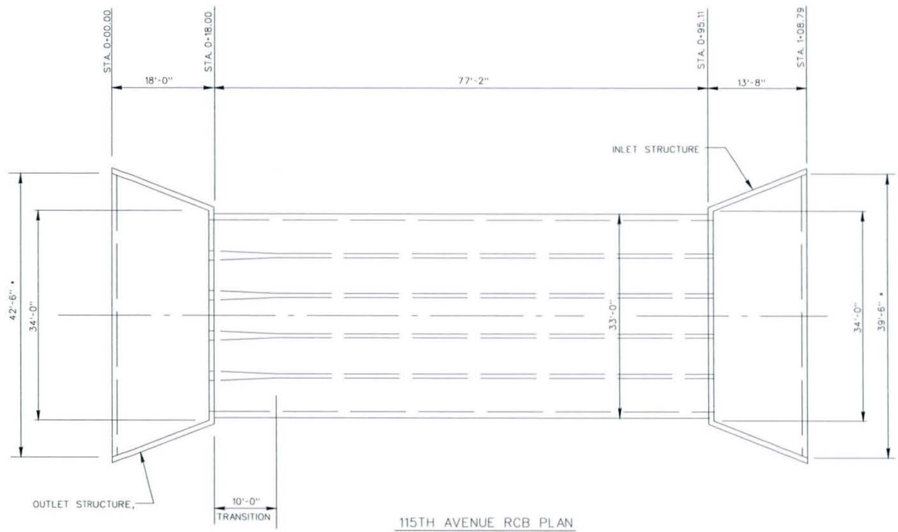
SYMBOL | DESCRIPTIONS | DATE | APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

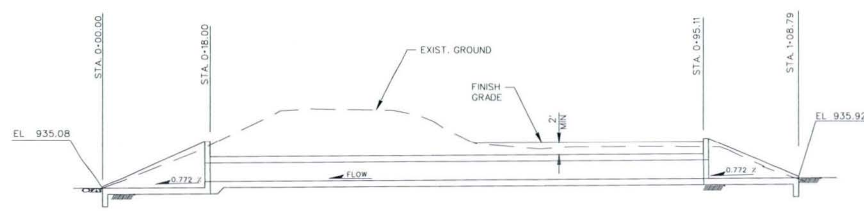
115TH AVENUE RCB CULVERT
PLAN, PROFILE AND DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC. NO. W912PL-05-B0004
DISTRICT FILE No. 115AveRCB.dgn
SCALE: 50:1
PLATE 31



115TH AVENUE RCB PLAN
SCALE: N.T.S.



115TH AVENUE RCB PROFILE
SCALE: N.T.S.

AS-BUILT

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. to 105TH AVE.)
115TH AVENUE BOX CULVERT
STRUCTURES, PLAN AND PROFILE

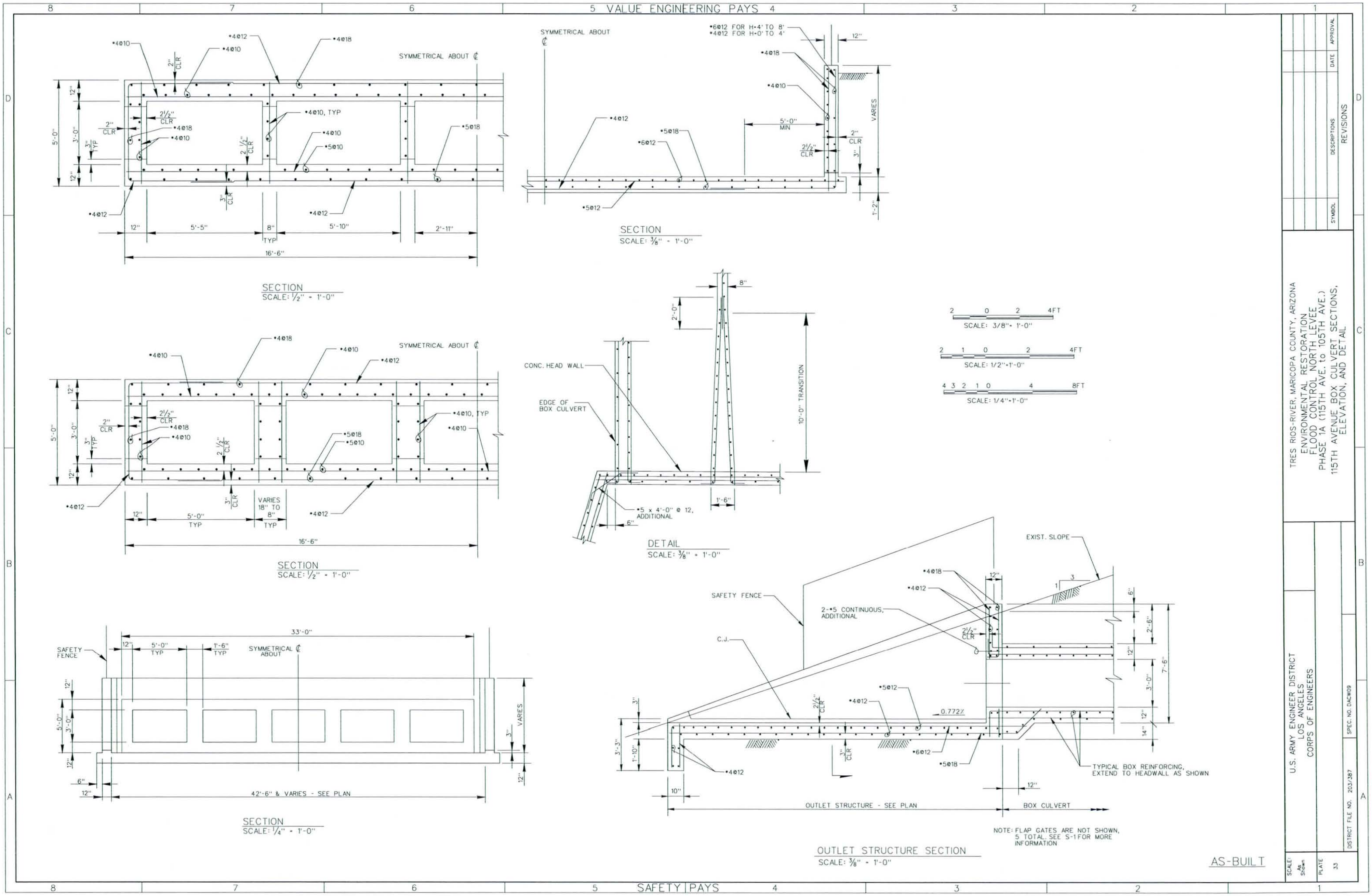
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC NO. DACW09

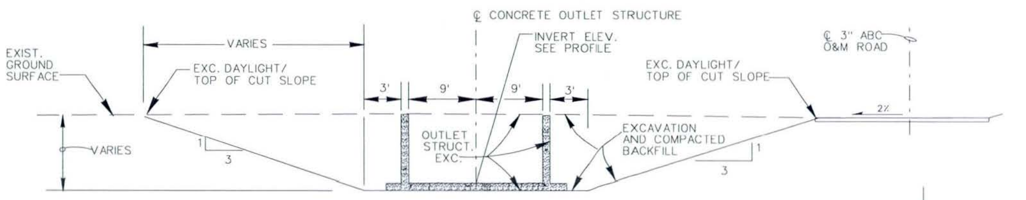
DISTRICT FILE NO. 203/385

SCALE: N.T.S.

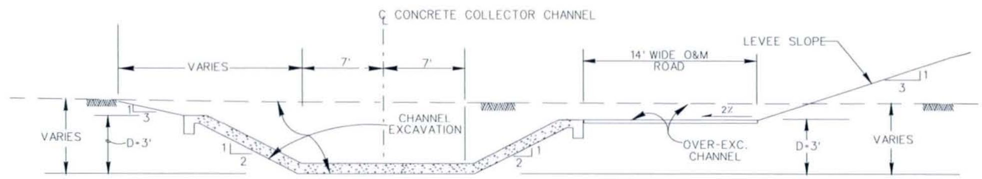
PLATE 32



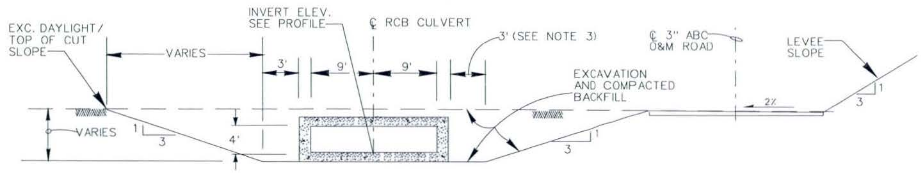
VALUE ENGINEERING PAYS
SAFETY PAYS
SECTION
SCALE: 1/2" = 1'-0"
SYMMETRICAL ABOUT ℄
16'-6"
12"
5'-5"
8" TYP
5'-10"
2'-11"
5'-0"
3'-0"
2" CLR
2 1/2" CLR
3" CLR
•4Ø10
•4Ø12
•4Ø18
•5Ø10
•5Ø18
•4Ø10, TYP
SECTION
SCALE: 3/8" = 1'-0"
•6Ø12 FOR H=4' TO 8'
•4Ø12 FOR H=0' TO 4'
5'-0" MIN
VARIES
•6Ø12
•5Ø12
SECTION
SCALE: 1/2" = 1'-0"
VARIES 18" TO 8"
5'-0" TYP
SECTION
SCALE: 1/4" = 1'-0"
SAFETY FENCE
33'-0"
1'-6" TYP
42'-6" & VARIES - SEE PLAN
DETAIL
SCALE: 3/8" = 1'-0"
CONC. HEAD WALL
EDGE OF BOX CULVERT
10'-0" TRANSITION
•5 x 4'-0" @ 12, ADDITIONAL
SCALE: 3/8" = 1'-0"
SCALE: 1/2" = 1'-0"
SCALE: 1/4" = 1'-0"
OUTLET STRUCTURE SECTION
SCALE: 3/8" = 1'-0"
EXIST. SLOPE
2-•5 CONTINUOUS, ADDITIONAL
C.J.
0.772%
TYPICAL BOX REINFORCING, EXTEND TO HEADWALL AS SHOWN
OUTLET STRUCTURE - SEE PLAN
BOX CULVERT
NOTE: FLAP GATES ARE NOT SHOWN, 5 TOTAL. SEE S-1 FOR MORE INFORMATION
AS-BUILT
SYMBOL
DESCRIPTIONS
DATE
APPROVAL
REVISIONS
TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. to 105TH AVE.)
115TH AVENUE BOX CULVERT SECTIONS, ELEVATION, AND DETAIL
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS
SPEC. NO. DACW09
DISTRICT FILE NO. 203/387
SCALE: As Shown
PLATE 33



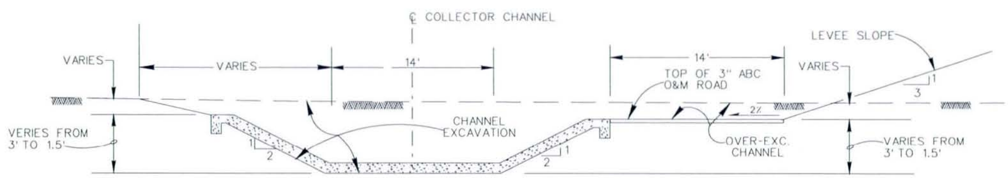
COLLECTOR CHANNEL - OUTLET STRUCTURE
TYPICAL SECTION
(STA. 0+00 TO STA. 00+35)
N.T.S.



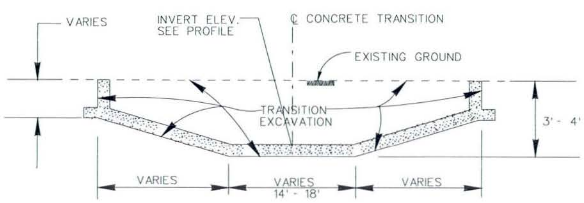
COLLECTOR CHANNEL TYPICAL SECTION
STA. 1+55.00 TO STA. 34+00
N.T.S.



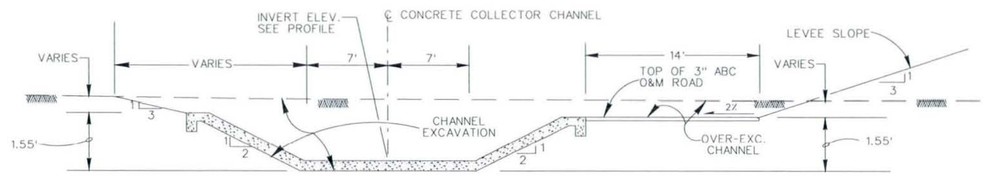
COLLECTOR CHANNEL - BOX CULVERT
TYPICAL SECTION
(STA. 0+35 TO STA. 0+80
N.T.S.



COLLECTOR CHANNEL TYPICAL SECTION
STA. 34+00 TO STA. 39+00
N.T.S.



TYPICAL TRANSITION CROSS SECTION
(STA. 0+80 TO STA. 1+55.00)
N.T.S



COLLECTOR CHANNEL TYPICAL SECTION
STA. 39+00 TO STA. 55+82.49
N.T.S.

AS-BUILT

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)
COLLECTOR CHANNEL OUTLET STRUCTURE
BOX CULVERT, TRANSITION AND
CHANNEL TYPICAL SECTIONS

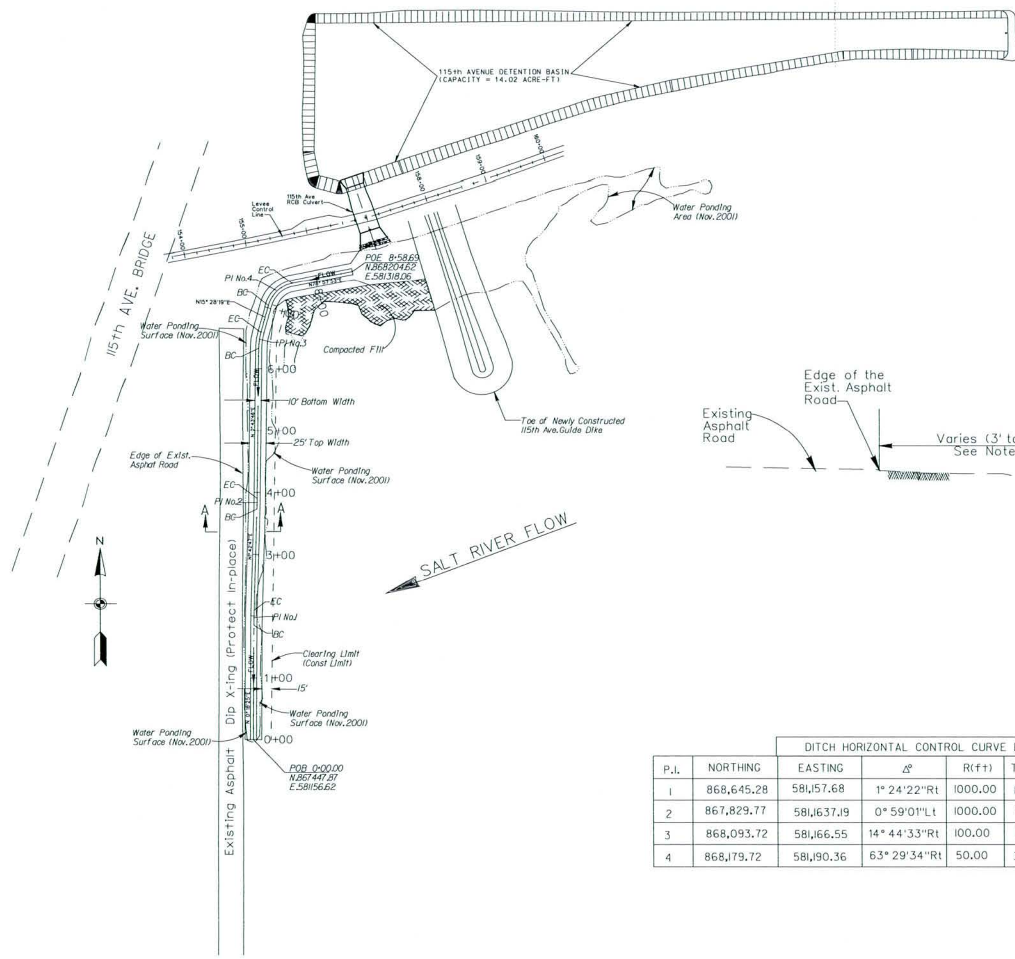
SYMBOL | DESCRIPTIONS | DATE | APPROVAL

SPEC. NO. W912PL-05-B0004

DISTRICT FILE No. 203/363

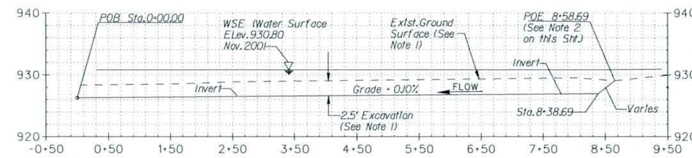
SCALE: 50:1

PLATE 34



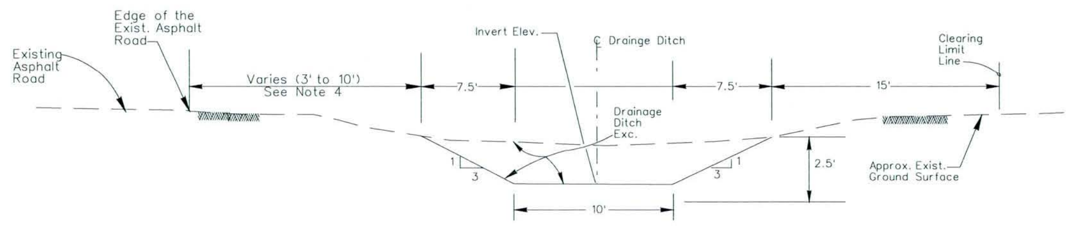
DRAINAGE DITCH PLAN

SCALE: 1 IN. = 100FT.



DRAINAGE DITCH CENTERLINE PROFILE

HORI. SCALE: 1IN. = 10 FT.
VERT. SCALE: 1IN. = 50 FT.



SECTION A-A TYP

N.T.S.

DITCH HORIZONTAL CONTROL CURVE DATA

P.I.	NORTHING	EASTING	Δ°	R(ft)	T(ft)	L(ft)	B.C Sta	E.C Sta
1	868,645.28	581,157.68	1° 24'22"Rt	1000.00	12.27	24.54	1+85.14	2+09.68
2	867,829.77	581,1637.19	0° 59'01"Lt	1000.00	8.58	17.17	3+73.40	3+90.57
3	868,093.72	581,166.55	14° 44'33"Rt	100.00	12.94	25.73	6+33.02	6+58.75
4	868,179.72	581,190.36	63° 29'34"Rt	50.00	30.94	55.41	7+04.11	7+59.52

AS-BUILT

SYMBOL | DESCRIPTIONS | DATE | APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1A (115TH AVE. TO 105TH AVE.)

115th AVENUE DRAINAGE DITCH
PLAN, PROFILE AND SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SPEC. NO. W912PL-05-B0004

DISTRICT FILE No. 203/367A

SCALE: 100'

PLATE 35

PHASE 1B

VALUE ENGINEERING PAYS

U.S. Army Corps of Engineers – Los Angeles District

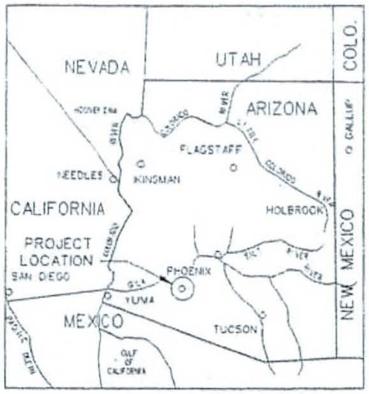
in cooperation with

The City of Phoenix

Tres Rios Environmental Restoration

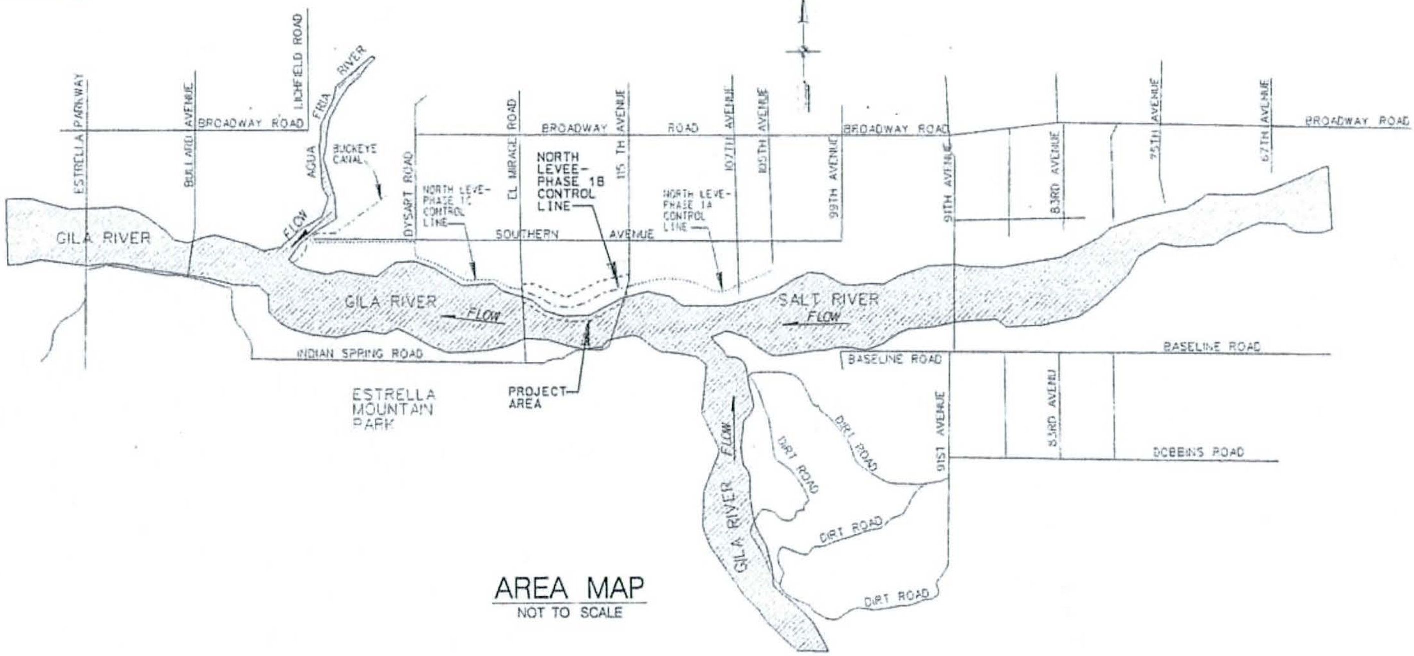
Flood Control North Levee – Phase 1B (El Mirage Road to 115th Avenue)

October 2006



VICINITY MAP

NOT TO SCALE



AREA MAP

NOT TO SCALE

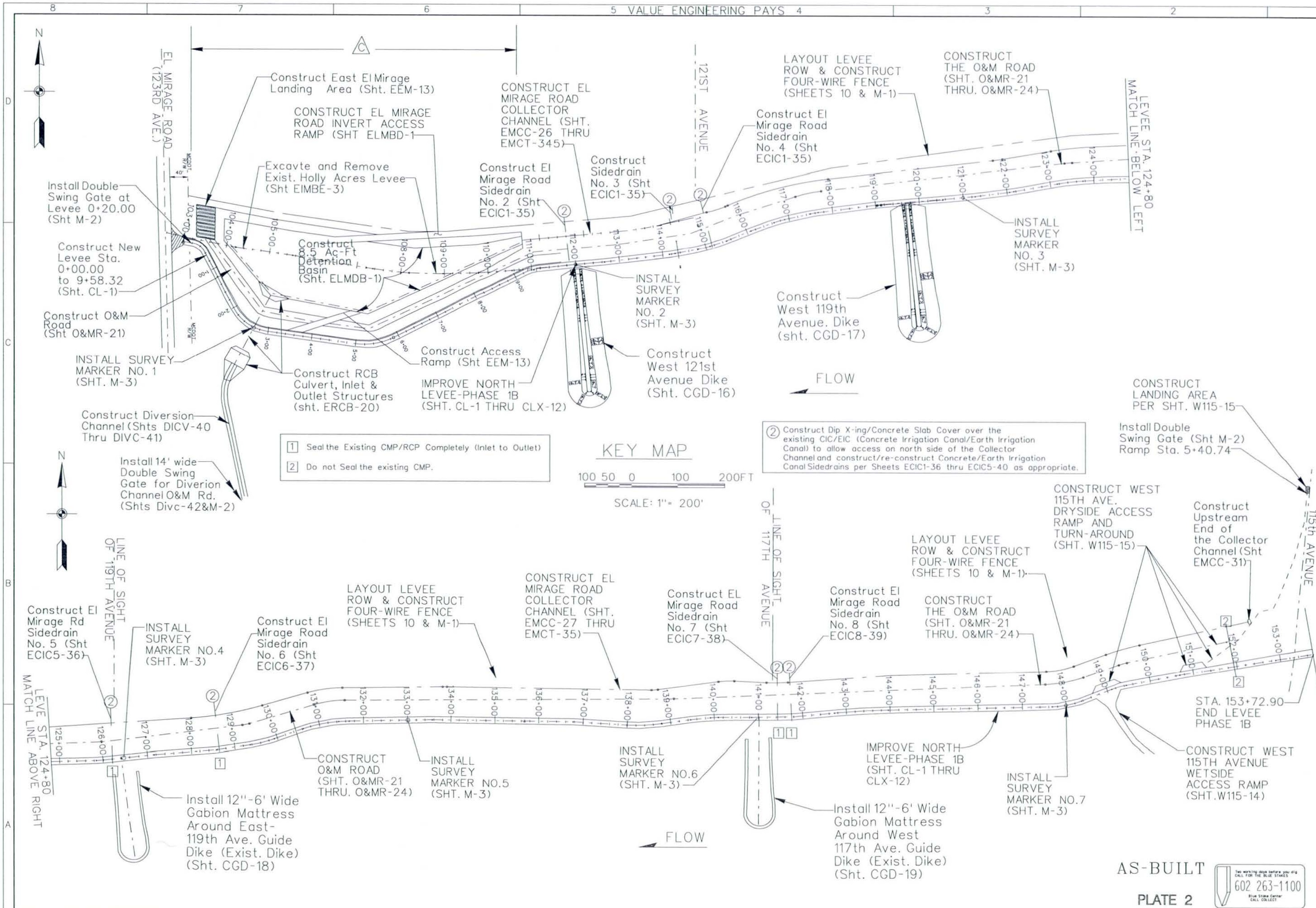
PLATE 1

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
PROJECT AREA AND VICINITY MAPS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

COLONEL ALEX C. DORNSTAUDER



SYMBOL	DESCRIPTIONS	DATE	APPROVAL
M1	Added Access Ramp	9-10-07	P.W.U.
	Deleted and Added Features	8-12-07	P.W.U.
	Added Standard Gate	7-10-07	P.W.U.

REVISIONS

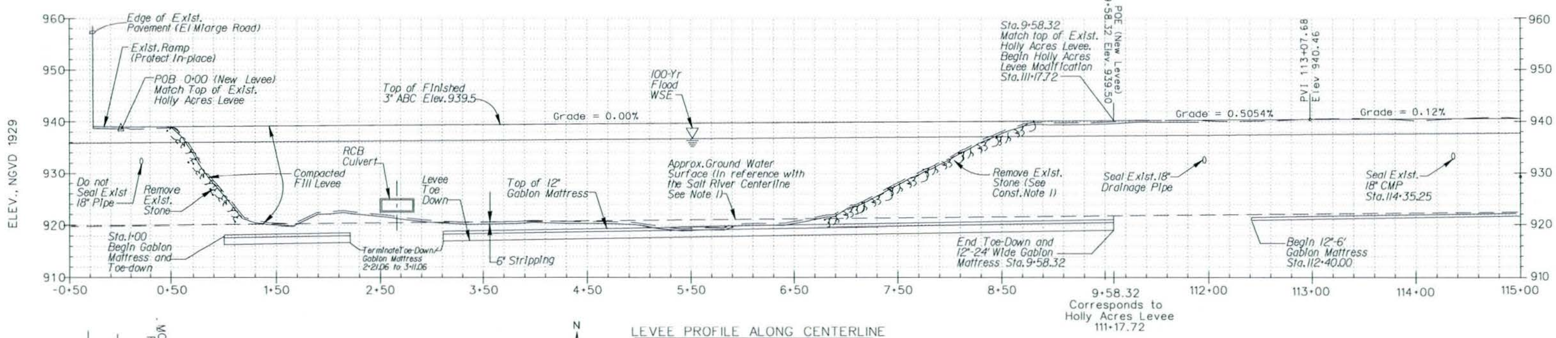
TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
KEY MAP

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: D.P.
DRAWN BY: D.P.
CHECKED BY: P.J.

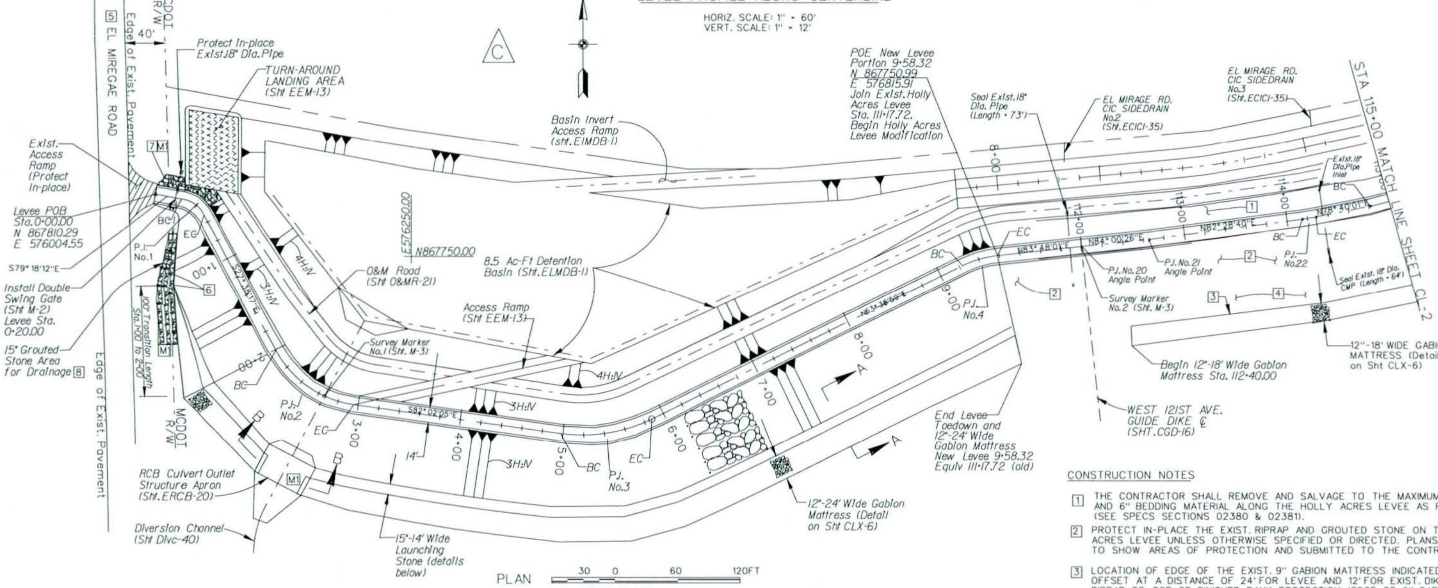
SUBMITTED BY: THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

FILE NAME: KeyMap.Dgn
SPEC. NO. W912PL-07-B-0003
DISTRICT FILE NO. 203/ 399
SCALE: 100-1
SHEET 6



LEVEE PROFILE ALONG CENTERLINE

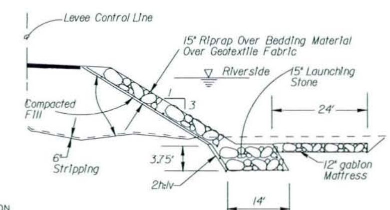
HORIZ. SCALE: 1" = 60'
VERT. SCALE: 1" = 12'



PLAN

SCALE: 1" = 60'

LEVEE HORIZONTAL CONTROL LINE POINT DATA			
P.I. NO.	NORTHING	EASTING	Δ°
20	867,759.85	576,897.44	ANGLE POINT
21	867,766.69	576,962.57	ANGLE POINT

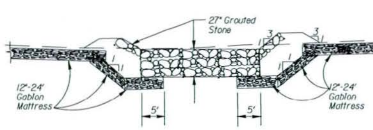


SECTION A-A

N.T.S.

THIS PORTION OF CROSS SECTION APLLIES TO NEW LEVEE STA. 0+00 TO 9+58.32

	LEVEE HORIZONTAL CONTROL LINE-CURVE DATA								
	P.I. NO.	NORTHING	EASTING	Δ°	R(FT)	T(FT.)	L(FT.)	B.C. Sta.	E.C. Sta.
New Levee	1	867,802.87	576,043.86	51° 39'55" RT	30	14.52	27.05	0+25.48	0+52.53
New Levee	2	867,613.27	576,143.13	54° 23'48" LF	100.00	51.39	94.94	2+00.63	2+95.57
New Levee	3	867,571.71	576,440.17	34° 18'56" LF	150.00	46.31	89.84	4+97.80	5+87.64
New Levee	4	867,749.07	576,798.24	20° 09'02" RT	100.00	17.11	35.17	9+23.15	9+58.32
	22	867,787.12	577,117.35	3° 48'39" Lt	200.00	6.65	13.30	114+14.73	114+28.04



M1 SECTION B-B

N.T.S.

NOTES

1. GROUND WATER TABLE LEVEL INDICATED ON THE PROFILE APPLIES TO SPRING AND WINTER SEASONS. IT IS ABOUT 2 FT. LOWER DURING FALL AND SUMMER.
2. LEVEE TOE-DOWN IS NOT REQUIRED FOR STA. 111+17.72 TO STA. 153+72.90 ALONG THE EXISTING HOLLY ACRES LEVEE.
3. 12"-18' WIDE GABION MATTRESS IS NOT REQUIRED UNDERNEATH THE 121ST AVE. DIKE WITHIN THE GUIDE DIKE'S FOOTPRINTS.
4. SEE SHEETS ELMDB-1 FOR DETAILS OF TYPICAL CROSS SECTION FOR STA. 0+00.00 TO 9+58.32 AND CLX-6 FOR STA. 111+17.72 TO STA. 148+88.50
5. 12"-18' WIDE GABION MATTRESS SHALL BE REQUIRED FROM STA. 117+17.72 TO STA. 127+10.00 EXCEPT GUIDE DIKES

CONSTRUCTION NOTES

[1] THE CONTRACTOR SHALL REMOVE AND SALVAGE TO THE MAXIMUM EXTENT POSSIBLE EXIST. 15" RIPRAP AND 6" BEDDING MATERIAL ALONG THE HOLLY ACRES LEVEE AS REQUIRED AND INDICATED ON THE PLAN (SEE SPECS SECTIONS 02380 & 02381).

[2] PROTECT IN-PLACE THE EXIST. RIPRAP AND GROUTED STONE ON THE RIVERSIDE SLOPE OF THE EXSITING HOLLY ACRES LEVEE UNLESS OTHERWISE SPECIFIED OR DIRECTED. PLANS WILL BE PREPARED BY THE CONTRACTOR TO SHOW AREAS OF PROTECTION AND SUBMITTED TO THE CONTRATING OFFICER FOR APPROVAL.

[3] LOCATION OF EDGE OF THE EXIST. 9" GABION MATTRESS INDICATED ON THE PLAN IS APPROXIMATED. IT WAS OFFSET AT A DISTANCE OF 24' FOR LEVEE AND 12' FOR EXIST. DIKES MEASURED HORIZONTALLY FROM TOE OF RIPRAP TO TOE OF FINISHED BANK PROTECTION (EDGE OF 9" GABION MATTRESS) RESPECTIVELY BASED ON THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY'S 1983 AS-BUILT DRAWINGS OF BANK STABILIZATION FOR HOLLY ACRES LEVEE. THE CONTRACTOR SHALL LOCATE AND EXPOSE THE EDGE OF THE EXIST. 9" MATTRESS IN ORDER TO TIE WITH THE NEW 12" GABION MATTRESS. THE NEW GABION AND THE EXIST. GABION MATTRESSES SHALL BE TIED IN THE SAME WAY THE NEW GABION MATTRESSES ARE TO BE TIED TOGETHER. SPIRAL TIES SHOULD BE CONSIDERED AS ONE OF THE METHODS FOR FASTENING MATTRESSES TOGETHER (SPECS SECTION 02371 PAR. 3.3)

[4] PROTECT IN-PLACE EXIST. 9" GABION MATTRESS. EXCAVATION IS REQUIRED TO EXPOSE EDGE OF THE EXIST. 9" GABION MATTRESS. EXCAVATION DEPTH VARIES FROM APPROX. 1 FOOT TO 2 FEET BELOW THE EXIST. GROUND SURFACE. THE CONTRACTOR SHALL TAKE SPECIAL CARE NOT TO DAMAGE THE EXIST. 9" GABION MATTRESSES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REPLACE IN-KIND DAMAGED GABION MATTRESSES AS THE RESULT OF THE CONSTRUCTION ACTIVITIES AT NO COST TO THE GOVERNMENT. IT IS ANTICIPATED THAT STANDING WATER IN THE EXCAVATION AREA WILL REMAIN THERE FOR AT LEAST 36 HOURS PERIOD. (SEE ENCLOSED PHOTOS IN SPECS).

[5] PROTECT IN-PLACE THE EL MIRAGE ROAD.

[6] LEVEE TOEDOWN AND GABION MATTRESS SHALL BEGIN AT LEVEE STA. 1+00 AND TRANSIT TO A FULL 14' WIDE TOE-DOWN AND 24' WIDE GABION MATTRESS. OUTER EDGE OF THE GABION MATTRESS MUST NOT EXTEND BEYOND THE MCDOT R/W WHICH IS 40FT. FROM EDGE OF THE EXIST. EL MIRAGE ROAD INDICATED IN THE PLAN.

M1 [7] DRY SIDE (BACK SIDE) OF LEVEE STA. 0+00 TO 0+50 SHALL BE AMORED WITH 15" GROUTED STONE. MINIMUM GRADING OF THE LEVEE CREST IS REQUIRED TO OBTAIN TOP OF FINISHED 3" ABC O&M ROAD FOR THIS PARTICULAR AREA.

M1 [8] 15" GROUTED STONE IS REQUIRED FOR AN AREA OF APPROX. 110' LONG AND VARIES IN WIDTH. INSTALLATION OF 15" GROUTED STONE SHALL FOLLOW EXISTING CONTOURS SUCH THAT FLOW CAN BE WITHIN DEFINED DITCH CONFIGURATION.

AS-BUILT

PLATE 3

Two working days before you dig CALL FOR THE BLUE STAKES 602 263-1100 Blue Stake Center CALL COLLECT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
M1	Added 15" Grouted Stone Areas & Gabion Connection Details	9/10/07	P.W.U
△	Deleted Levee Sta. 103+00 thru. 111+17.72 and Replaced with New levee Sta. 0+00 thru. 9+58.32	8/9/07	P.W.U

REVISIONS

U.S. ARMY ENGINEER DISTRICT LOS ANGELES CORPS OF ENGINEERS

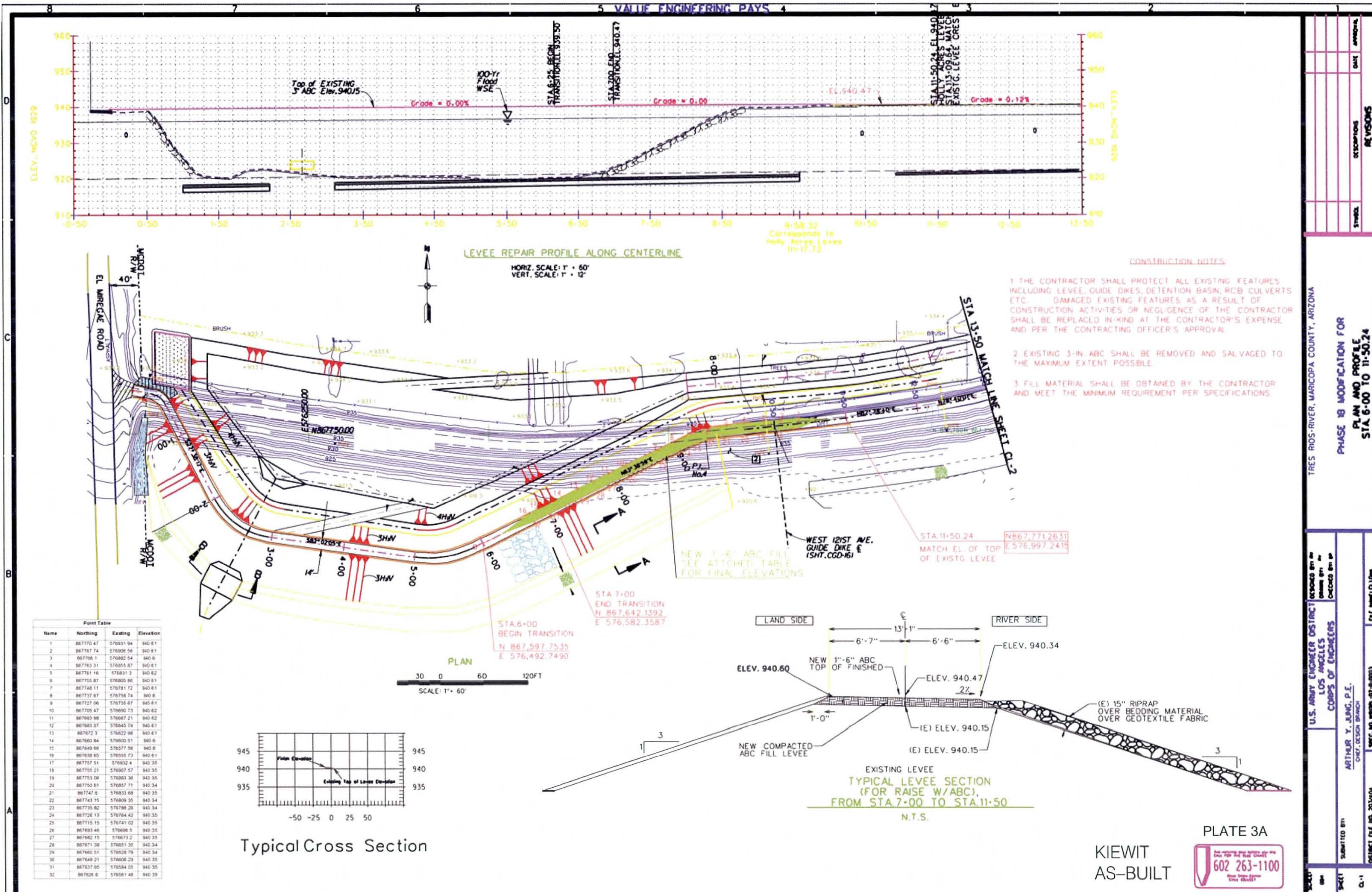
DESIGNED BY: D.P. DRAWN BY: D.P. CHECKED BY: P.U.

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
PLAN AND PROFILE
STA. 0+00 TO 9+58.32 (New Levee)
AND 111+17.72 TO 115+00 (Holly Acres Levee)

SCALE: 60:1 SHEET CL-1

SUBMITTED BY: THOMAS H. SAGE, P.E. CHIEF, DESIGN BRANCH

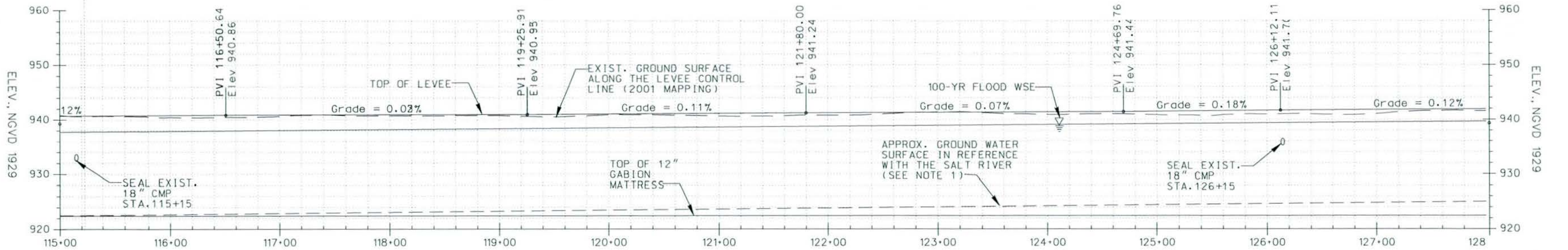
DISTRICT FILE NO. 203/ 404 SPEC. NO. W912PL-07-B-0003 FILE NAME: CL1.Dgn



Point Table

Name	Northing	Easting	Elevation
1	867770.47	576931.94	940.61
2	867767.74	576906.56	940.61
3	867768.1	576882.54	940.6
4	867763.31	576855.87	940.61
5	867761.16	576831.3	940.62
6	867755.87	576805.88	940.61
7	867748.11	576781.72	940.61
8	867737.97	576758.74	940.6
9	867727.06	576735.67	940.61
10	867705.47	576690.73	940.62
11	867693.98	576667.21	940.62
12	867683.07	576645.74	940.61
13	867672.3	576622.98	940.61
14	867660.84	576600.51	940.6
15	867649.68	576577.58	940.6
16	867638.65	576555.73	940.61
17	867757.51	576932.4	940.35
18	867755.21	576907.57	940.35
19	867753.06	576883.36	940.35
20	867750.81	576857.71	940.34
21	867747.6	576833.68	940.35
22	867743.15	576809.35	940.34
23	867735.82	576786.28	940.34
24	867726.13	576764.42	940.35
25	867715.15	576741.02	940.35
26	867693.48	576696.5	940.35
27	867682.15	576673.2	940.35
28	867671.38	576651.35	940.34
29	867660.51	576628.79	940.34
30	867649.21	576606.29	940.35
31	867637.95	576584.05	940.35
32	867626.8	576561.48	940.35

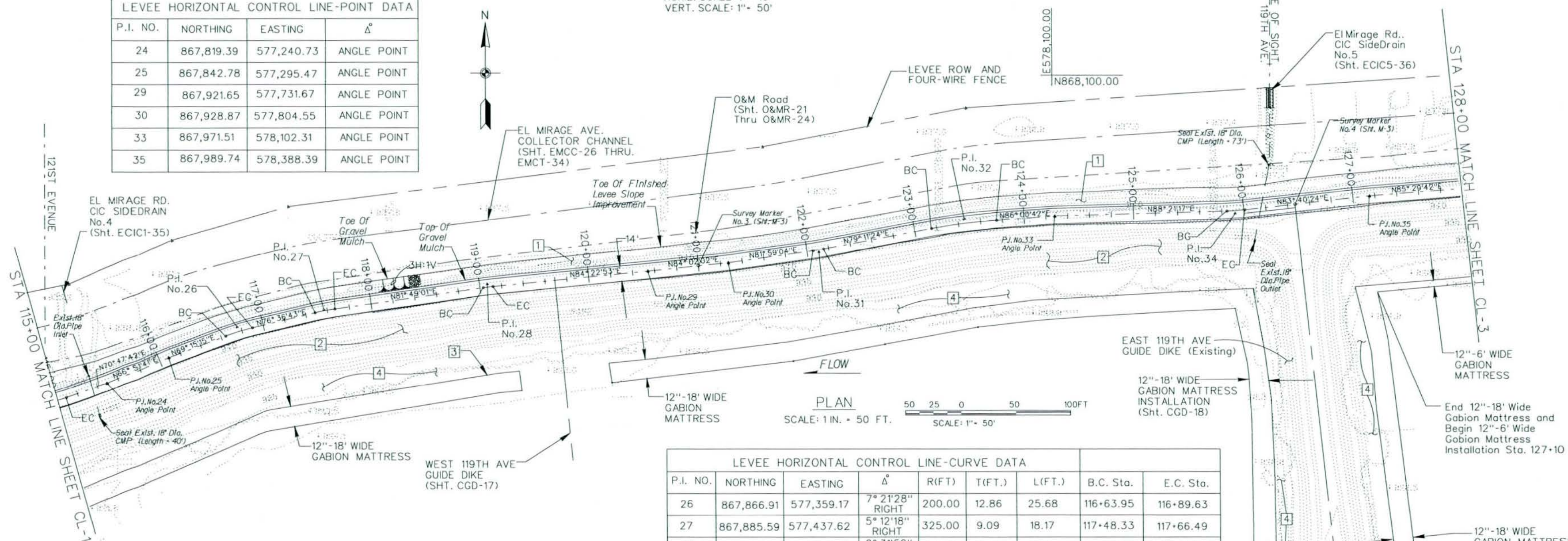
5 VALUE ENGINEERING PAYS 4



LEVEE CONTROL LINE AND GABION MATTRESS PROFILE

HORIZ. SCALE: 1" = 10'
VERT. SCALE: 1" = 50'

LEVEE HORIZONTAL CONTROL LINE-POINT DATA			
P.I. NO.	NORTHING	EASTING	Δ°
24	867,819.39	577,240.73	ANGLE POINT
25	867,842.78	577,295.47	ANGLE POINT
29	867,921.65	577,731.67	ANGLE POINT
30	867,928.87	577,804.55	ANGLE POINT
33	867,971.51	578,102.31	ANGLE POINT
35	867,989.74	578,388.39	ANGLE POINT



PLAN

SCALE: 1 IN. = 50 FT.

50 25 0 50 100FT
SCALE: 1" = 50'

LEVEE HORIZONTAL CONTROL LINE-CURVE DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(FT)	T(FT.)	L(FT.)	B.C. Sta.	E.C. Sta.
26	867,866.91	577,359.17	7° 21'28" RIGHT	200.00	12.86	25.68	116+63.95	116+89.63
27	867,885.59	577,437.62	5° 12'18" RIGHT	325.00	9.09	18.17	117+48.33	117+66.49
28	867,906.92	577,585.96	2° 31'52" RT	200.00	4.48	8.95	119+02.79	119+11.74
31	867,940.47	577,886.97	2° 47'41" LF	200.00	4.88	9.76	122+05.32	122+15.08
32	867,965.71	578,019.15	6° 49'19" RT	500.00	29.80	59.53	123+14.96	123+74.49
34	867,976.23	578,266.53	4° 40'53" LF	200.00	8.18	16.34	125+84.17	126+00.51

C

CONSTRUCTION NOTES

1. THE CONTRACTOR SHALL REMOVE AND SALVAGE TO THE MAXIMUM EXTENT POSSIBLE EXIST. 15" RIPRAP AND 6" BEDDING MATERIAL ALONG THE HOLLY ACRES LEVEE INDICATED ON THE PLAN (SEE SPECS SECTIONS 02380 & 02381).
2. PROTECT IN-PLACE THE EXIST. RIPRAP AND GROUTED STONE ON THE RIVERSIDE SLOPE OF THE EXSITING HOLLY ACRES LEVEE UNLESS OTHERWISE SPECIFIED OR DIRECTED. PLANS WILL BE PREPARED BY THE CONTRACTOR TO SHOW AREAS OF PROTECTION AND SUBMITTED TO THE CONTRATING OFFICER FOR APPROVAL.
3. LOCATION OF THE EDGE OF THE EXIST. 9" GABION MATTRESS INDICATED ON THE PLAN IS APPROXIMATED. IT WAS OFFSET AT A DISTANCE OF 24' FOR LEVEE AND 12' FOR EXIST. DIKES MEASURED HORIZONTALLY FROM TOE OF RIPRAP TO TOE OF FINISHED BANK PROTECTION (EDGE OF 9" GABION MATTRESS) RESPECTIVELY BASED ON THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY'S 1983 AS-BUILT DRAWINGS OF BANK STABILIZATION FOR HOLLY ACRES LEVEE. THE CONTRACTOR SHALL LOCATE AND EXPOSE THE EDGE OF THE EXIST. 9" MATTRESS IN ORDER TO TIE WITH THE NEW 12" GABION MATTRESS. THE NEW GABION AND THE EXIST. GABION MATTRESSES SHALL BE TIED IN THE SAME WAY THE NEW GABION MATTRESSES ARE TO BE TIED TOGETHER. SPIRAL TIES SHOULD BE CONSIDERED AS ONE OF THE METHODS FOR FASTENING MATTRESSES TOGETHER (SPECS SECTION 02371 PAR. 3.3)
4. PROTECT IN-PLACE EXIST. 9" GABION MATTRESS. EXCAVATION IS REQUIRED TO EXPOSE EDGE OF THE EXIST. 9" GABION MATTRESS. EXCAVATION DEPTH VARIES FROM APPROX. 1 FOOT TO 2 FEET BELOW THE EXIST. GROUND SURFACE. THE CONTRACTOR SHALL TAKE SPECIAL CARE NOT TO DAMAGE THE EXIST. 9" GABION MATTRESSES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REPLACE IN-KIND DAMAGED GABION MATTRESSES AS THE RESULT OF THE CONSTRUCTION ACTIVITIES AT NO COST TO THE GOVERNMENT. IT IS ANTICIPATED THAT STANDING WATER IN THE EXCAVATION AREA WILL REMAIN THERE FOR AT LEAST 36 HOURS PERIOD. (SEE ENCLOSED PHOTOS IN SPECS).

NOTES

1. GROUND WATER TABLE LEVEL INDICATED ON THE PROFILE APPLIES TO SPRING AND WINTER SEASONS. IT IS ABOUT 2 FT. LOWER DURING FALL AND SUMMER.
2. LEVEE TOE-DOWN IS NOT REQUIRED FOR STA. 103+44 TO STA. 153+72.90 ALONG THE EXISTING HOLLY ACRES LEVEE.
3. 12"-6' WIDE GABION MATTRESS IS NOT REQUIRED UNDERNEATH THE WEST 119TH AVE. DIKE WITHIN THE GUIDE DIKE'S FOOTPRINT.
4. SEE SHEET CLX-6 FOR DETAILS OF TYPICAL CROSS SECTION STA. 103+44.00 TO STA. 148+88.50
5. 12"-18' WIDE GABION MATTRESS SHALL BE REQUIRED FROM STA. 103+44.00 TO STA. 127+10.00 AND AROUND THE EAST 119th AVE. GUIDE DIKE.
6. 12"-6' WIDE GABION MATTRESS SHALL BE REQUIRED FROM STA. 127+10.00 TO STA. 152+13.94

AS-BUILT

PLATE 4

Two working days before you dig CALL FOR THE BLUE STAKES
602 263-1100
Blue Stake Center CALL COLLECT

SAFETY PAYS

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
C	Added Construction Notes	8/09/07	P.U.

REVISIONS

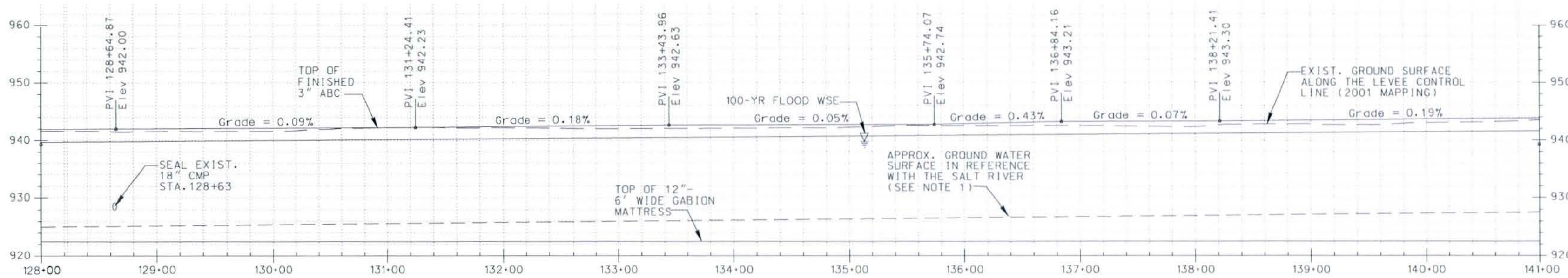
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: D.P.
DRAWN BY: D.P.
CHECKED BY: P.U.

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
PLAN AND PROFILE
STA. 115+00 TO STA. 128+00

SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

SPEC NO. W912PL-07-B-0003
DISTRICT FILE NO. 203/405
FILE NAME: CL2.Dgn
SCALE: 50:1
SHEET CL-2



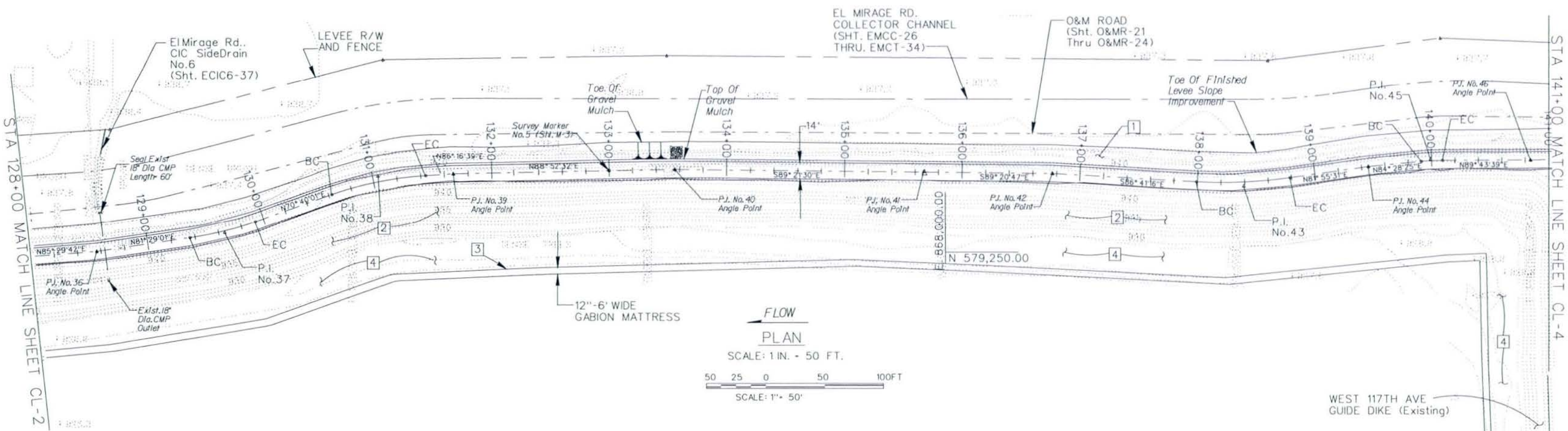
LEVEE CONTROL LINE AND GABION MATTRESS PROFILE

HORIZ. SCALE: 1"= 10'
VERT. SCALE: 1"= 50'

LEVEE HORIZONTAL CONTROL LINE-CURVE DATA								
P.I. NO.	NORTHING	EASTING	Δ	R(FT)	T(FT.)	L(FT.)	B.C. Sta.	E.C. Sta.
37	868,016.79	578,635.86	10° 49'01" LF	300.00	28.40	56.64	129+35.63	129+92.27
38	868,062.67	578,767.48	15° 36'39" LF	300.00	41.12	81.74	130+62.23	131+43.96
43	868,057.89	579502.85	11° 23'13" LF	400.00	39.88	79.50	137+98.80	138+78.29
45	868,078.17	579,663.01	5° 15'15" LF	200.00	9.18	18.34	139+90.71	140+09.05
47	868,079.73	579,838.12	4° 33'44" LF	200.00	7.97	15.93	141+67.03	141+82.95

LEVEE HORIZONTAL CONTROL LINE-POINT DATA			
P.I. NO.	NORTHING	EASTING	Δ
36	868,000.84	578,529.36	ANGLE POINT
39	868,067.19	578,832.29	ANGLE POINT
40	868,070.88	579,020.34	ANGLE POINT
41	868,068.51	579,231.50	ANGLE POINT

LEVEE HORIZONTAL CONTROL LINE-POINT DATA			
P.I. NO.	NORTHING	EASTING	Δ
42	868,067.26	579,340.80	ANGLE POINT
44	868,072.94	578,608.99	ANGLE POINT
46	868,078.57	579,747.48	ANGLE POINT



PLAN

SCALE: 1 IN. = 50 FT.

50 25 0 50 100FT

SCALE: 1"= 50'

CONSTRUCTION NOTES

1, 2, 3, 4 (SEE SHEET CL-1)

NOTES

1. GROUND WATER TABLE LEVEL INDICATED ON THE PROFILE APPLIES TO SPRING AND WINTER SEASONS. IT IS ABOUT 2 FT. LOWER DURING FALL AND SUMMER.
2. LEVEE TOE-DOWN IS NOT REQUIRED FOR STA. 103+44 TO STA. 153+72.90 ALONG THE EXISTING HOLLY ACRES LEVEE.
3. SEE SHEET CLX-6 FOR DETAILS OF TYPICAL CROSS SECTION STA. 103+44 TO STA. 148+69.23
4. 12"-6' WIDE GABION MATTRESS IS REQUIRED FOR STA. 127+10.00 TO STA. 152+13.94.

AS-BUILT

PLATE 5

Two working days before you dig CALL FOR THE BLUE STAKES 602 263-1100 Blue Stake Center CALL COLLECT

REVISIONS: SYMBOL | DESCRIPTIONS | DATE | APPROVAL

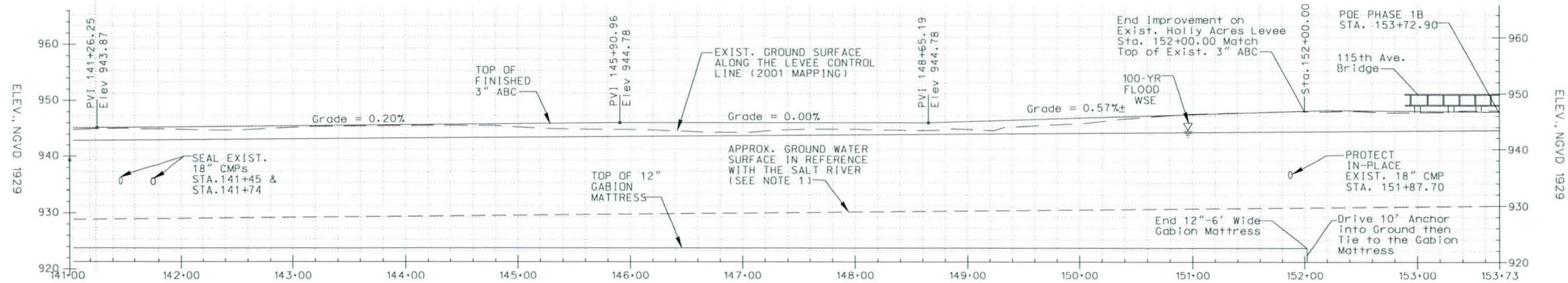
TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
PLAN AND PROFILE
STA. 128+00 TO STA. 141+00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: D.P. DRAWN BY: D.P. CHECKED BY: P.U.

SUBMITTED BY: THOMAS H. SAGE, P.E. CHIEF, DESIGN BRANCH

SCALE: 50' | SHEET CL-3 | FILE NAME: CL3.Dgn | SPEC. NO. W912PL-07-B-0003 | DISTRICT FILE NO. 203/406

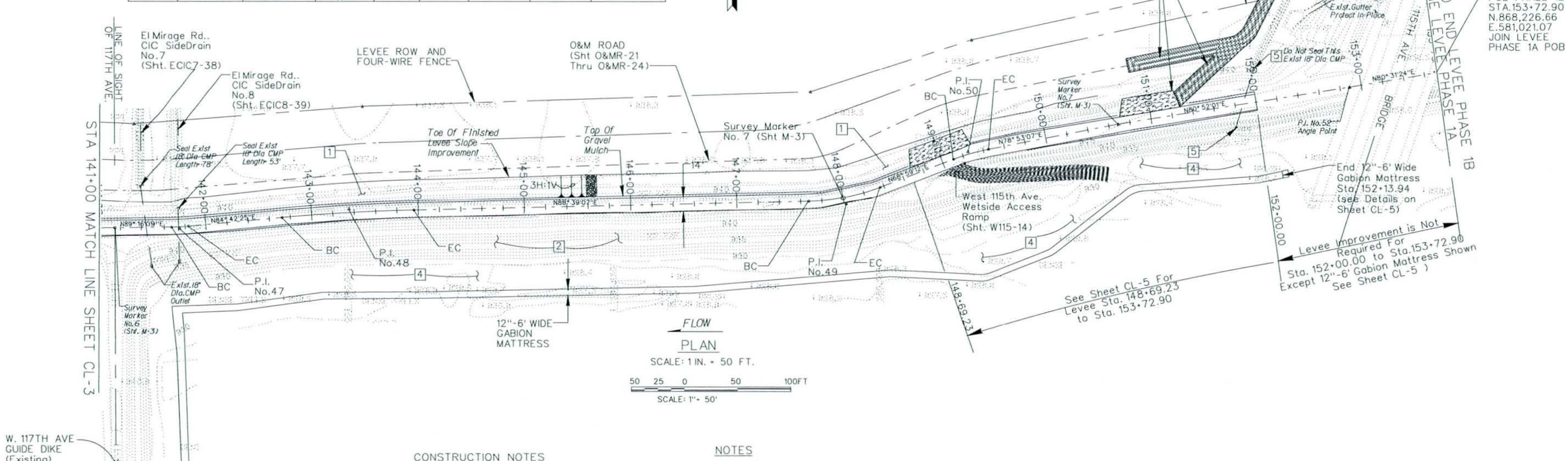


LEVEE CONTROL LINE AND GABION MATTRESS PROFILE

HORIZ. SCALE: 1"= 10'
VERT. SCALE: 1"= 50'

LEVEE HORIZONTAL CONTROL LINE-CURVE DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(FT)	T(FT.)	L(FT.)	B.C. Sta.	E.C. Sta.
47	868,079.73	579,838.12	4° 33'44" LF	200.00	7.97	15.93	141+67.03	141+82.95
48	868,094.36	569,996.10	3° 56'42" RT	1,800.00	61.99	123.93	142+71.65	143+95.58
49	868,105.38	580,464.25	19° 39'55" LF	200.00	34.66	68.65	147+67.21	148+35.85
50	868,150.60	580,581.97	9° 53'55" RT	200.00	17.32	34.55	149+09.97	149+44.53

LEVEE HORIZONTAL CONTROL POINT DATA			
P.I. NO.	NORTHING	EASTING	Δ°
51	868,177.86	570,720.73	ANGLE POINT
52	868,212.80	580,938.06	ANGLE POINT



PLAN

SCALE: 1 IN. = 50 FT.

50 25 0 50 100FT
SCALE: 1"= 50'

CONSTRUCTION NOTES

1 2 3 4 (SEE SHEET CL-1)

5 PROTECT EXIST. 18" CMP IN-PLACE

NOTES

1. GROUND WATER TABLE LEVEL INDICATED ON THE PROFILE APPLIES TO SPRING AND WINTER SEASONS. IT IS ABOUT 2 FT. LOWER DURING FALL AND SUMMER.
2. LEVEE TOE-DOWN IS NOT REQUIRED FOR STA. 103+44 TO STA. 153+72.90 ALONG THE EXISTING HOLLY ACRES LEVEE.
3. SEE SHEET CLX-6 FOR DETAILS OF TYPICAL CROSS SECTION STA. 103+44TO STA. 148+69.23
4. 12"-6' WIDE GABION MATTRESS IS REQUIRED FOR STA. 127+10.00 TO STA. 152+13.94 AND AROUND THE WEST 117TH AVE. GUIDE DIKE.

AS-BUILT

Two working days before you dig CALL FOR THE BLUE STAKES 602 263-1100 Blue Stake Center CALL COLLECT

PLATE 6

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)

PLAN AND PROFILE
STA. 141+00 TO STA. 153+72.90

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: D.P. DRAWN BY: D.P. CHECKED BY: P.J.

SUBMITTED BY: THOMAS H. SAGE, P.E. CHIEF, DESIGN BRANCH

FILE NAME: CL4.Dgn

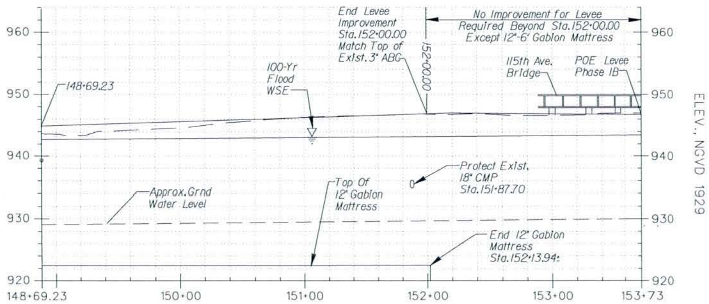
SPEC. NO. W912PL-07-B-0003

DISTRICT FILE NO. 203/ 407

SCALE: 50:1

SHEET CL-4

5 VALUE ENGINEERING PAYS 4

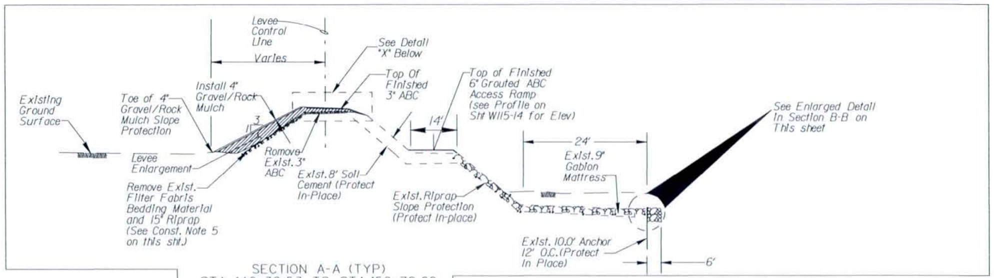


LEVEE CONTROL LINE AND GABION MATTRESS PROFILE
STA. 148+69.23 TO STA. 153+72.90

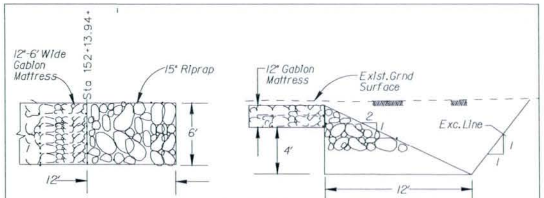
HORIZ. SCALE: 1"= 10'
VERT. SCALE: 1"= 50'

NOTES

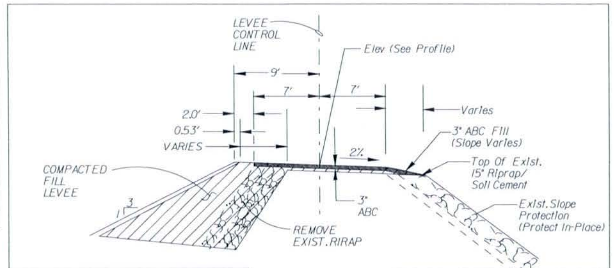
1. GROUND WATER TABLE LEVEL INDICATED ON THE PROFILE APPLIES TO SPRING AND WINTER SEASONS. IT IS ABOUT 2 FT. LOWER DURING FALL AND SUMMER.



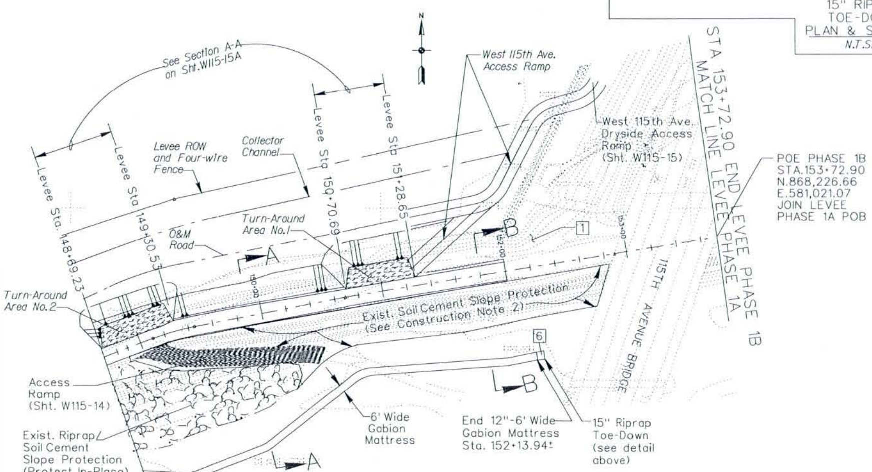
SECTION A-A (TYP)
STA. 149+30.53 TO STA. 150+70.69
N.T.S.



15" RIPRAP
TOE-DOWN
PLAN & SECTION
N.T.S.

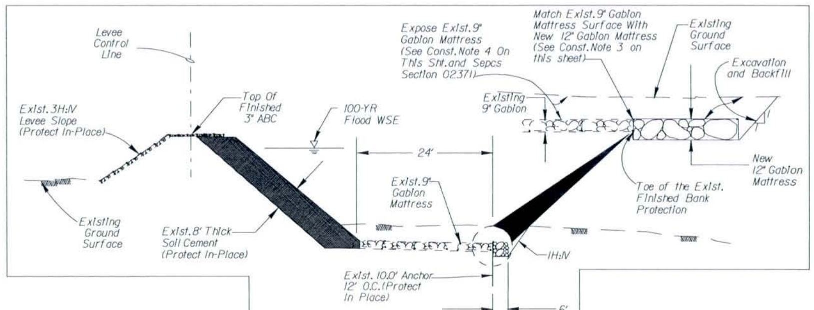


DETAIL "X"
N.T.S.



PLAN
LEVEE STA. 148+69.23 TO STA. 153+72.90

HORIZ. SCALE: 1"= 10'
VERT. SCALE: 1"= 50'



SECTION B-B (TYP)
STA. 151+28.65 TO STA. 152+13.94±
N.T.S.

AS-BUILT

PLATE 7

CONSTRUCTION NOTES

1 PROTECT IN PLACE EXISTING RIPRAP.

2 EXISTING 8' SOIL CEMENT SLOPE PROTECTION SHALL BE PROTECTED IN-PLACE, EXCEPT NOTED OR DIRECTED OTHERWISE.

3 LOCATION OF THE EDGE OF THE EXIST. 9" GABION MATTRESS INDICATED ON THE HOLLY ACRES LEVEE PLANS IS APPROXIMATED. IT WAS OFFSET AT A DISTANCE OF 24' MEASURED HORIZONTALLY FROM TOE OF THE EXIST. RIPRAP TO TOE OF FINISHED BANK PROTECTION (EDGE OF 9" GABION MATTRESS) BASED ON THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY'S 1983 AS-BUILT DRAWINGS OF BANK STABILIZATION FOR HOLLY ACRES LEVEE. THE CONTRACTOR SHALL LOCATE AND EXPOSE THE EDGE OF THE EXIST. 9" MATTRESS IN ORDER TO TIE WITH THE NEW 12" GABION MATTRESS. THE NEW GABION AND THE EXIST. GABION MATTRESSES SHALL BE TIED IN THE SAME WAY THE NEW GABION MATTRESSES ARE TO BE TIED TOGETHER. SPIRAL TIES SHOULD BE CONSIDERED AS ONE OF THE METHODS FOR FASTENING MATTRESSES TOGETHER (SPECS SECTION 02371 PAR. 3.3)

CONSTRUCTION NOTES CONT.

4 SOIL EXCAVATION IS REQUIRED TO EXPOSE EDGE OF THE EXIST. 9" GABION MATTRESS. EXCAVATION DEPTH VARIES FROM APPROX. 1 FOOT TO 2 FEET BELOW THE EXIST. GROUND SURFACE. THE CONTRACTOR SHALL TAKE SPECIAL CARE NOT TO DAMAGE THE EXIST. 9" GABION MATTRESSES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REPLACE IN-KIND FOR DAMAGED GABION MATTRESSES AS THE RESULT OF THE CONSTRUCTION ACTIVITIES AT NO COST TO THE GOVERNMENT. IT IS ANTICIPATED THAT STANDING WATER IN THE EXCAVATION AREA WILL REMAIN THERE FOR AT LEAST 36 HOURS PERIOD. (SEE ENCLOSED PHOTOS IN THE SPECS)

5 THE CONTRACTOR SHALL REMOVE AND SALVAGE TO THE MAXIMUM EXTENT POSSIBLE EXIST. 15" RIPRAP AND 6" BEDDING MATERIAL ALONG THE HOLLY ACRES LEVEE (SEE SPECS SECTIONS 02380 & 02381).

6 BASED ON THE AS-BUILT DRAWINGS FOR BANK STABILIZATION OF HOLLY ACRES LEVEE OF FLOOD CONTROL DISTRICT OF MARICOPA COUNTY DATED MAY 12TH, 1984, EXISTING 9" GABION MATTRES WAS TERMINATED ABOUT 50 FT. WEST OF 115TH AVE. (AVONDALE) BRIDGE CENTERLINE. THE CONTRACTOR SHALL END 12"-6' WIDE GABION MATTRESS WHERE THE EXIST. 9" GABION TERMINATED.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)

DETAILED LEVEE PLAN, PROFILE AND SECTIONS
STA. 148+69.23 TO STA. 153+72.90

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: D.P.
DRAWN BY: P.J.
CHECKED BY: D.P.

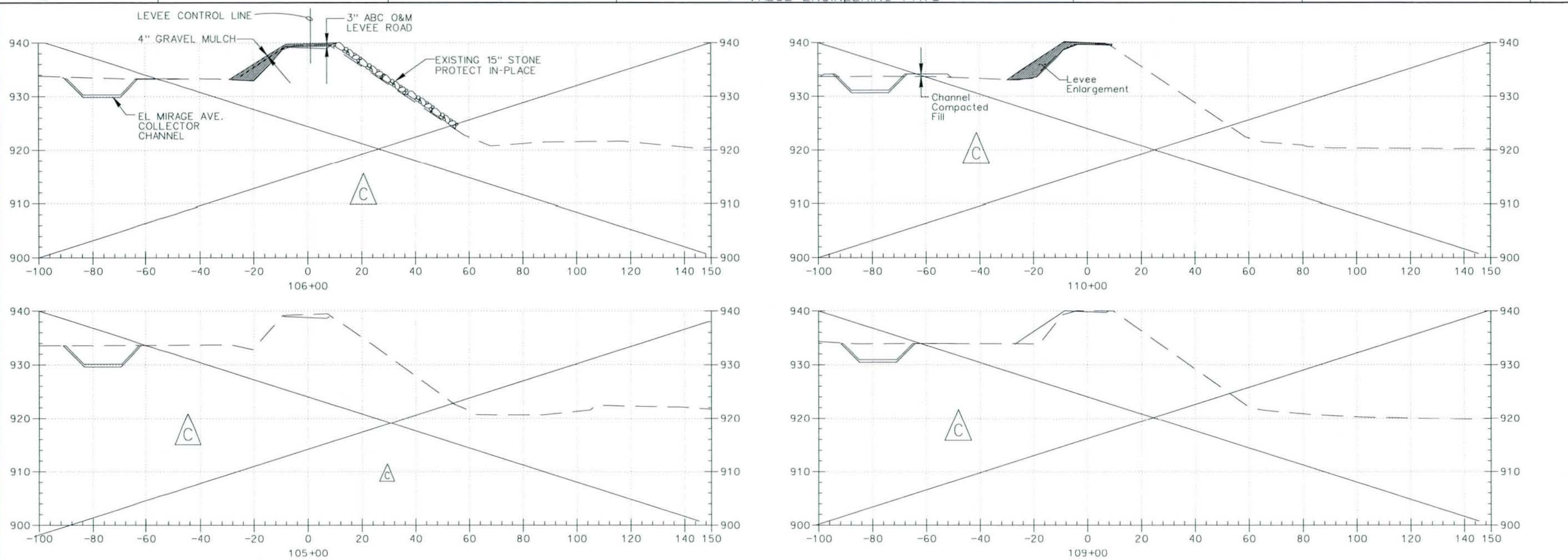
SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

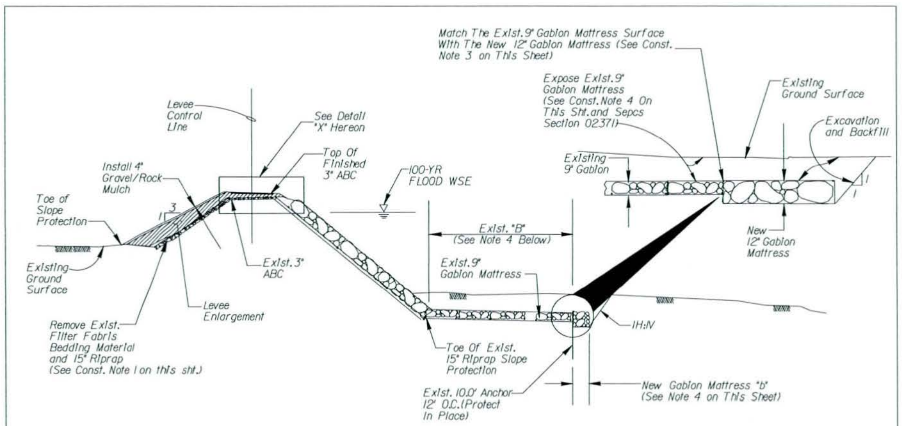
FILE NAME: CL5.Dgn
SPEC NO. W912PL-07-B-0003
DISTRICT FILE NO. 203/408

SCALE: 50:1
SHEET CL-5

SAFETY PAYS

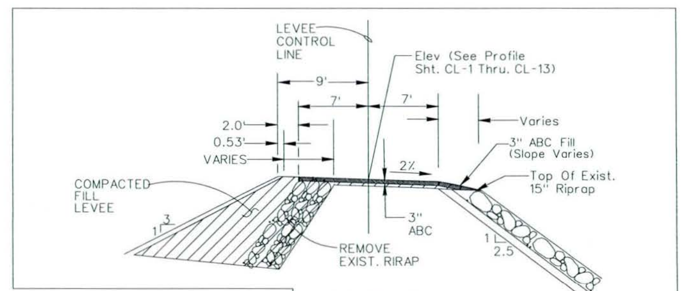
VALUE ENGINEERING PAYS





TYP SECTION (STA 111+17.72 TO 148+69.23)

N.T.S.



DETAIL "X"

N.T.S.

NOTES:

1. CROSS SECTIONS ARE DRAWN LOOKING UPSTREAM IN THE DIRECTION OF ADVANCING STATIONS.
2. LEVEE ENLARGEMENT IS REQUIRED FOR STA. 111+17.72 TO STA. 151+28.65.
3. THE CONTRACTOR SHALL REMOVE AND SALVAGE TO THE MAXIMUM EXTENT POSSIBLE EXIST. 15" RIPRAP AND 6" BEDDING MATERIAL ALONG THE HOLLY ACRES LEVEE (SEE SPECS SECTIONS 02380 & 02381).
4. B=18' FOR STA. 111+17.72 TO STA. 127+10.00, AND b=6' FOR STA. 127+10.00 TO STA. 151+28.65

AS-BUILT

PLATE 8

CONSTRUCTION NOTES

1. THE CONTRACTOR SHALL REMOVE AND SALVAGE TO THE MAXIMUM EXTENT POSSIBLE EXIST. 15" RIPRAP AND 6" BEDDING MATERIAL ALONG THE HOLLY ACRES LEVEE (SEE SPECS SECTIONS 02380 & 02381).
2. PROTECT IN-PLACE EXISTING RIPRAP AND GROUTED STONE ON THE RIVERSIDE SLOPE OF THE EXISTING HOLLY ACRES LEVEE UNLESS OTHERWISE SPECIFIED OR DIRECTED.
3. LOCATION OF THE EDGE OF THE EXIST. 9" GABION MATTRESS INDICATED ON THE HOLLY ACRES LEVEE PLANS IS APPROXIMATED. IT WAS OFFSET AT A DISTANCE OF 24' MEASURED HORIZONTALLY FROM TOE OF RIPRAP TO TOE OF FINISHED BANK PROTECTION (EDGE OF 9" GABION MATTRESS) BASED ON THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY'S 1983 AS-BUILT DRAWINGS OF BANK STABILIZATION FOR HOLLY ACRES LEVEE. THE CONTRACTOR SHALL LOCATE AND EXPOSE THE EDGE OF THE EXIST. 9" MATTRESS IN ORDER TO TIE WITH THE NEW 12" GABION MATTRESS. THE NEW GABION AND THE EXIST. GABION MATTRESSES SHALL BE TIED IN THE SAME WAY THE NEW GABION MATTRESSES ARE TO BE TIED TOGETHER. SPIRAL TIES SHOULD BE CONSIDERED AS ONE OF THE METHODS FOR FASTENING MATTRESSES TOGETHER (SPECS SECTION 02371 PAR. 3.3)
4. SOIL EXCAVATION IS REQUIRED TO EXPOSE EDGE OF THE EXIST. 9" GABION MATTRESS. EXCAVATION DEPTH VARIES FROM APPROX. 1 FOOT TO 2 FEET BELOW THE EXIST. GROUND SURFACE. THE CONTRACTOR SHALL TAKE SPECIAL CARE NOT TO DAMAGE THE EXIST. 9" GABION MATTRESSES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REPLACE IN-KIND FOR DAMAGED GABION MATTRESSES AS THE RESULT OF THE CONSTRUCTION ACTIVITIES AT NO COST TO THE GOVERNMENT. IT IS ANTICIPATED THAT STANDING WATER IN THE EXCAVATION AREA WILL REMAIN THERE FOR AT LEAST 36 HOURS PERIOD. (SEE ENCLOSED PHOTOS IN THE SPECS)

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
C	Deleted X-Section Sta. 105+00 thru. 110+00	8-12-07	D.P.
	Revised Notes to callout correct Stationing		

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)

TYP SECTION 111+17.72 TO 148+69.23

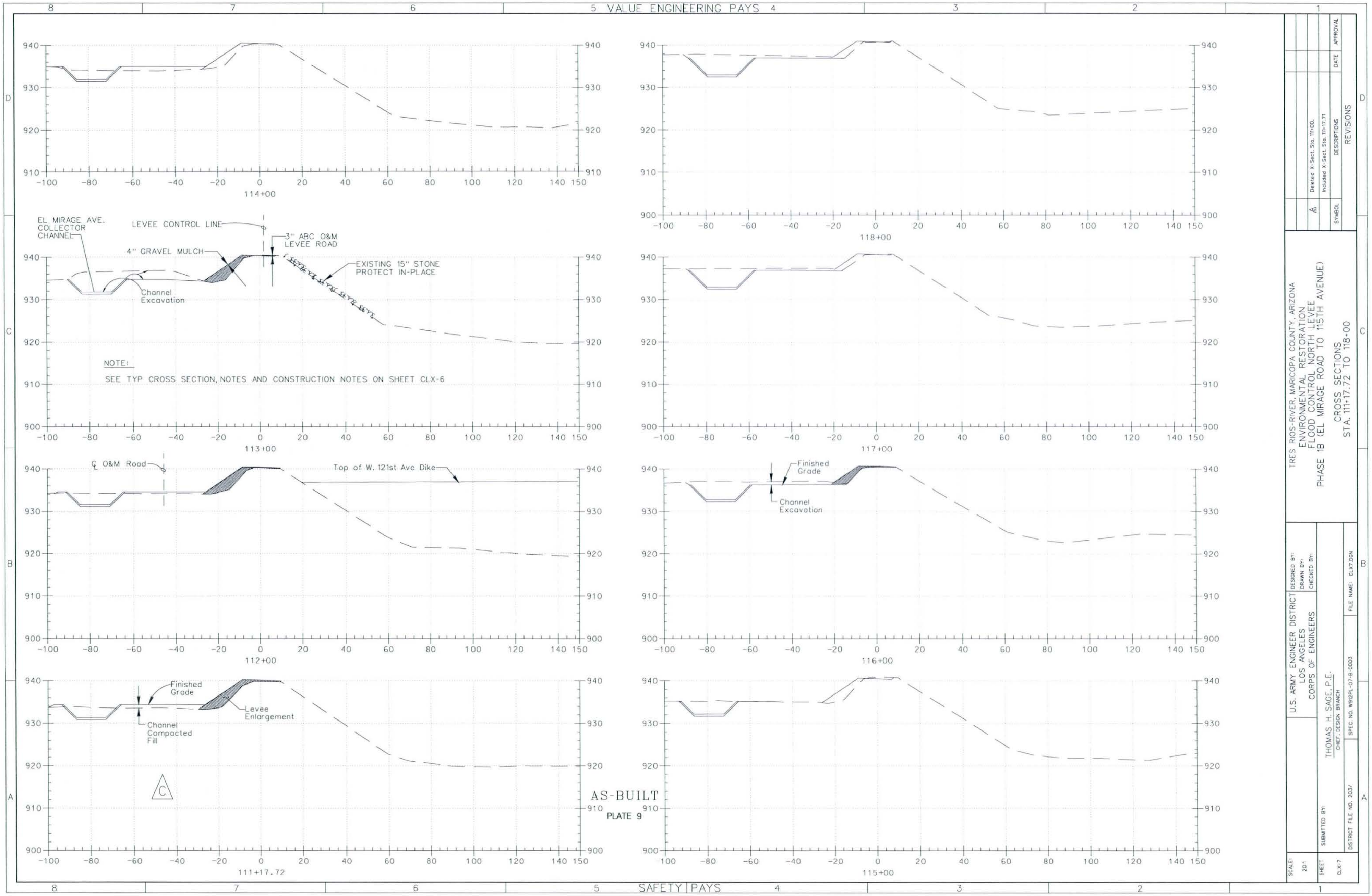
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:

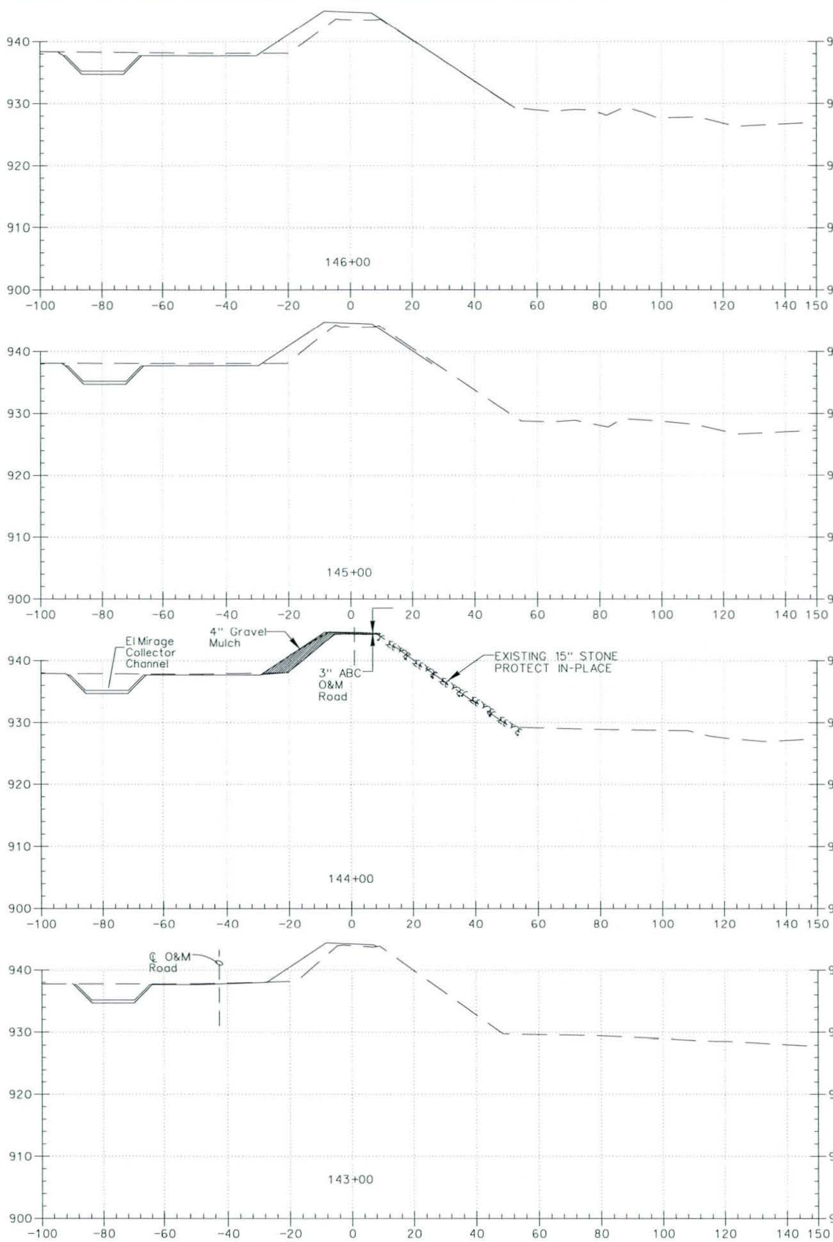
SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

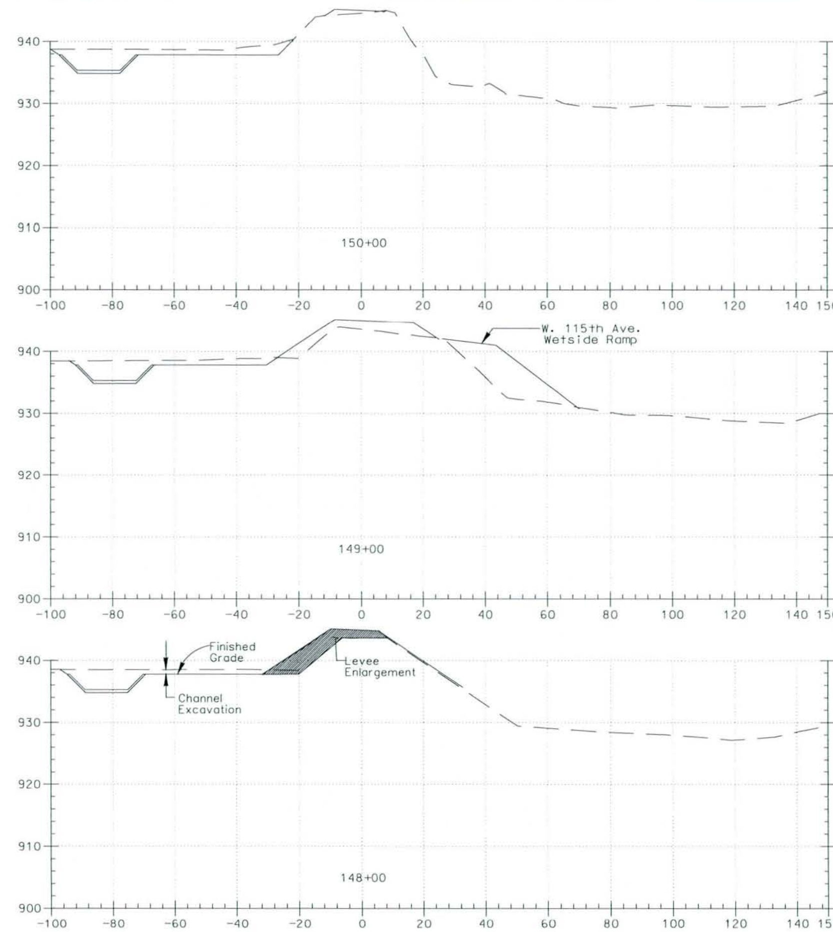
SCALE: 20:1
SHEET CLX-6
DISTRICT FILE NO. 203/409
SPEC. NO. W912PL-07-B-0003
FILE NAME: CLX6.DGN

SAFETY PAYS


VALUE ENGINEERING PAYS
114+00
118+00
EL MIRAGE AVE. COLLECTOR CHANNEL
LEVEE CONTROL LINE
3" ABC O&M LEVEE ROAD
4" GRAVEL MULCH
EXISTING 15" STONE PROTECT IN-PLACE
Channel Excavation
NOTE:
SEE TYP CROSS SECTION, NOTES AND CONSTRUCTION NOTES ON SHEET CLX-6
113+00
117+00
℄ O&M Road
Top of W. 121st Ave Dike
Finished Grade
Channel Excavation
112+00
116+00
Finished Grade
Channel Compacted Fill
Levee Enlargement
111+17.72
115+00
AS-BUILT
PLATE 9
SAFETY PAYS
Deleted X-Sect. Sta. 111+00.
Included X-Sect. Sta. 111+17.71
SYMBOL
DESCRIPTIONS
DATE
APPROVAL
REVISIONS
TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
CROSS SECTIONS
STA. 111+17.72 TO 118+00
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS
DESIGNED BY:
DRAWN BY:
CHECKED BY:
SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH
FILE NAME: CLX7.DGN
SPEC. NO. W912PL-07-B-0003
DISTRICT FILE NO. 203/
SCALE: 20:1
SHEET CLX-7

VALUE ENGINEERING PAYS





NOTES:

1. SEE TYP CROSS SECTION, NOTES AND CONSTRUCTION NOTES ON SHEET CLX-6 FOR STA. 143+00 TO STA. 152+00.00
2. SEE SECTION A-A ON SHEET CL-5 FOR STA. 149+30.53 TO 150+70.69
3. CROSS SECTIONS ARE DRAWN LOOKING UPSTREAM IN THE DIRECTION OF ADVANCING STATIONS.

AS-BUILT

PLATE 10

Two working days before you dig CALL FOR THE BLUE STAKES 602 263-1100 Blue Stake Center CALL COLLECT

SAFETY PAYS

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
CROSS SECTIONS
STA. 143+00 TO 150+00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

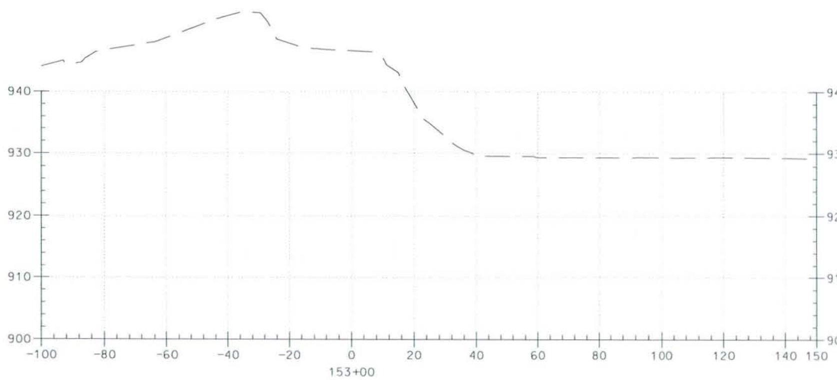
DESIGNED BY:
DRAWN BY:
CHECKED BY:

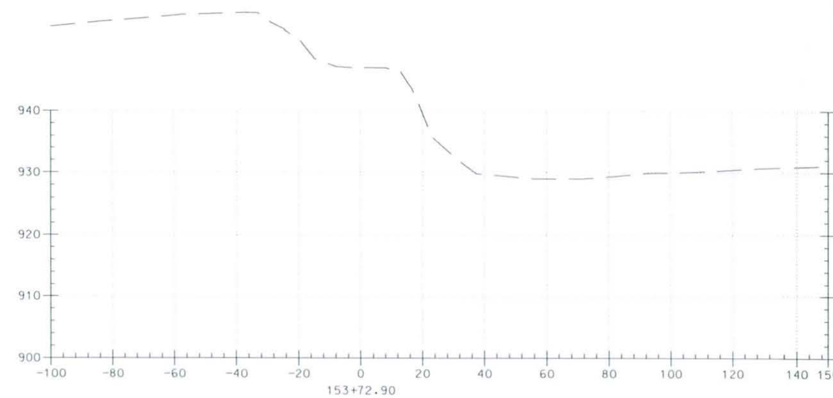
SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

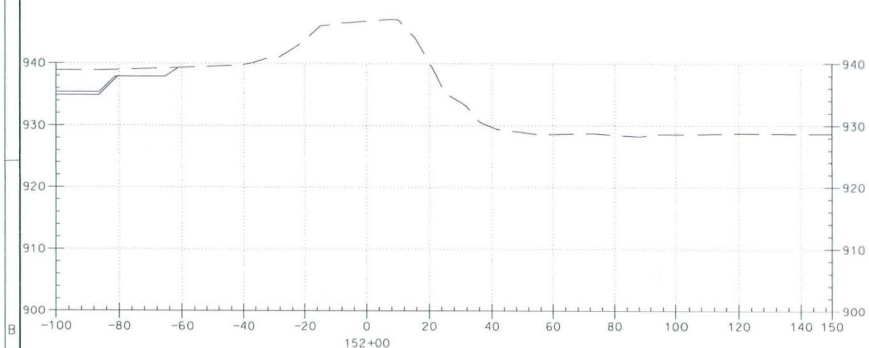
FILE NAME: CLX11.Dgn
SPEC. NO. W912PL-07-B-0003
DISTRICT FILE NO. 203/414

SCALE:
2011
SHEET
CLX-11

VALUE ENGINEERING PAYS







NOTES:

1. SEE SECTION B-B ON SHEET CL-5 FOR STA. 151+28.15 TO 152+13.94
2. CROSS SECTIONS ARE DRAWN LOOKING UPSTREAM IN THE DIRECTION OF ADVANCING STATIONS.

AS-BUILT

PLATE 11

Two working days before you dig CALL FOR THE BLUE STAKES 602 263-1100 Blue Stake Center CALL COLLECT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)

CROSS SECTIONS
STA. 152+00.00 TO 153+72.90

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:

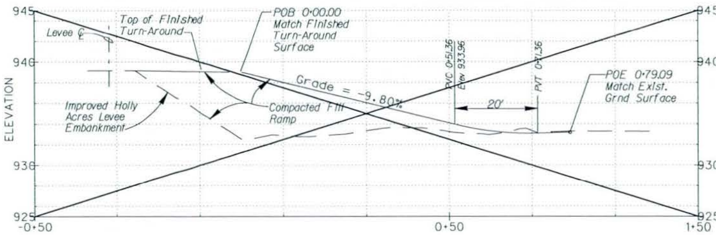
SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

DISTRICT FILE NO. 203/415 | SPEC. NO. W912PL-07-B-0003 | FILE NAME: CLX12.Dgn

SCALE: 20:1

SHEET CLX-12

SAFETY PAYS

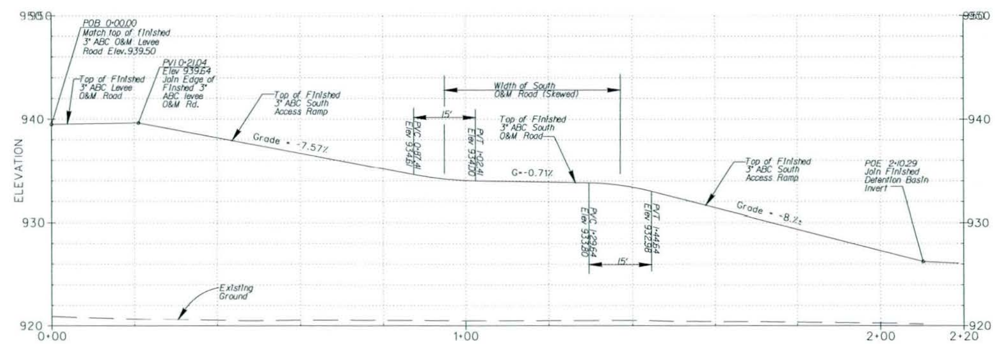


RAMP CENTER LINE PROFILE

HORIZ. SCALE: 1 IN. = 10 FT.
VERT. SCALE: 1 IN. = 20 FT.

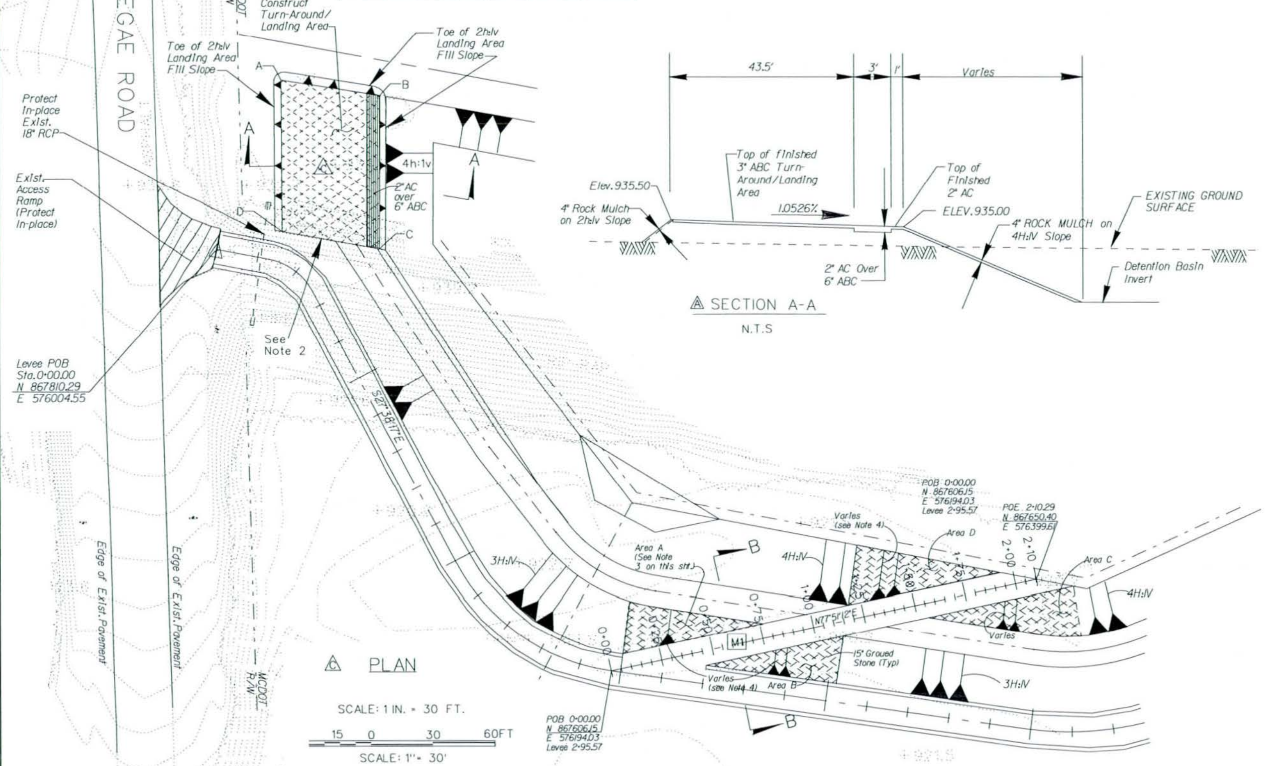
LANDING AREA P.I. CONTROL POINTS DATA

P.I. No	NORTHING	EASTING	Exist. Grade Elev	Finished Grade Elev
A	867,892.38	576,036.61	933.70	935.50
B	867,884.23	576,083.43	933.70	935.00
C	867,810.52	576,083.02	934.00	935.00
D	867,819.02	576,035.91	934.00	935.50



SOUTH RAMP CENTER LINE PROFILE

N.T.S.



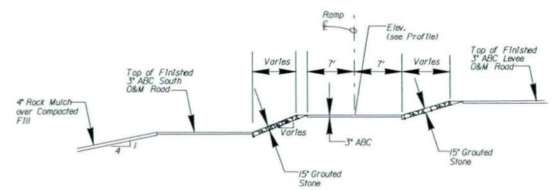
PLAN

SCALE: 1 IN. = 30 FT.

SCALE: 1"= 30'

SECTION A-A

N.T.S.



SECTION B-B

N.T.S

NOTES:

1. 4" THICK GRAVEL/ROCK MULCH SHALL BE APPLIED ON THE COMPACTED 2H:1V FILL SLOPES OF THE LANDING AREA.
2. COMPACTED FILL TO MATCH DESIGN ELEVATION
3. 15" GROUTED STONE IS REQUIRED FOR AREAS A, B, C & D.
4. TOP AND TOE OF FINISHED 15" GROUTED STONE SLOPES SHALL MATCH EDGE OF FINISHED 3" ABC O&M ROADS AND BASIN INVERT.

AS-BUILT
PLATE 12

602 263-1100

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
M1	Added Access Ramp Plan, Profile&Section	8/10/07	P.W.U.
B	Deleted Profile, Revised Plan and Section	8/8/07	P.W.U.
A	Revised Section A-A and Note 1	7/10/07	P.W.U.

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
EAST EL MIRAGE ROAD TURN-AROUND/LANDING AREA
PLAN AND SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: D.P.
DRAWN BY: D.P.
CHECKED BY: P.U.

SUBMITTED BY: THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

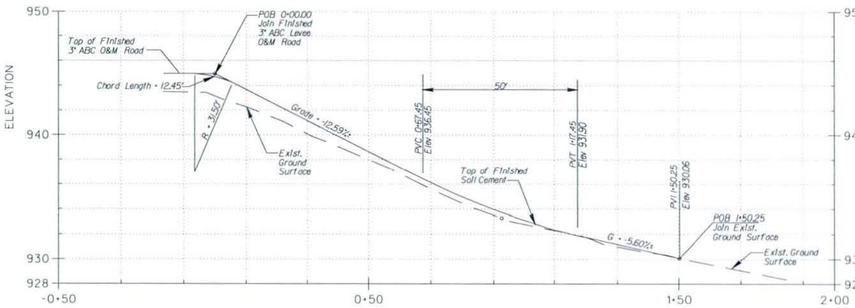
FILE NAME: EEM13.Dgn

SPEC. NO. W912PL-07-B-0003

DISTRICT FILE NO. 203/416

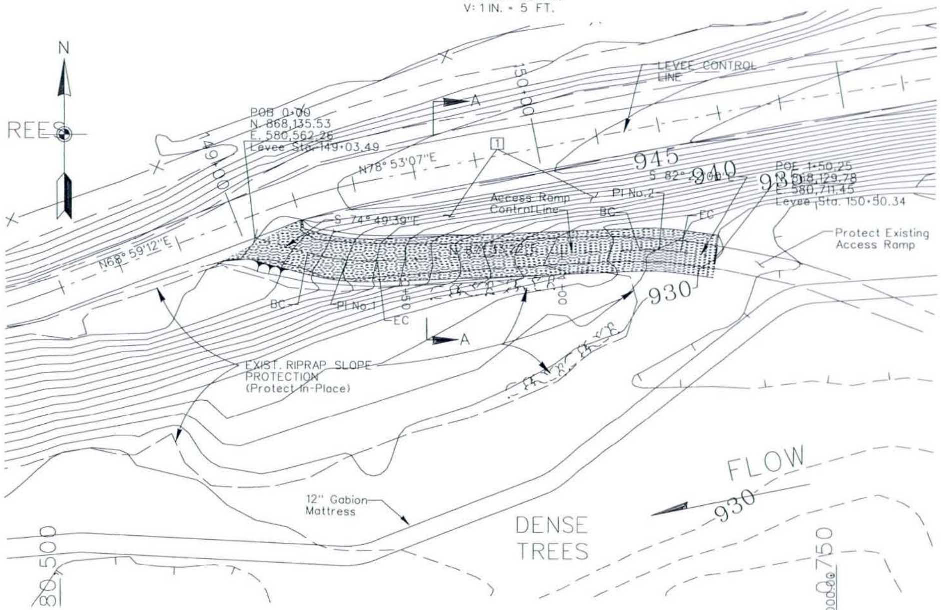
SCALE: 30:1

SHEET EEM-13



CONTROL LINE PROFILE

H: 1 IN. = 20 FT.
V: 1 IN. = 5 FT.

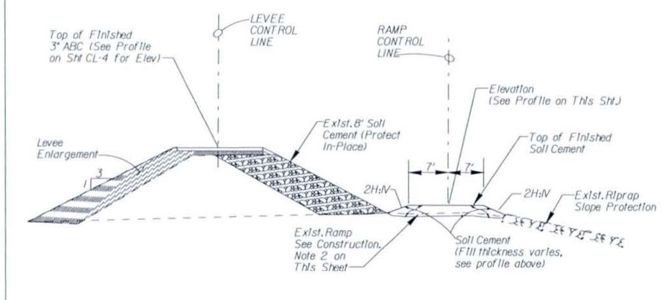


W. 115th AVENUE ACCESS RAMP

PLAN

SCALE: 1 IN. = 20 FT.

			HORIZONTAL CONTROL LINE- CURVE DATA					
P.I.	NORTHING	EASTING	Δ°	R(FT)	T(FT.)	L(FT.)	B.C. Sta.	E.C. Sta.
1	869,127.83	580,590.67	17° 36'58" Left	75.00	11.62	23.06	0+17.81	0+40.87
2	868,132.21	580,693.32	10° 04'37" Right	75.00	6.61	13.19	1+25.38	1+38.58



SECTION A-A (TYP)

N.T.S.

CONSTRUCTION NOTES:

1. EXISTING 8' SOIL CEMENT SLOPE PROTECTION, PROTECT IN-PLACE. THE CONTRACTOR SHALL PREPARE AND SUBMIT PLANS SHOWING AREAS OF PROTECTION (SOIL CEMENT AREAS) TO THE GOVERNMENT FOR REVIEW AND APPROVAL.

2. EXISTING ACCESS RAMP SHALL BE MODIFIED TO MEET LEVEE IMPROVEMENT DESIGN DIMENSIONS. IT IS ASSUMED THAT TOP OF THE EXISTING ACCESS RAMP CONTAINS SOIL CEMENT AND GROUTED ABC. THE CONTRACTOR SHALL REMOVE ALL LOOSE MATERIAL INCLUDING GRAVEL, DIRT ETC. AND APPLY WATER JET FOR CLEANING BEFORE APPLYING NEW MATERIALS. THE CONTRACTOR IS REQUIRED TO PROVIDE PLAN(S) AND DETAILS SHOWING AREA(S) OF REPAIR AND DESCRIBE BRIEFLY METHOD OF REPAIR TO THE CONTRACTING OFFICER FOR APPROVAL PRIOR TO ANY CONSTRUCTION WORK ON THIS ACCESS RAMP.

AS-BUILT
PLATE 13

Two working days before you dig CALL FOR THE BLUE STAKES
602 263-1100
Blue Stake Center CALL COLLECT

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
W. 115th AVENUE WETSIDE ACCESS RAMP
PLAN, PROFILE AND SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

SYMBOL | DESCRIPTIONS | DATE | APPROVAL

REVISIONS

DESIGNED BY: DRAWN BY: CHECKED BY:

SUBMITTED BY:

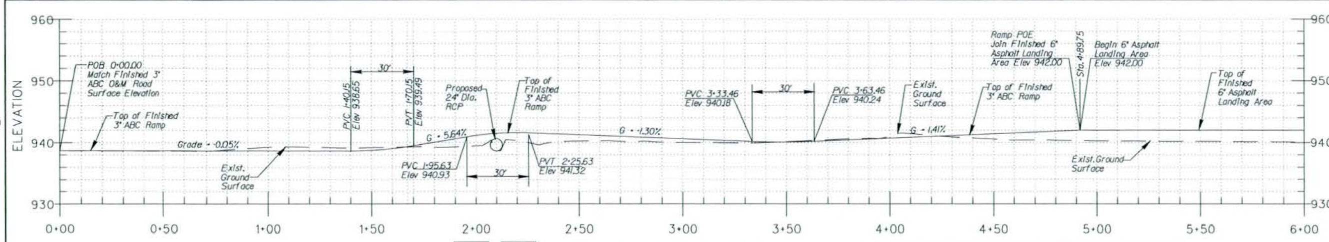
FILE NAME: W115WAR.Dgn

SPEC. NO. W912PL-07-B-0003

DISTRICT FILE NO. 203/ 417

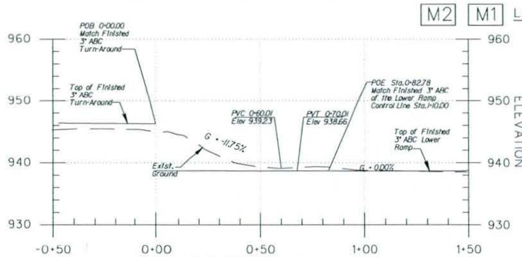
SCALE: 50'

SHEET W115-14



M2 M1 LOWER RAMP CENTER LINE PROFILE

LOWER RAMP HORIZONTAL CONTROL CURVE DATA									
P.I.	NORTHING	EASTING	Δ°	R(Ft)	T(Ft)	L(Ft)	B.C Sta	E.C Sta
1	868,255.91	580,840.00	51° 18'25"Lt	30.00	14.41	26.86	0+98.44	1+25.30
2	868,328.37	580,877.01	52° 40'21"Rt	30.00	14.85	27.58	1+77.41	2+04.99
3	868,336.30	580,920.75	52° 20'41"Lt	30.00	14.74	27.41	2+19.85	2+47.26
4	868,492.89	581,001.86	17° 57'25"Lt	60.00	9.48	18.80	3+99.38	4+18.19
5	868,553.35	581,011.90	Angle Point	N/A	51.81	N/A	N/A	N/A



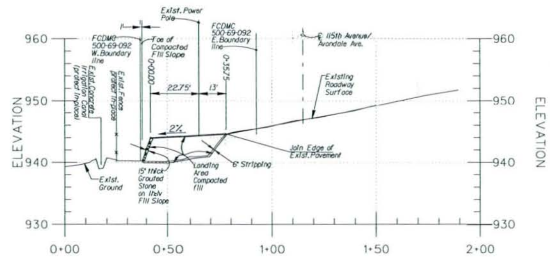
UPPER RAMP CENTER LINE PROFILE

PROFILE SCALE

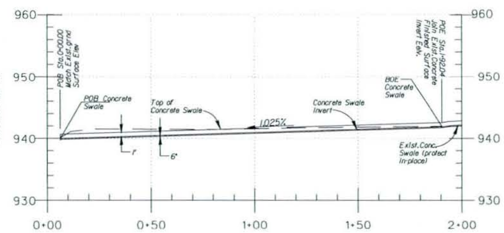
VERT. SCALE: 1 IN. = 10 FT.

HORIZ. SCALE: 1 IN. = 30 FT.

Turn-Around Area No.1 Horizintal Control Points Data			
Point	Equiv Levee Sta.	Northing	Easting
A	150+76.55	868,201.68	580,724.13
B	151+05.03	868,209.75	580,771.97
C	151+08.75	868,194.08	580,778.83
D	150+70.90	868,184.36	580,721.78



M2 M1 LANDING AREA CONTROL LINE PROFILE (SECTION E-E)



M2 M1 CONCRETE SWALE CENTERLINE PROFILE

NOTES:

1. Removal of exist. fence and replacement of the new one on the west side of the Lower Access Ramp and the landing area is required for construction purposes. Existing fence on the east side of the Lower Access Ramp shall be protected in-place.
2. End of curve radius shall join edge of the existing pavement.
3. See Sheet W115-15A for Sections A-A, B-B, C-C and D-D.

CONSTRUCTION NOTES:

[1] Protect in-place existing riprap

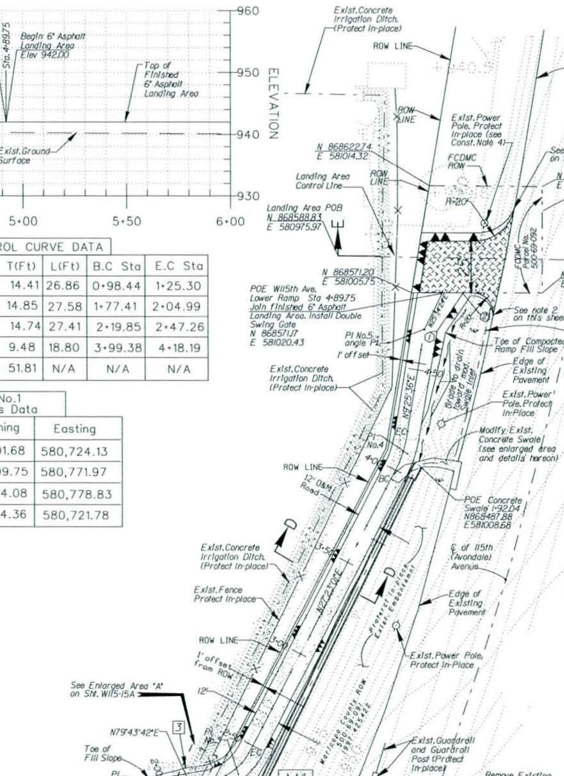
[2] Exist. Irrigation sidedrain pipe and flap gate shall be removed and replaced. The contractor is required to submit plan and details of sidedrains in connection with the 24" RCP for approval by the Government unless otherwise.

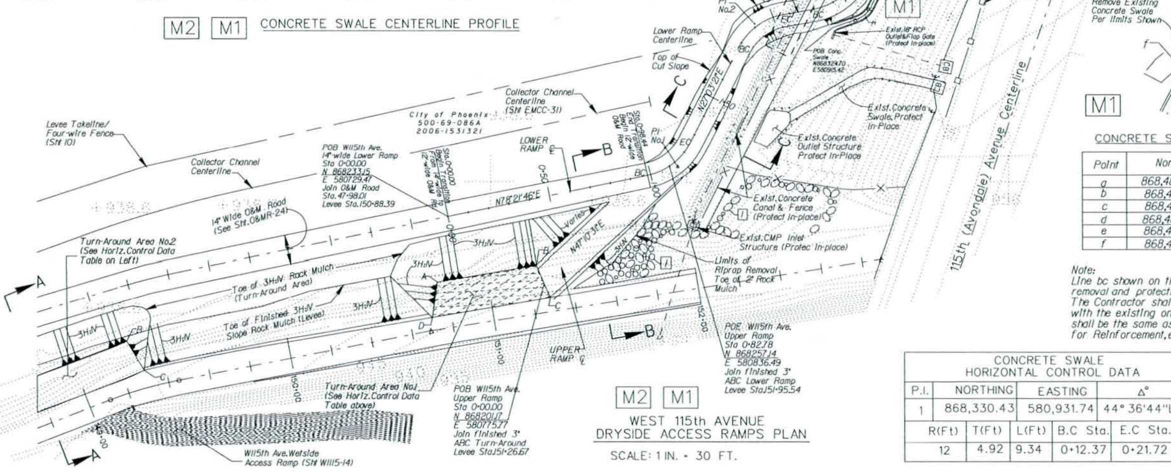
[3] Exist. Irrigation sidedrain pipe and flap gate shall be removed and replaced. The contractor is required to submit plan and details of sidedrains in connection with the 24" RCP for approval by the Government.

[4] Protect the Existing Power Pole During Construction and in Compliance with the Safety Section mentioned elsewhere in the Specs. .

[5] Align the curb parallel to existing pavement of the roadway including horizontal and vertical control datum so that water can properly drain. POB (south end) & POE (north end) of curb shall be at the existing concrete swale and landing area respectively.

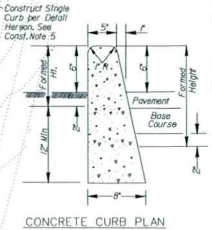
Turn-Around Area No.2 Horizintal Control Points Data			
Point	Equiv Levee Sta.	Northing	Easting
A	148+74.49	868,153.76	580,524.15
B	149+25.79	868,172.81	580,574.25
C	149+30.14	868,158.79	580,582.59
D	148+69.23	868,136.31	580,525.25





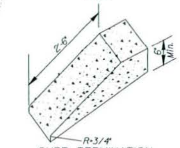
M2 M1 WEST 115th AVENUE DRYSIDE ACCESS RAMPS PLAN

SCALE: 1 IN. = 30 FT.



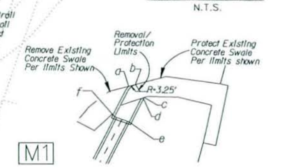
CONCRETE CURB PLAN

N.T.S.



CURB TERMINATION

N.T.S.



M1

CONCRETE SWALE ENLARGED PLAN

Point	Northing	Easting
a	868,488.59	581,006.85
b	868,489.47	581,009.09
c	868,486.45	581,010.65
d	868,486.23	581,009.99
e	868,480.90	581,007.22
f	868,489.89	581,006.85

Note:
Line bc shown on the plan is the limit line for removal and protection of the exist. concrete swale. The Contractor shall match and join new concrete swale with the existing one. Thickness of the new Swale Wall shall be the same as the existing one's. There is no need for Reinforcement, except swale invert.

CONCRETE SWALE HORIZONTAL CONTROL DATA				
P.I.	NORTHING	EASTING	Δ°	
1	868,330.43	580,931.74	44° 36'44"Lt	
R(Ft)	T(Ft)	L(Ft)	B.C Sta.	E.C Sta.
12	4.92	9.34	0+12.37	0+21.72

AS-BUILT

PLATE 14

Two working days before you dig CALL FOR THE BLUE STAKES 602 263-1100 Blue Stake Center CALL COLLECT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
M2	Relocated Landing Area for Lower Access Ramp	22 JUL 08	P.W.U
M1	Redesigned Lower Access Ramp and Added Concrete Swale	31 MAR 08	P.W.U

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
WEST 115th AVE. DRYSIDE ACCESS RAMPS
PLANS, PROFILES AND SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: D.P.
DRAWN BY: P.U.
CHECKED BY: D.P.

SUBMITTED BY: ARTHUR Y. JUNG, P.E. CHIEF, DESIGN BRANCH

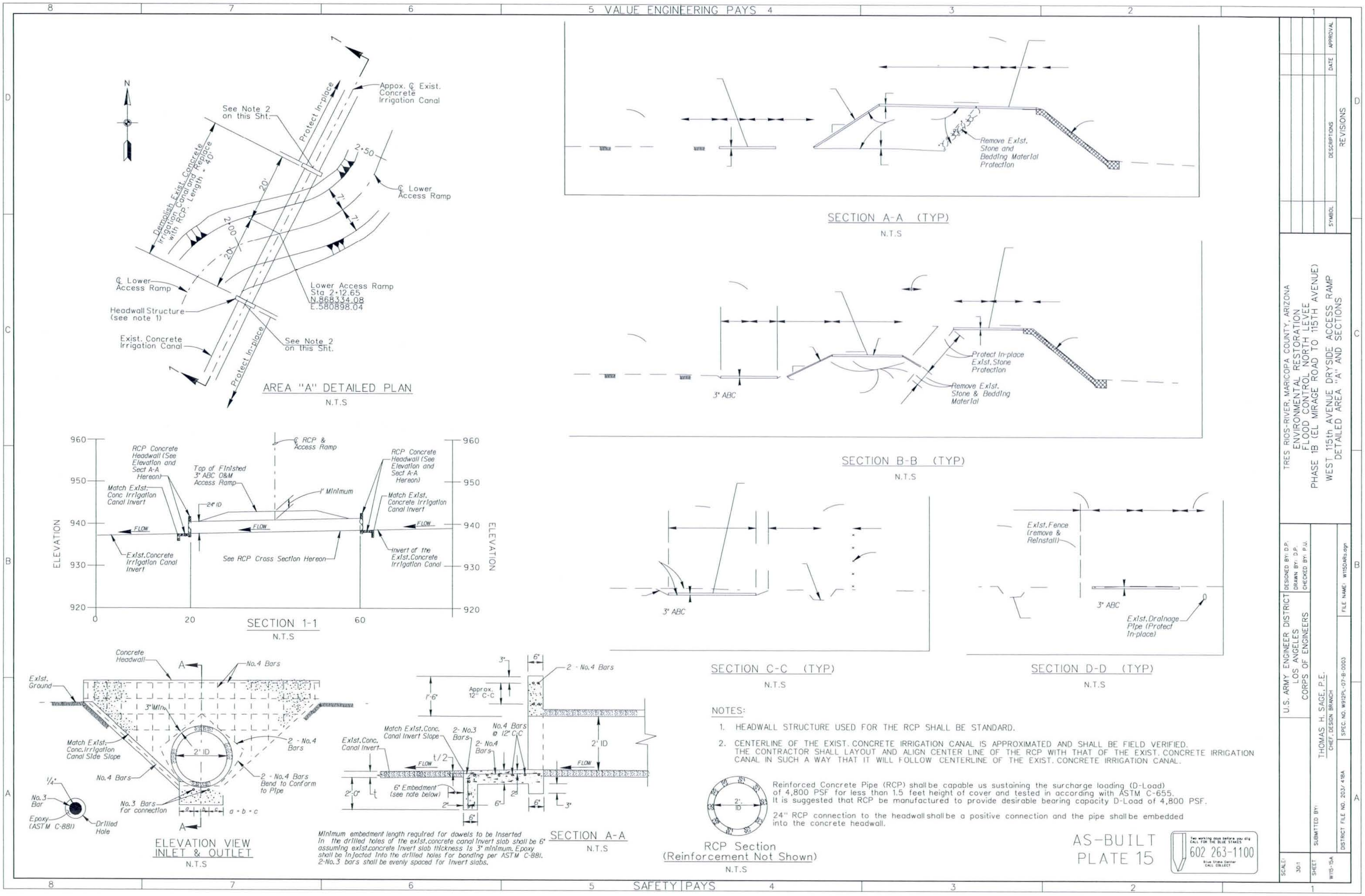
FILE NAME: W115DAR.Dgn

SPEC. NO. W912PL-07-B-0003

DISTRICT FILE NO. 203/418

SCALE: 30:1

SHEET W115-15 M2



NOTES:

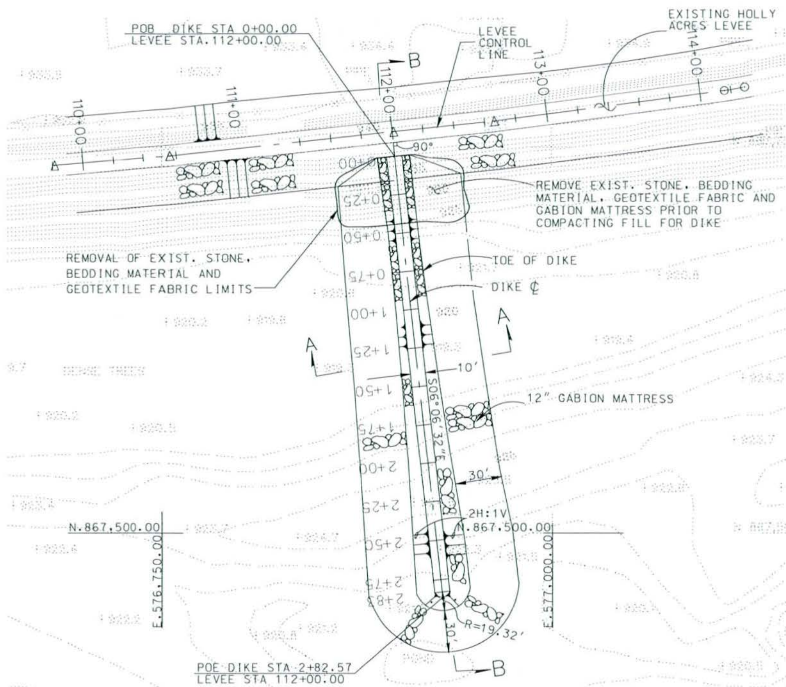
1. HEADWALL STRUCTURE USED FOR THE RCP SHALL BE STANDARD.
2. CENTERLINE OF THE EXIST. CONCRETE IRRIGATION CANAL IS APPROXIMATED AND SHALL BE FIELD VERIFIED. THE CONTRACTOR SHALL LAYOUT AND ALIGN CENTER LINE OF THE RCP WITH THAT OF THE EXIST. CONCRETE IRRIGATION CANAL IN SUCH A WAY THAT IT WILL FOLLOW CENTERLINE OF THE EXIST. CONCRETE IRRIGATION CANAL.

Reinforced Concrete Pipe (RCP) shall be capable us sustaining the surcharge loading (D-Load) of 4,800 PSF for less than 1.5 feet height of cover and tested in according with ASTM C-655. It is suggested that RCP be manufactured to provide desirable bearing capacity D-Load of 4,800 PSF.

24" RCP connection to the headwall shall be a positive connection and the pipe shall be embedded into the concrete headwall.

℄ PROFILE

VERT. SCALE: 1" = 4'
HORIZ. SCALE: 1" = 40'

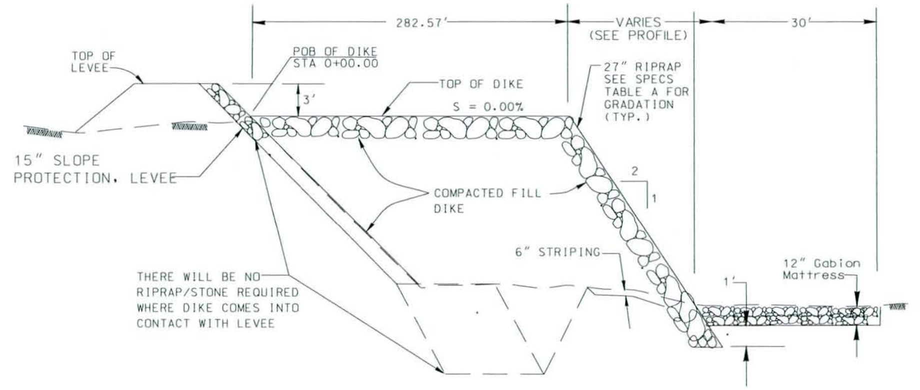


WEST 121st AVENUE DIKE PLAN

SCALE: 1" = 40'

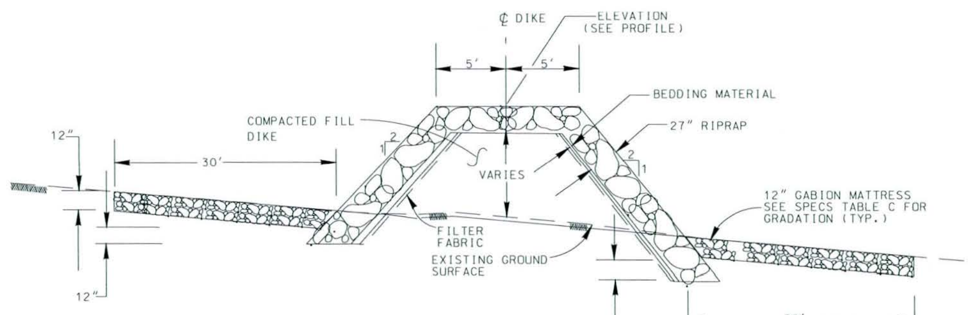
40 20 0 40 80FT
SCALE: 1"= 40'

DIKE CONTROL LINE HORIZ. POINTS DATA			
POINT	NORTHING	EASTING	BEARING ANGLE
P.O.B.	867,743.94	576,899.15	S06°06'32"E
P.O.E.	867,459.19	576,929.77	



SECTION "B-B" TYP

N.T.S.



SECTION "A-A" TYP

N.T.S.

NOTES:

1. REFER TO SHEET 6 FOR THE GENERAL LOCATION OF DIKE

AS-BUILT

PLATE 16

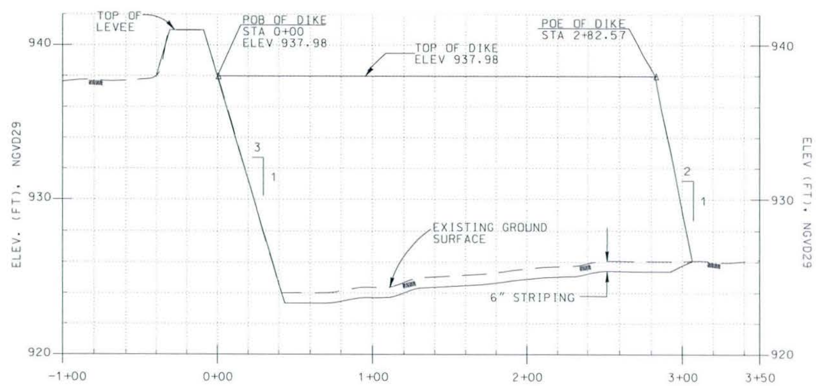
Two working days before you dig CALL FOR THE BLUE STAKES 602 263-1100 Blue Stake Center CALL COLLECT

SYMBOL | DESCRIPTIONS | DATE | APPROVAL
REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
WEST 121st AVENUE DIKE
PLAN, PROFILE AND SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

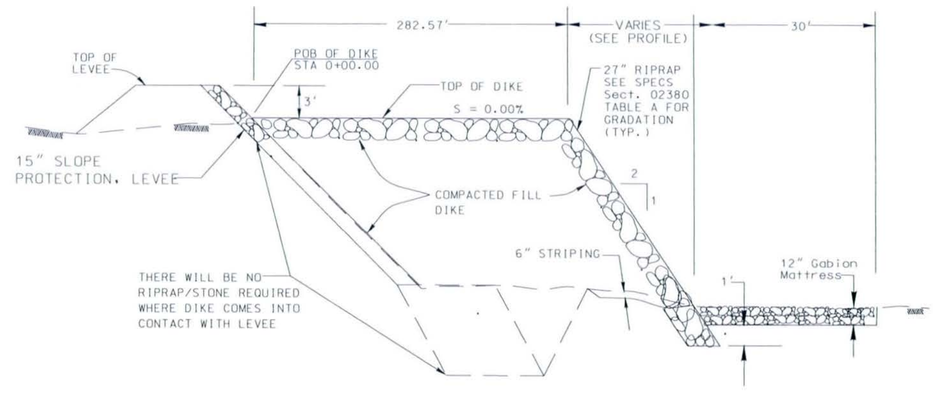
DESIGNED BY: DRAWN BY: CHECKED BY:
FILE NAME: CD016.Dgn
SUBMITTED BY: THOMAS H. SAGE, P.E. CHIEF, DESIGN BRANCH
SPEC. NO. W912PL-07-B-0003
DISTRICT FILE NO. 203/
SCALE: 40:1
SHEET CD0-16



℄ PROFILE

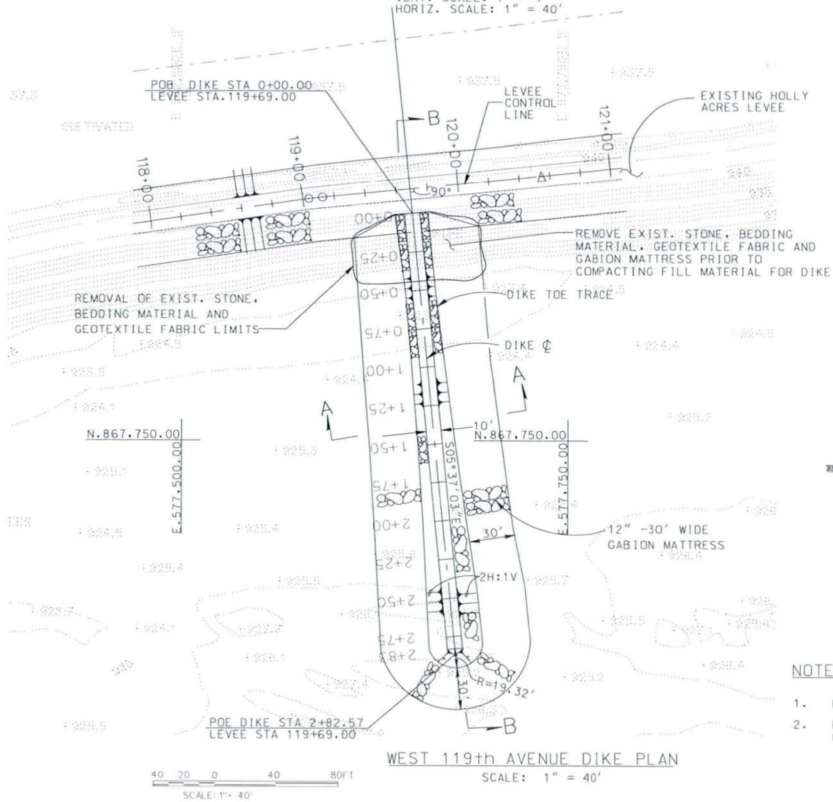
VERT. SCALE: 1" = 4'
HORIZ. SCALE: 1" = 40'

DIKE CONTROL LINE HORIZ. POINTS DATA			
POINT	NORTHING	EASTING	BEARING ANGLE
P.O.B.	867,897.04	577,648.96	S05°37'03"E
P.O.E.	867,612.03	577,676.99	



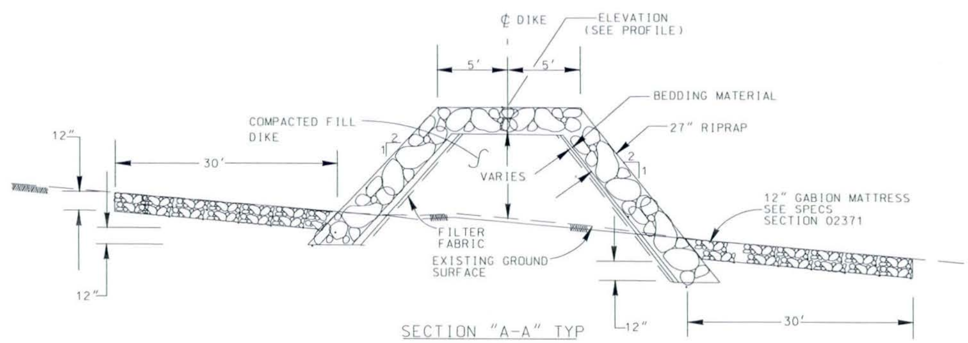
SECTION "B-B" TYP

N.T.S.



WEST 119th AVENUE DIKE PLAN

SCALE: 1" = 40'



SECTION "A-A" TYP

N.T.S.

NOTES:

1. REFER TO SHEET 6 FOR THE GENERAL LOCATION OF DIKE
2. EXISTING GABION MATTRESS UNDERNEATH THE DIKE IS NOT SHOWN ON THE PLAN.

AS-BUILT

PLATE 17

602 263-1100

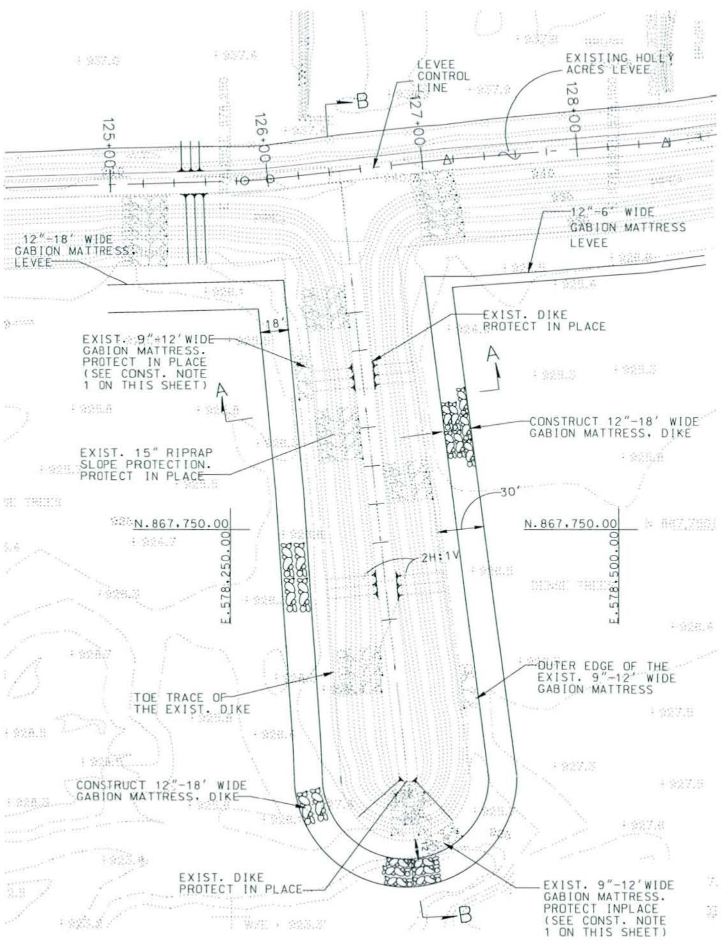
REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)

WEST 119th AVENUE DIKE
PLAN, PROFILE AND SECTIONS

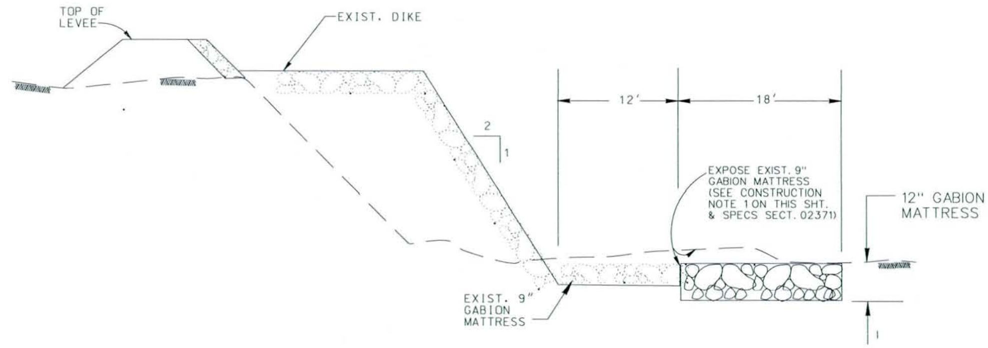
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH



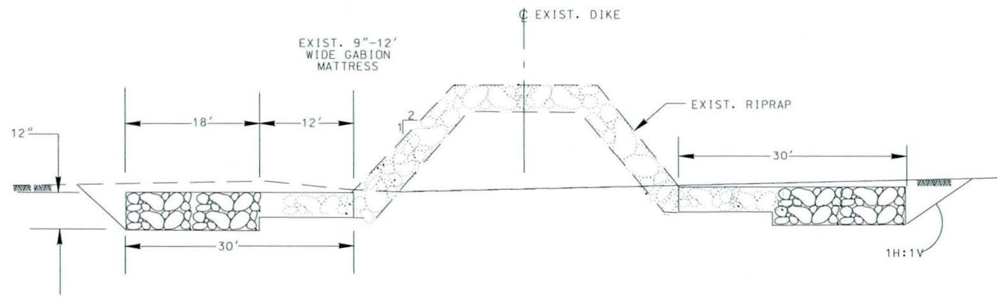
EAST 119th AVENUE GABION MATTRESS PLAN

SCALE: 1" = 40'



SECTION "B-B" (TYP)

N.T.S.



SECTION "A-A" (TYP)

N.T.S.

CONSTRUCTION NOTES

1. LOCATION OF THE OUTER EDGE OF THE EXIST. 9" GABION MATTRESS INDICATED ON THE PLAN IS APPROXIMATED. IT WAS OFFSET AT A DISTANCE OF 12' MEASURED HORIZONTALLY FROM TOE OF THE EXIST. 15" RIPRAP SLOPE PROTECTION (FLOOD CONTROL DISTRICT OF MARICOPA COUNTY'S 1983 AS-BUILT DRAWINGS OF BANK STABILIZATION FOR HOLLY ACRES LEVEE). THE CONTRACTOR SHALL LOCATE AND EXPOSE THE OUTER EDGE OF THE EXIST. 9" MATTRESS IN ORDER TO TIE WITH THE NEW 12" GABION MATTRESS. THE NEW GABION AND THE EXIST. GABION MATTRESSES SHALL BE TIED IN THE SAME WAY THE NEW GABION MATTRESSES ARE TO BE TIED TOGETHER. SPIRAL TIES SHOULD BE CONSIDERED AS ONE OF THE METHODS FOR FASTENING MATTRESSES TOGETHER (SPECS SECTION 02371 PAR. 3.3)

   SOIL EXCAVATION IS REQUIRED TO EXPOSE EDGE OF THE EXIST. 9" GABION MATTRESS. EXCAVATION DEPTH VARIES FROM APPROX. 1 FOOT TO 2 FEET BELOW THE EXIST. GROUND SURFACE. THE CONTRACTOR SHALL TAKE SPECIAL CARE NOT TO DAMAGE THE EXIST. 9" GABION MATTRESSES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REPLACE IN-KIND FOR DAMAGED GABION MATTRESSES AS THE RESULT OF THE CONSTRUCTION ACTIVITIES AT NO COST TO THE GOVERNMENT. IT IS ANTICIPATED THAT STANDING WATER IN THE EXCAVATION AREA WILL REMAIN THERE FOR AT LEAST 36 HOURS PERIOD.

2. SEE SHEET 10 FOR CONSTRUCTION LIMITS FOR DIKES

AS-BUILT

PLATE 18

Two working days before you dig CALL FOR THE BLUE STAKES 602 263-1100 Blue Stake Center CALL COLLECT

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
EAST 119th AVENUE DIKE
GABION MATTRESS INSTALLATION
PLAN AND SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

SYMBOL | DESCRIPTIONS | DATE | APPROVAL — REVISIONS

DESIGNED BY: DRAWN BY: CHECKED BY: SUBMITTED BY:

FILE NAME: C0D18.Dgn

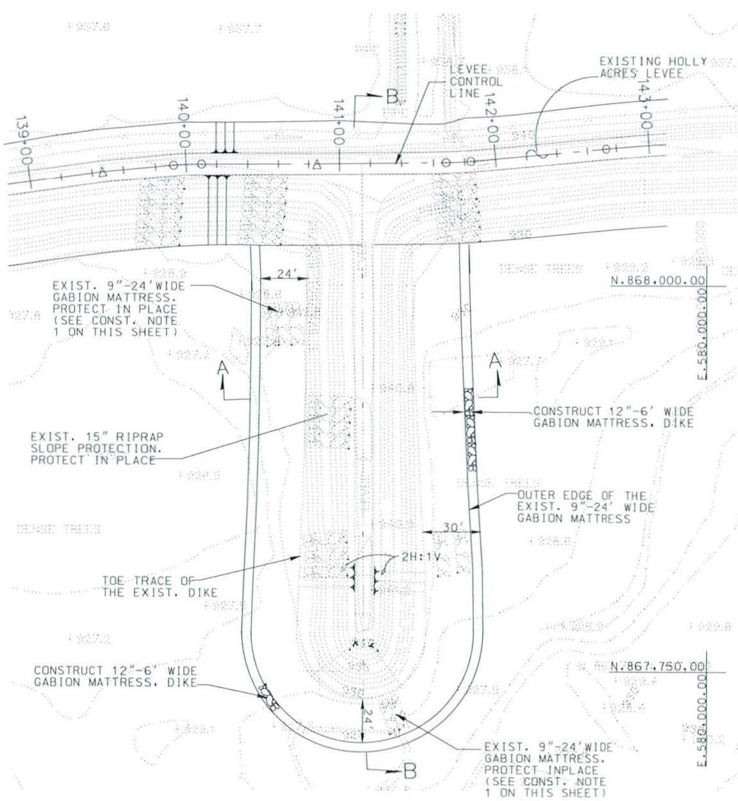
SPEC. NO. W912PL-07-B-0003

DISTRICT FILE NO. 203/421

SCALE 40:1

SHEET C0D-18

VALUE ENGINEERING PAYS

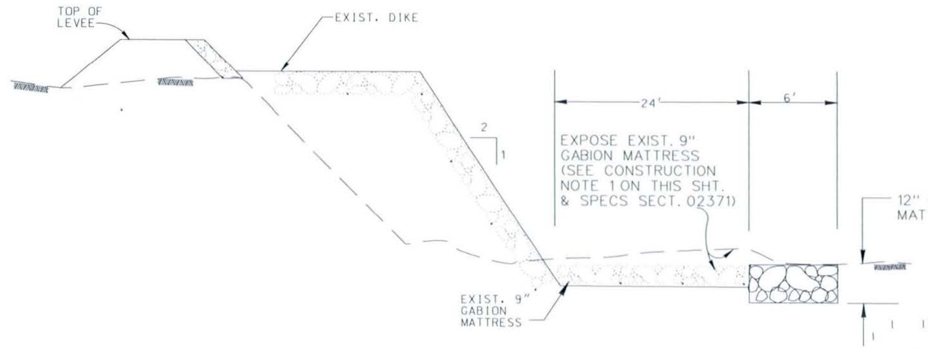


WEST 117th AVENUE GABION MATTRESS PLAN

SCALE: 1" = 40'

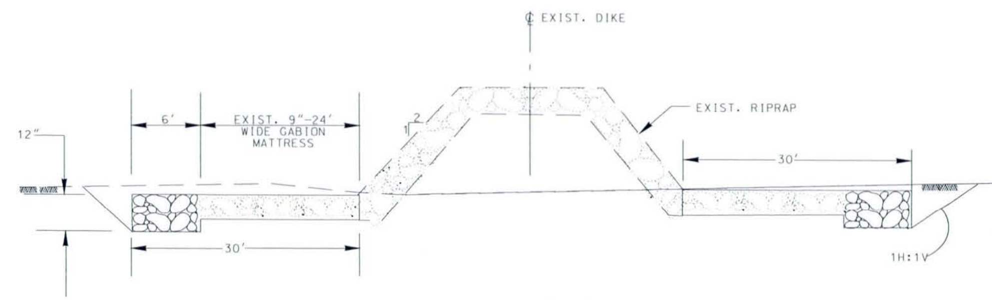
40 20 0 40 80FT

SCALE: 1"= 40'



SECTION "B-B" (TYP)

N.T.S.



SECTION "A-A" (TYP)

N.T.S.

CONSTRUCTION NOTES

1 LOCATION OF THE OUTER EDGE OF THE EXIST. 9" GABION MATTRESS INDICATED ON THE PLAN IS APPROXIMATED. IT WAS OFFSET AT A DISTANCE OF 24' MEASURED HORIZONTALLY FROM TOE OF THE EXIST. 15" RIPRAP SLOPE PROTECTION (FLOOD CONTROL DISTRICT OF MARICOPA COUNTY'S 1983 AS-BUILT DRAWINGS OF BANK STABILIZATION FOR HOLLY ACRES LEVEE). THE CONTRACTOR SHALL LOCATE AND EXPOSE THE OUTER EDGE OF THE EXIST. 9" MATTRESS IN ORDER TO TIE WITH THE NEW 12" GABION MATTRESS. THE NEW GABION AND THE EXIST. GABION MATTRESSES SHALL BE TIED IN THE SAME WAY THE NEW GABION MATTRESSES ARE TO BE TIED TOGETHER. SPIRAL TIES SHOULD BE CONSIDERED AS ONE OF THE METHODS FOR FASTENING MATTRESSES TOGETHER (SPECS SECTION 02371 PAR. 3.3)

SOIL EXCAVATION IS REQUIRED TO EXPOSE EDGE OF THE EXIST. 9" GABION MATTRESS. EXCAVATION DEPTH VARIES FROM APPROX. 1 FOOT TO 2 FEET BELOW THE EXIST. GROUND SURFACE. THE CONTRACTOR SHALL TAKE SPECIAL CARE NOT TO DAMAGE THE EXIST. 9" GABION MATTRESSES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REPLACE IN-KIND FOR DAMAGED GABION MATTRESSES AS THE RESULT OF THE CONSTRUCTION ACTIVITIES AT NO COST TO THE GOVERNMENT. IT IS ANTICIPATED THAT STANDING WATER IN THE EXCAVATION AREA WILL REMAIN THERE FOR AT LEAST 36 HOURS PERIOD.

2 SEE SHEET 10 FOR CONSTRUCTION LIMITS FOR DIKES

AS-BUILT

PLATE 19

Two working days before you dig CALL FOR THE BLUE STAKES
602 263-1100
Blue Stake Center CALL COLLECT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
WEST 117th AVENUE DIKE
GABION MATTRESS INSTALLATION
PLAN AND SECTIONS

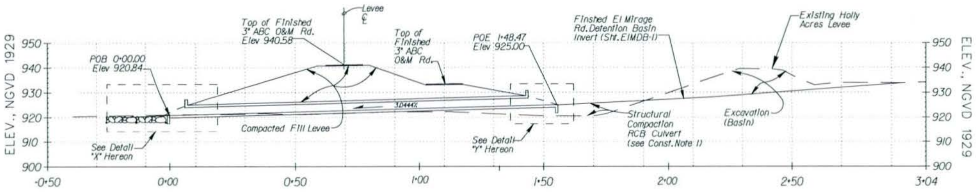
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:

SUBMITTED BY: THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

SCALE: 40:1
SHEET: CGD-19
DISTRICT FILE NO. 203/422
SPEC. NO. W912PL-07-B-0003
FILE NAME: CGD19.Dgn

SAFETY PAYS

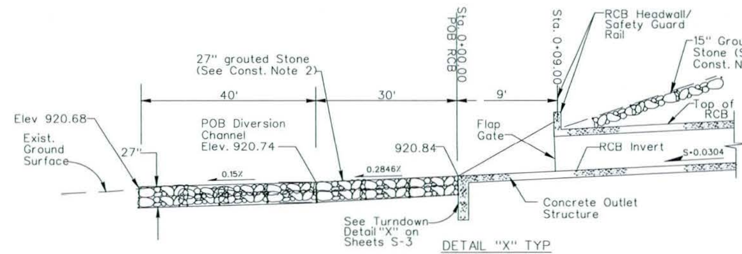


RCB CONTROL LINE PROFILE

HORIZONTAL 1in= 25ft
VERTICLE 1in=25ft

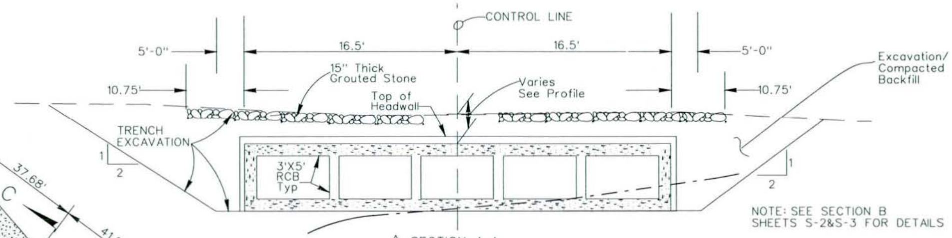
RCB INLET STRUCTURE HORIZ.CONTROL CONTROL POINTS DATA		
POINT	NORTHING	EASTING
A	N 867,720.35	E 576,179.23
B	N 867,687.39	E 576,204.37
C	N 867,679.40	E 576,246.66
D	N 867,673.03	E 576,215.43
E	N 867,688.50	E 576,186.27

RCB CONCRETE OUTLET STRUCTURE AND 27" GROUTED STONE APRON STRUCTURE HORIZ.CONTROL CONTROL POINTS DATA		
POINT	NORTHING	EASTING
A	N 867,571.90	E 576,124.94
B	N 867,556.44	E 576,153.59
C	N 867,544.51	E 576,156.88
D	N 867,518.01	E 576,142.83
E	N 867,491.36	E 576,110.28
F	N 867,495.96	E 576,097.17
G	N 867,541.43	E 576,098.66
H	N 867,567.94	E 576,112.71



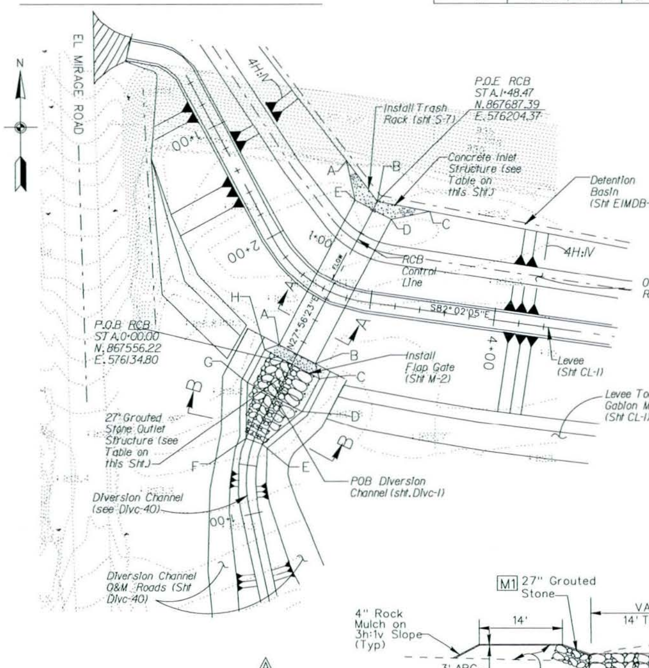
DETAIL "X" TYP

N.T.S.



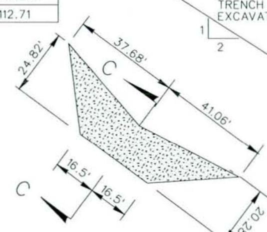
SECTION A-A

N.T.S.



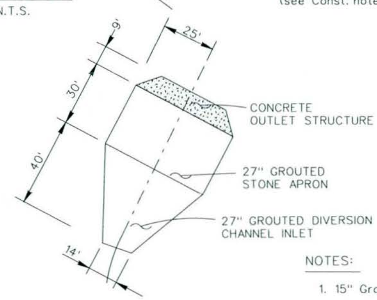
RCB PLAN

SCALE: 1 IN. = 50 FT.



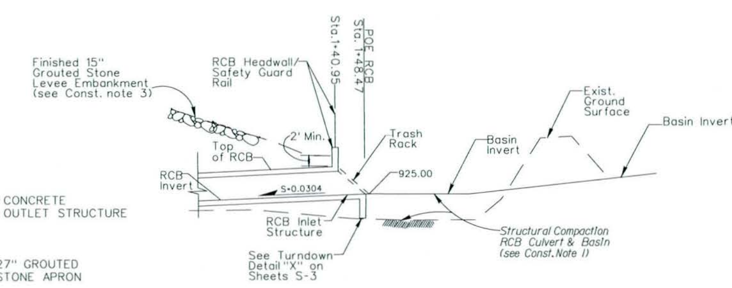
INLET STRUCTURE

N.T.S.



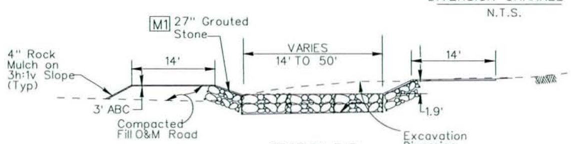
OUTLET STRUCTURE/APRON AND DIVERSION CHANNEL

N.T.S.



DETAIL "Y"/SECTION C-C

N.T.S.



SECTION B-B

N.T.S.

NOTES:

1. 15" Grouted Stone on the face of levee is not shown on the plan for RCB culvert

CONSTRUCTION NOTES:

1. STRUCTURAL COMPACTION IS REQUIRED FOR THE RCB CULVERT. COMPACTED FILL HEIGHT RANGES FROM ABOUT 4 FT. FOR THE UPSTREAM END OF THE RCB CULVERT TO INCHES FOR THE DOWN STREAM END.
2. INSTALL 27" GROUTED STONE FOR THE OUTLET STRUCTURE APRON AND A 40FT. SECTION OF THE DIVERSION CHANNEL. THIS MAY REQUIRE EXCAVATION AS WELL AS COMPACTED FILL OF THE EXISTING GROUND SURFACE TO OBTAIN A DESIRABLE GRADE AND DEPTH SPECIFIED ON THE DRAWING.
3. INSTALL 15" GROUTED STONE ON THE FACE OF THE LEVEE RIVERSIDE SLOPE EXTENDING FROM TOP TO TOE OF LEVEE SLOPE AND COVERING ENTIRE WIDTH OF THE RCB CULVERT.

AS-BUILT

PLATE 20

CALL FOR THE BLUE STAKES 602 263-1100

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
M1	Added 27" grouted stone	9/10/07	D.P.
	Revised entire drawing sheet	8/10/07	P.M.U.
	Deleted RCB outlet Structure Apron Dimensions on the RCB Plan. Added RCB Outlet Structure Plan. Revised Construction Note 1 & Sect.A-A	7/10/07	P.M.U.

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
EL MIRAGE ROAD RCB CULVERT
PLAN, PROFILE, SECTION AND DETAILS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

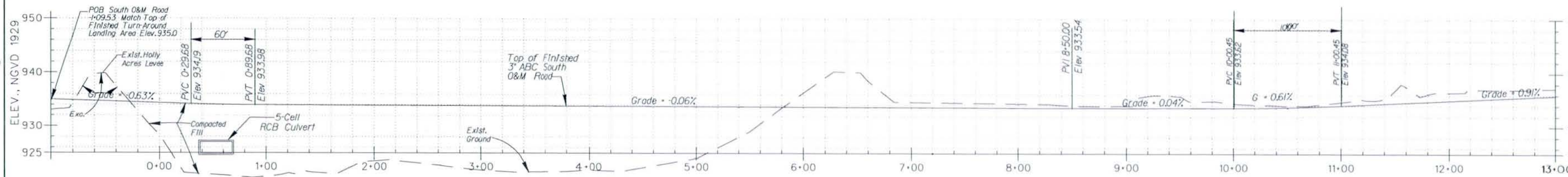
DESIGNED BY: D.P.
DRAWN BY: D.P.
CHECKED BY: P.U.

THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

SUBMITTED BY:

FILE NAME: ERCB20.Dgn
SPEC. NO. W912PL-07-B-0003
DISTRICT FILE NO. 203/423
SCALE: 50'
SHEET ERCB-20

VALUE ENGINEERING PAYS



SOUTH O&M ROAD CENTERLINE PROFILE

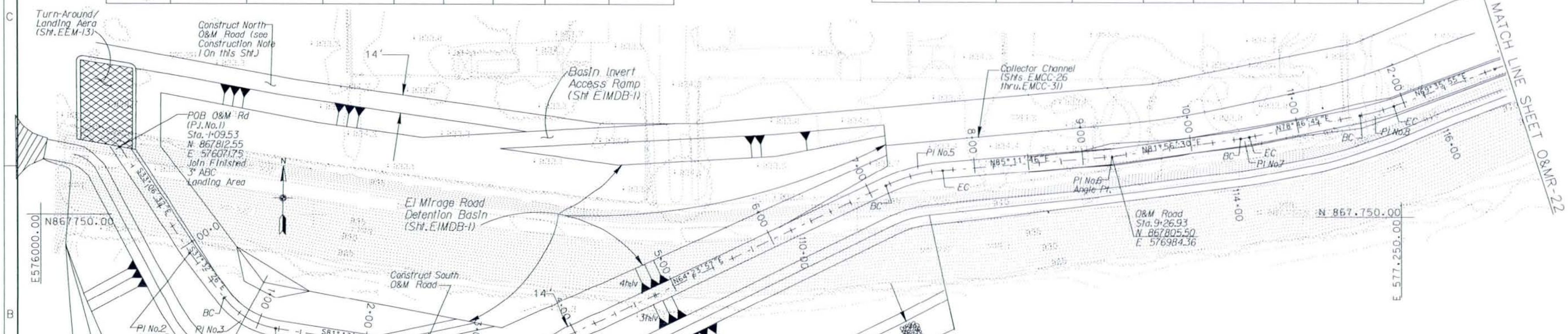
VERT. SCALE: 1" = 10'
HORIZ. SCALE: 1" = 50'

SOUTH O&M ROAD CENTER LINE HORIZ. CONTROL POINTS & CURVE DATA

P.I. NO.	NORTHING	EASTING	Δ°	R(FT.)	T(FT.)	L(FT.)	B.C. Sta	E.C. Sta
1 (POB)	867,812.55	576,071.75	N/A	N/A	N/A	N/A	POB Sta 0+00.00	
2 (Angle Pt.)	867,714.62	576,135.61	N/A	N/A	N/A	N/A	P.I. Sta. 0+07.38	
3	867,649.32	576,185.79	43° 40'52"Lt	75.00	30.06	57.18	0+59.68	1+16.86
4	867,611.79	576,428.83	34° 22'45"Lt	100.00	30.94	60.00	3+01.79	3+61.79

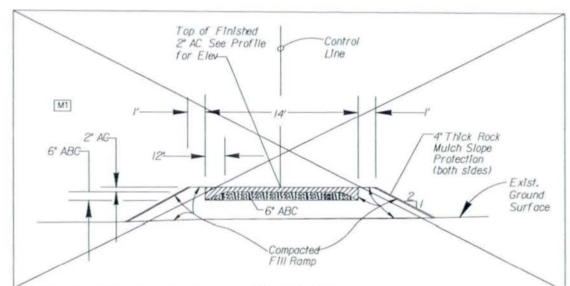
SOUTH O&M ROAD CENTER LINE HORIZ. CONTROL POINT & CURVE DATA

P.I. NO.	NORTHING	EASTING	Δ°	R(FT.)	T(FT.)	L(FT.)	B.C. Sta	E.C. Sta
5	867,790.09	576,800.96	Angle Point	N/A	N/A	N/A	P.I. Sta. 7+43.49	
6	867,805.50	576,984.36	Angle Point	N/A	N/A	N/A	P.I. Sta. 9+26.93	
7	867,822.79	577,106.48	3° 09'45"Lt	150.00	4.14	8.28	10+46.13	10+54.41
8	867,846.93	577,228.18	9° 10'49"Lt	200.00	16.06	32.05	11+58.28	11+90.33



PLAN
SCALE: 1 IN. = 50 FT.
50 25 0 50 100FT
SCALE: 1" = 50'

FLOW



AC AND ABC SECTION
N.T.S

CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL LAYOUT AND CONSTRUCT THE NORTH O&M ROAD THAT IS PARALLEL TO THE PROPOSED FOUR-WIRE R/W FENCE. TOP OF FINISHED 3" ABC FOR NORTH O&M ROAD SHALL BE SET AT ELEV. 935.00 ALONG THE DETENTION BASIN NORTH SIDE ONLY.

AS-BUILT
PLATE 21

Two working days before you dig CALL FOR THE BLUE STAKES
602 263-1100
Blue Stake Center CALL COLLECT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
M1	Deleted AC and ABC Section	9/10/07	P.W.U
△	Deleted O&M Rd. 0+00.00 to 9+26.93 and Replaced with New O&M Road 1+09.53 to 9+26.93	8/14/07	P.W.U

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
EL MIRAGE ROAD O&M ROAD
PLAN AND PROFILE STA. 1+09.53 TO STA. 13+00
AC AND ABC SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

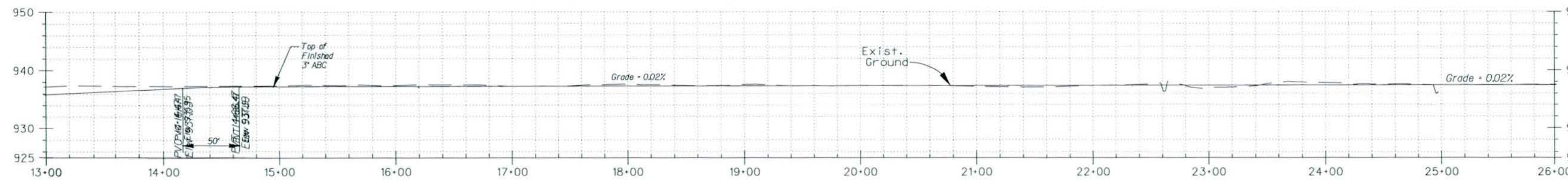
DESIGNED BY: C.P.
DRAWN BY: C.P.
CHECKED BY: P.U.

SUBMITTED BY: THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

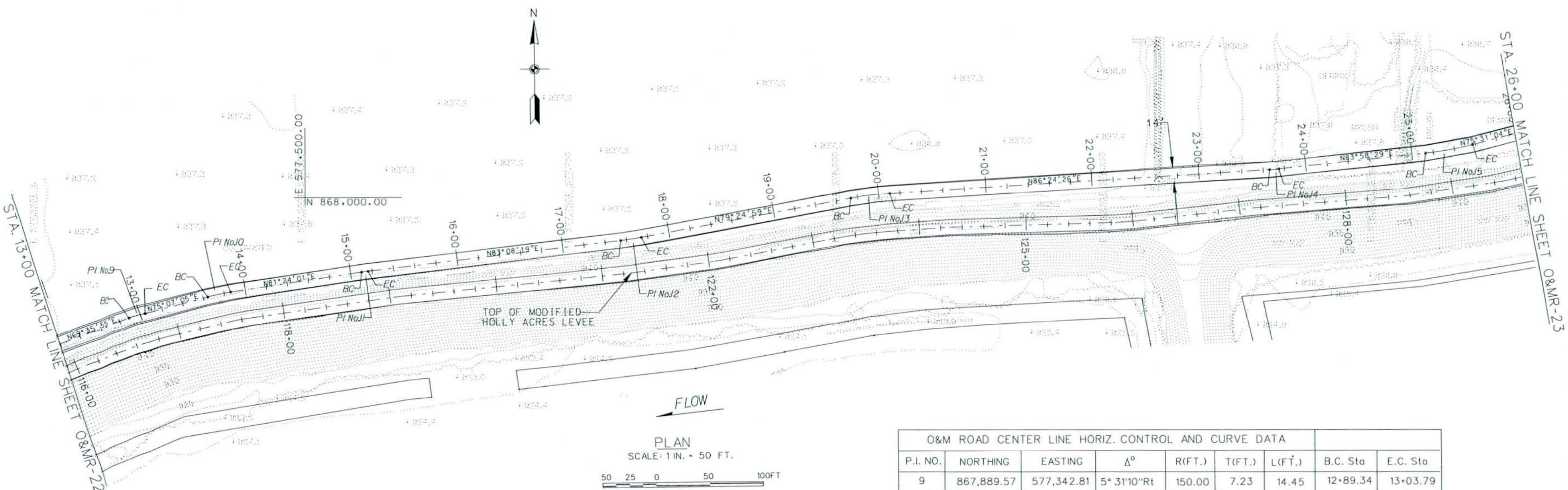
FILE NAME: O&M21.DGN
SPEC. NO. W912PL-07-B-0003
DISTRICT FILE NO. 203/424
SCALE: 50:1
SHEET O&MR-21

SAFETY PAYS

VALUE ENGINEERING PAYS



O&M ROAD CENTER LINE PROFILE
VERT. SCALE: 1" = 10'
HORIZ. SCALE: 1" = 50'



PLAN
SCALE: 1 IN. = 50 FT.
SCALE: 1" = 50'

O&M ROAD CENTER LINE HORIZ. CONTROL AND CURVE DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(FT.)	T(FT.)	L(FT.)	B.C. Sta	E.C. Sta
9	867,889.57	577,342.81	5° 31'10"Rt	150.00	7.23	14.45	12+89.34	13+03.79
10	867,909.80	577,418.95	6° 16'56"Rt	200.00	10.98	21.93	13+64.36	13+86.29
11	867,930.43	577,555.36	1° 14'18"Rt	200.00	3.03	6.07	15+10.25	15+16.31
12	867,960.42	577,804.60	3° 43'20"Lt	300.00	9.75	19.49	17+54.57	17+74.06
13	868,002.28	578,028.63	6° 59'27"Rt	300.00	18.32	36.60	19+73.90	20+10.50
14	868,025.98	578,406.07	2° 25'07"Lt	200.00	4.25	8.49	23+66.11	23+74.60
15	868,043.26	578,569.75	8° 27'25"Lt	300.00	22.18	44.28	25+12.77	25+57.05

AS-BUILT
PLATE 22

Two working days before you dig CALL FOR THE BLUE STAKES
602 263-1100
Blue Stake Center CALL COLLECT

SYMBOL | DESCRIPTIONS | DATE | APPROVAL
REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
EL MIRAGE ROAD O&M ROAD
PLAN AND PROFILE
STA. 13+00 TO STA. 26+00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

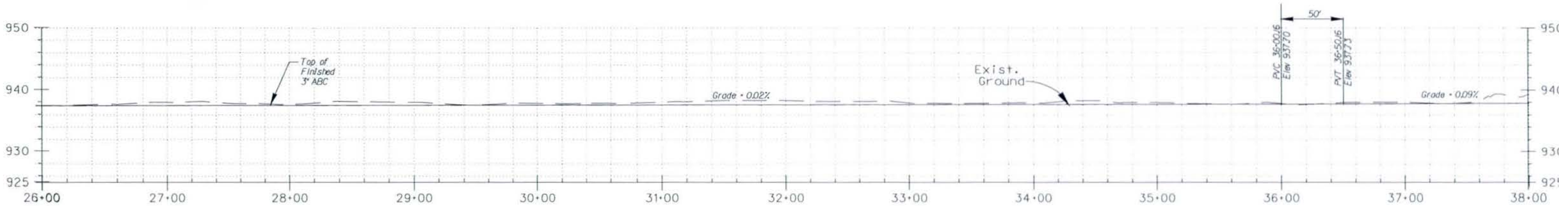
DESIGNED BY: D.P.
DRAWN BY: P.U.
CHECKED BY:

SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

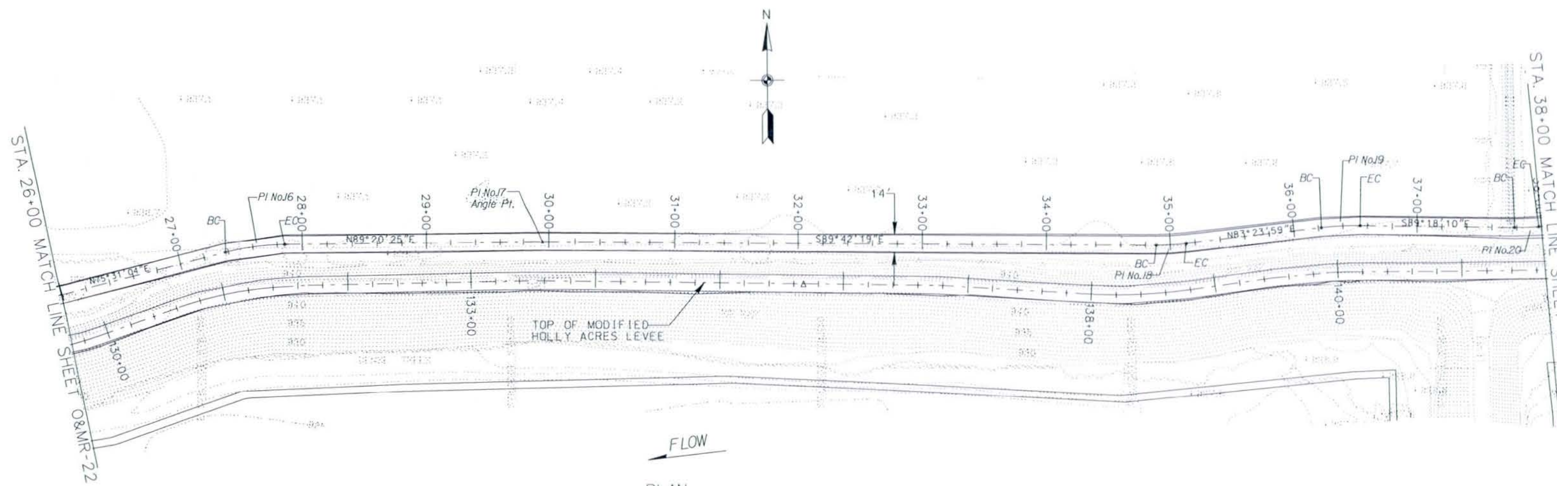
FILE NAME: O&M22.DGN
SPEC. NO. W912PL-07-B-0003
DISTRICT FILE NO. 203/425

SCALE: 50'
SHEET O&MR-22

SAFETY PAYS



DRYSIDE O&M ROAD CENTER LINE PROFILE
VERT. SCALE: 1" = 10'
HORIZ. SCALE: 1" = 50'



PLAN
SCALE: 1 IN. = 50 FT.

50 25 0 50 100FT
SCALE: 1" = 50'

O&M ROAD CENTER LINE HORIZ. CONTROL AND CURVE DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(FT.)	T(FT.)	L(FT.)	B.C. Sta	E.C. Sta
16	868,100.06	578,545.05	10° 28'47"Lt	250.00	22.93	45.73	25+94.73	26+40.46
17	868,113.47	578,792.28	14° 59'29"Rt	250.00	32.89	65.41	28+16.72	28+82.13
18	868,111.15	579,527.88	8° 30'14"Lt	250.00	18.59	37.11	35+66.25	36+03.35
19	868,133.67	579,681.87	9° 50'15"Rt	250.00	21.52	42.92	37+18.88	37+61.80
20	868,133.67	579,681.87	9° 50'15"Rt	250.00	21.52	42.92	37+18.88	37+61.80

AS-BUILT
PLATE 23

Two working days before you dig CALL FOR THE BLUE STAKES
602 263-1100
Blue Stake Center CALL COLLECT

REVISIONS
SYMBOL | DESCRIPTIONS | DATE | APPROVAL

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
EL MIRAGE ROAD O&M ROAD
PLAN AND PROFILE
STA. 26+00 TO STA. 38+00

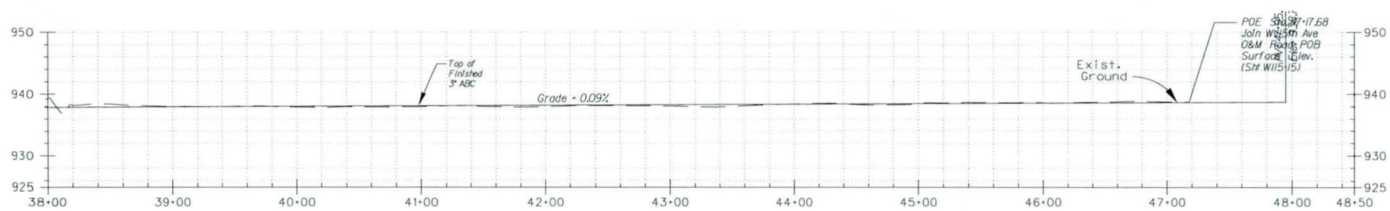
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: D.P.
DRAWN BY: D.P.
CHECKED BY: P.U.

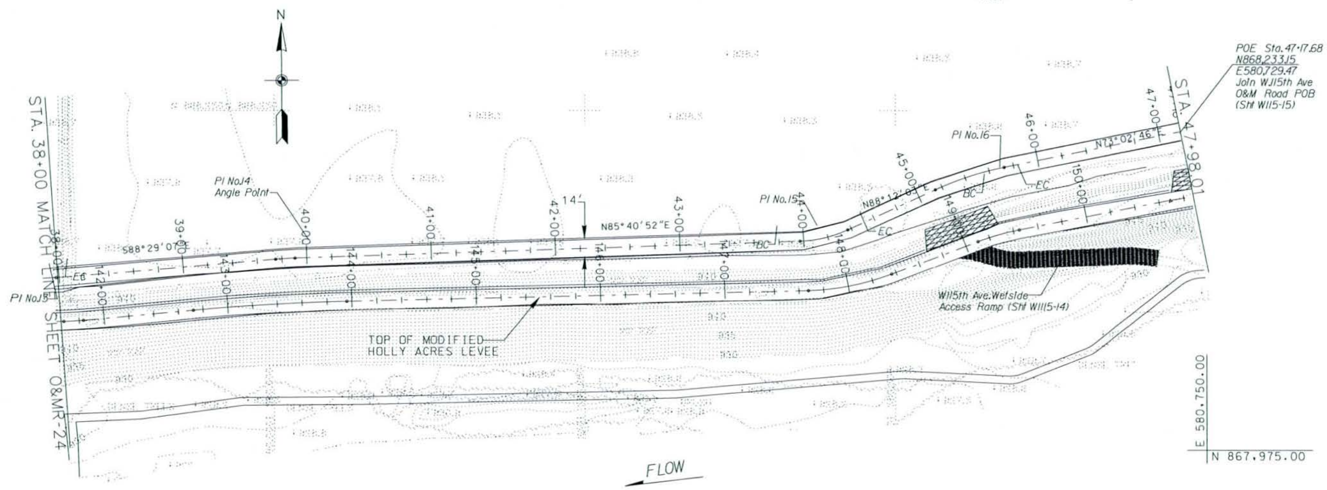
SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

SPEC. NO. W912PL-07S-B-0003
FILE NAME: O&M23.DGN
DISTRICT FILE NO. 203/426
SCALE: 501
SHEET O&MR-23

VALUE ENGINEERING PAYS



DRYSIDE O&M ROAD CENTER LINE PROFILE
VERT. SCALE: 1" = 10'
HORIZ. SCALE: 1" = 50'



PLAN
SCALE: 1 IN. = 50 FT.

50 25 0 50 100FT
SCALE: 1" = 50'

O&M ROAD CENTER LINE HORIZ. CONTROL AND CURVE DATA								
P.I. NO.	NORTHING	EASTING	Δ°	R(FT.)	T(FT.)	L(FT.)	B.C. Sta	E.C. Sta
21	868,198.55	580,008.94	2° 57'54"Rt	300.00	7.76	15.52	39+74.84	39+90.37
22	868,145.45	580,443.32	22° 49'41"Lt	100.00	20.19	39.84	43+97.04	44+36.89
23	868,198.55	580,558.44	13° 19'46"Rt	250.00	29.21	58.16	45+14.26	45+72.42

AS-BUILT
PLATE 24

Two working days before you dig CALL FOR THE BLUE STAKES
602 263-1100
Blue Stake Center CALL COLLECT

SYMBOL | DESCRIPTIONS | DATE | APPROVAL
REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
EL MIRAGE ROAD O&M ROAD
PLAN AND PROFILE
STA. 38+00 TO STA. 47+17.68

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

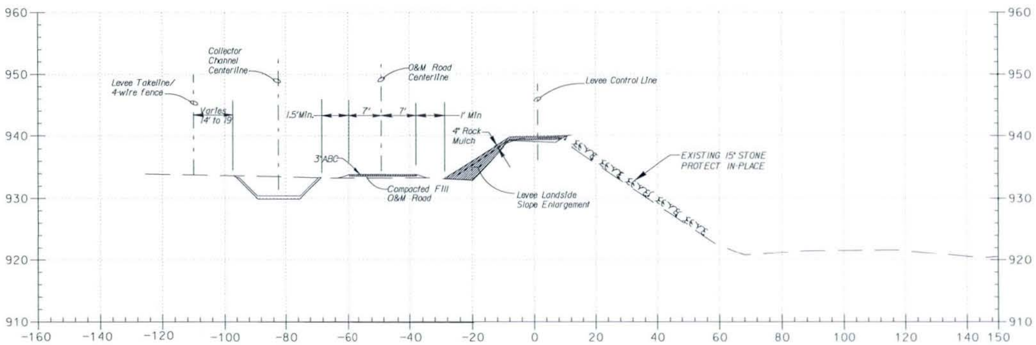
DESIGNED BY: D.P.
DRAWN BY: D.P.
CHECKED BY: P.U.

SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

SPEC. NO. W912PL-07-B-0003
FILE NAME: O&M24.DGN
DISTRICT FILE NO. 203/427
SCALE:
SHEET 501
O&MR-24

SAFETY PAYS

5 VALUE ENGINEERING PAYS 4

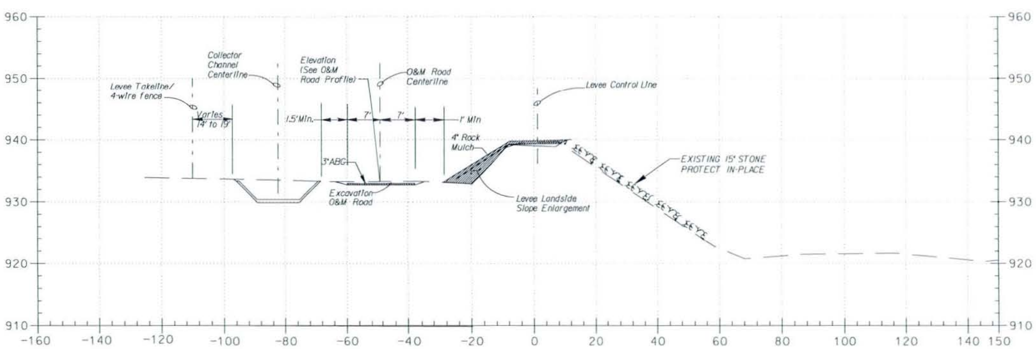


TYPICAL CROSS SECTION
IN FILL AREA

N.T.S.

NOTES:

CROSS SECTIONS ARE DRAWN LOOKING UPSTREAM IN THE DIRECTION OF ADVACING STATION



TYPICAL CROSS SECTION
IN CUT AREA

N.T.S.

AS-BUILT

PLATE 25

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
△	Revised Typical Sections	7/10/07	P.W.U.

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)
EL MIRAGE ROAD O&M ROAD
TYPICAL CROSS SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:

SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

SCALE: 20:1
SHEET XSect-25
DISTRICT FILE NO. 203/428
SPEC. NO. W912PL-07S-B-0003
FILE NAME: XSect25.DGN

SAFETY PAYS

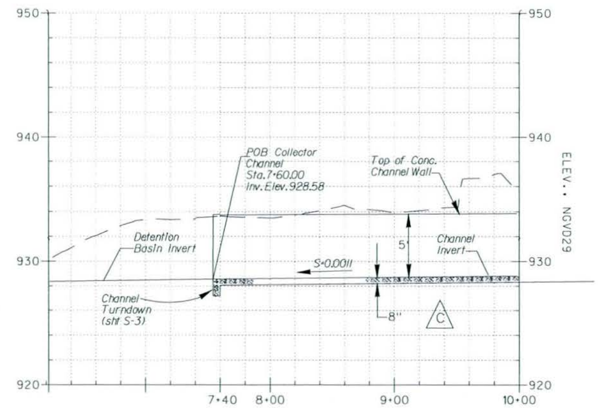
5 VALUE ENGINEERING PAYS 4

CONSTRUCTION NOTES:

1. VERTICAL DISTANCE OF 5.0' INDICATED ON THE PROFILE IS THE DEPTH OF THE CONCRETE CHANNEL. THE CONTRACTOR SHALL GRADE (CUT/ FILL) EXISTING GROUND SURFACE FOR BOTH O&M ROADS ALONG NORTH AND SOUTH SIDES OF THE COLLECTOR CHANNEL. GRADING SHALL BE DONE IN SUCH A WAY THAT POSITIVE SLOPE(S) TOWARD THE COLLECTOR CHANNEL SHALL BE ACHIEVED. FINISHED GRADED GROUND SURFACE SHALL BE SURFACED WITH 3" ABC FOR THE O&M ROAD ALONG THE SOUTH SIDE OF THE CHANNEL.

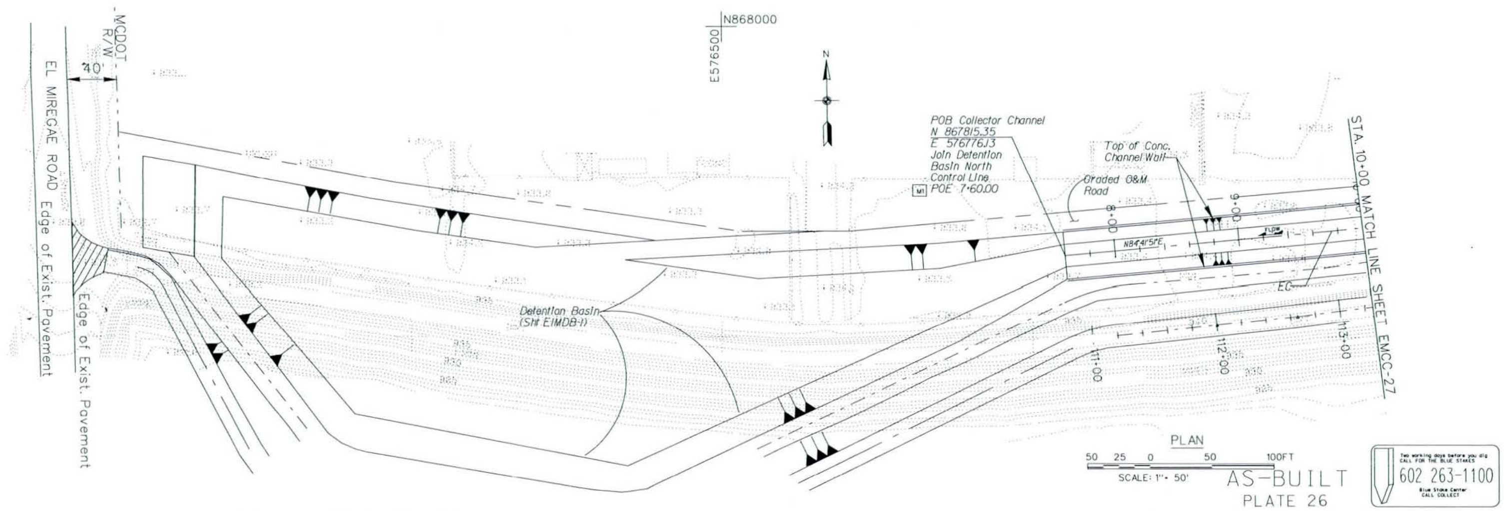
NOTES:

1. SEE SHEET CMCX-32 FOR CROSS SECTIONS.
2. SEE SHEET 5 FOR UTILITY RELOCATIONS/REMOVAL LIMITS.
3. SEE SHEET EMCT-34 FOR CHANNEL TYPICAL SECTIONS.
4. SEE S-SHEETS FOR STRUCTURAL DETAILS OF THE RCB CULVERT.
5. 4" THICK GRAVEL MULCH ON GRADING SLOPE IS NOT SHOWN ON THE PLAN.



℄ PROFILE

VERT. SCALE: 1in = 5ft
HORIZ. SCALE: 1in = 50ft



PLAN

50 25 0 50 100FT

SCALE: 1"= 50'

AS-BUILT

PLATE 26

Two working days before you dig CALL FOR THE BLUE STAKES

602 263-1100

Blue Stake Center CALL COLLECT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
M1	Revised POE Station on the Plan	9-10-07	P.W.U.
C	Deleted Channel Sta.0+00 to 7+60 and changed wall & invert slab thickness from 6" to 8"	8-10-07	P.W.U.

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVE.)
EL MIRAGE ROAD COLLECTOR CHANNEL
PLAN AND PROFILE
STA. 7+40 TO STA. 10+00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.Y.
DRAWN BY: J.Y./D.P.
CHECKED BY: D.P.

SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

FILE NAME: EMCC26.DGN

SPEC. NO. W912PL-07-B-0003

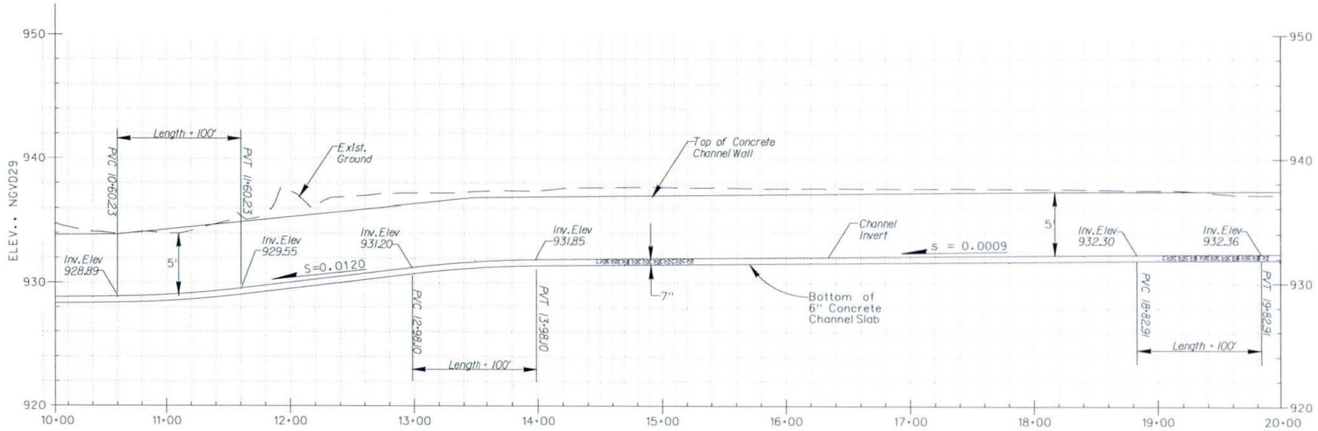
DISTRICT FILE NO. 203/ 429

SCALE: 50:1

SHEET EMCC-26

SHEETS

5 SAFETY PAYS 4

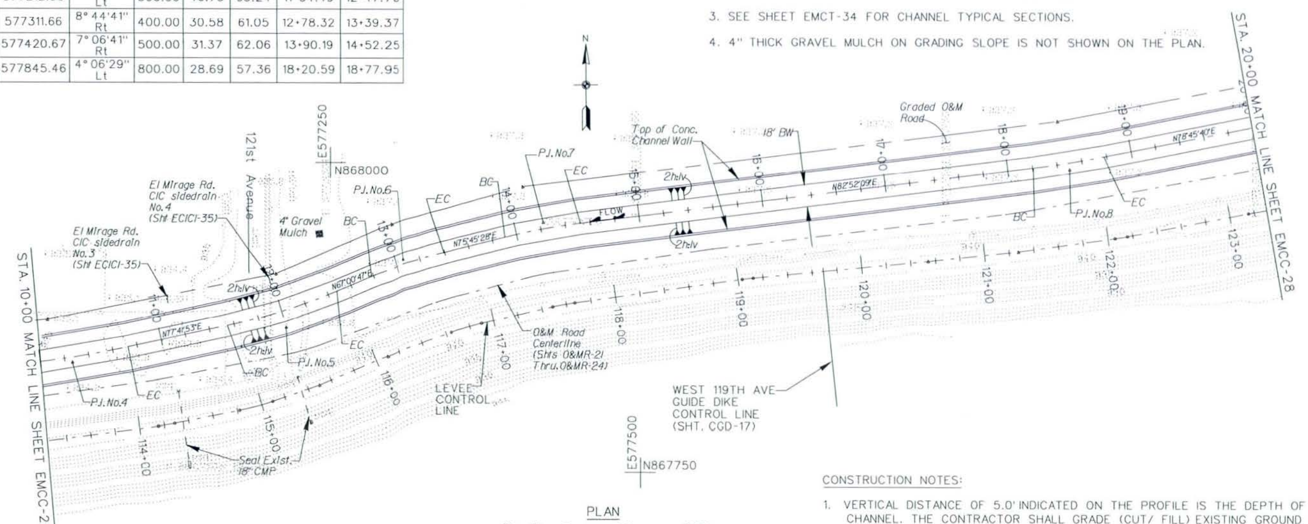


℄ PROFILE
VERT. SCALE: 1in = 5ft
HORIZ. SCALE: 1in = 50ft

CHANNEL ℄ HORIZONTAL CONTROL CURVE DATA								
P.I. No.	NORTHING	EASTING	Δ°	R(Ft)	T(Ft)	L(Ft)	B.C. STA.	E.C. STA.
4	867839.73	577038.78	6° 59'58" Lt	800.00	48.93	97.73	9+74.85	10+72.58
5	867877.57	577212.30	10° 41'05" Lt	500.00	46.76	93.24	11+54.49	12+47.73
6	867919.72	577311.66	8° 44'41" Rt	400.00	30.58	61.05	12+78.32	13+39.37
7	867947.39	577420.67	7° 06'41" Rt	500.00	31.37	62.06	13+90.19	14+52.25
8	868000.53	577845.46	4° 06'29" Lt	800.00	28.69	57.36	18+20.59	18+77.95

NOTES:

1. SEE SHEET CMCX-32 FOR CROSS SECTIONS.
2. SEE SHEET 5 FOR UTILITY RELOCATIONS/REMOVAL LIMITS.
3. SEE SHEET EMCT-34 FOR CHANNEL TYPICAL SECTIONS.
4. 4" THICK GRAVEL MULCH ON GRADING SLOPE IS NOT SHOWN ON THE PLAN.



PLAN
50 25 0 50 100FT
SCALE: 1"= 50'

CONSTRUCTION NOTES:

1. VERTICAL DISTANCE OF 5.0' INDICATED ON THE PROFILE IS THE DEPTH OF THE CONCRETE CHANNEL. THE CONTRACTOR SHALL GRADE (CUT/ FILL) EXISTING GROUND SURFACE FOR BOTH O&M ROADS ALONG NORTH AND SOUTH SIDES OF THE COLLECTOR CHANNEL. GRADING SHALL BE DONE IN SUCH A WAY THAT POSITIVE SLOPE(S) TOWARD THE COLLECTOR CHANNEL SHALL BE ACHIEVED. FINISHED GRADED GROUND SURFACE SHALL BE SURFACED WITH 3" ABC ROCK MULCH FOR THE O&M ROAD ALONG THE SOUTH SIDE OF THE CHANNEL.

AS-BUILT
PLATE 27

Two working days before you dig CALL FOR THE BLUE STAKES 602 263-1100 Blue Stake Center CALL COLLECT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
C	Changed Channel Wall and Invert slab thickness from 6" to 8"	8-12-07	P.W.U.

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVE.)
EL MIRAGE ROAD COLLECTOR CHANNEL
PLAN AND PROFILE
STA. 10+00 TO STA. 20+00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

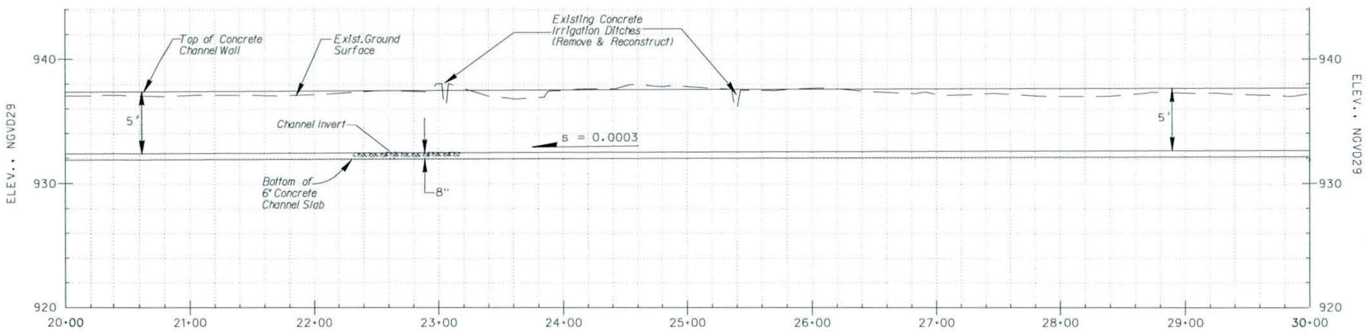
DESIGNED BY: J.Y.
DRAWN BY: J.Y./D.P.
CHECKED BY: D.P.

SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

FILE NAME: EMCC27.DGN
SPEC. NO. W912PL-07-B-0003
DISTRICT FILE NO. 203/430

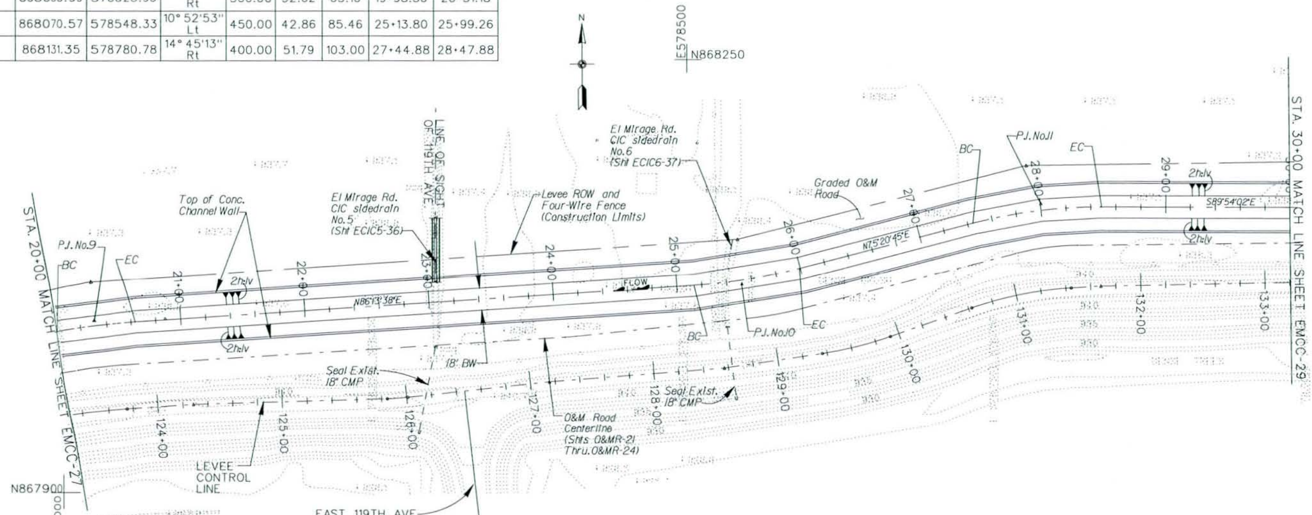
SCALE: 50:1
SHEET EMCC-27
SHEETS

5 VALUE ENGINEERING PAYS 4



℄ PROFILE
VERT. SCALE: 1in = 5ft
HORIZ. SCALE: 1in = 50ft

CHANNEL ℄ HORIZONTAL CONTROL CURVE DATA								
P.I. No.	NORTHING	EASTING	Δ°	R(Ft)	T(Ft)	L(Ft)	B.C. STA.	E.C. STA.
9	868035.99	578023.90	7° 27'58" Rt	500.00	32.62	65.16	19+98.56	20+31.18
10	868070.57	578548.33	10° 52'53" Lt	450.00	42.86	85.46	25+13.80	25+99.26
11	868131.35	578780.78	14° 45'13" Rt	400.00	51.79	103.00	27+44.88	28+47.88



PLAN
50 25 0 50 100FT
SCALE: 1" = 50'

NOTES:

1. SEE SHEET CMCX-32 FOR CROSS SECTIONS.
2. SEE SHEET 5 FOR UTILITY RELOCATIONS/REMOVAL LIMITS.
3. SEE SHEET EMCT-34 FOR CHANNEL TYPICAL SECTIONS.
4. 4" THICK GRAVEL MULCH ON GRADING SLOPE IS NOT SHOWN ON THE PLAN.

CONSTRUCTION NOTES:

1. VERTICAL DISTANCE OF 5.0' INDICATED ON THE PROFILE IS THE DEPTH OF THE CONCRETE CHANNEL. THE CONTRACTOR SHALL GRADE (CUT/ FILL) EXISTING GROUND SURFACE FOR BOTH O&M ROADS ALONG NORTH AND SOUTH SIDES OF THE COLLECTOR CHANNEL. GRADING SHALL BE DONE IN SUCH A WAY THAT POSITIVE SLOPE(S) TOWARD THE COLLECTOR CHANNEL SHALL BE ACHIEVED. FINISHED GRADED GROUND SURFACE SHALL BE SURFACED WITH 3" ABC ROCK MULCH FOR THE O&M ROAD ALONG THE SOUTH SIDE OF THE CHANNEL.

AS-BUILT
PLATE 28

Two working days before you dig CALL FOR THE BLUE STAKES
602 263-1100
Blue Stake Center CALL COLLECT

REVISIONS

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
C	Changed Channel Wall and Invert slab thickness from 6" to 8"	8-12-07	P.W.U.

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVE.)
EL MIRAGE ROAD COLLECTOR CHANNEL
PLAN AND PROFILE
STA. 20+00 TO STA. 30+00

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:

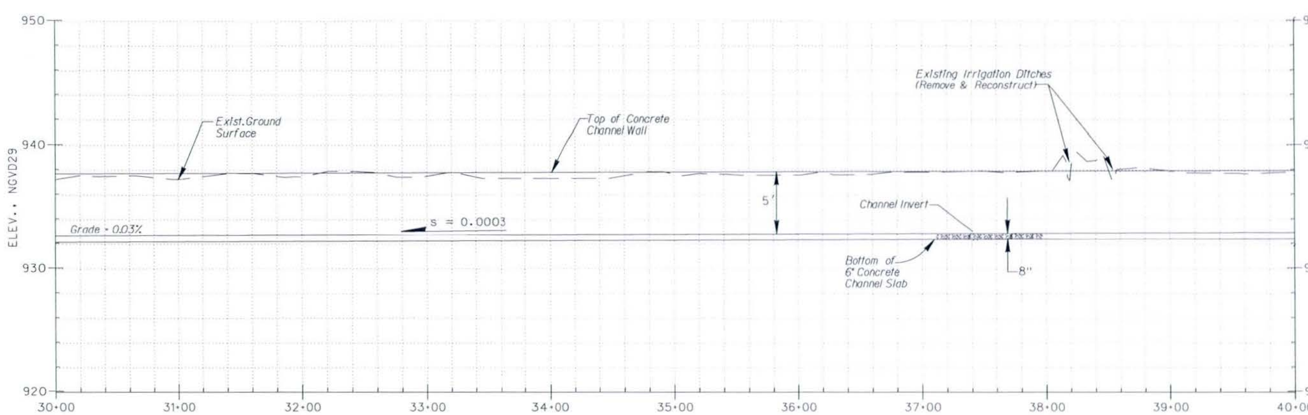
SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

FILE NAME: EMCC28.DGN
SPEC. NO. W912PL-07-B-0003
DISTRICT FILE NO. 203/431

SCALE: 50:1
SHEET EMCC-28
SHEETS

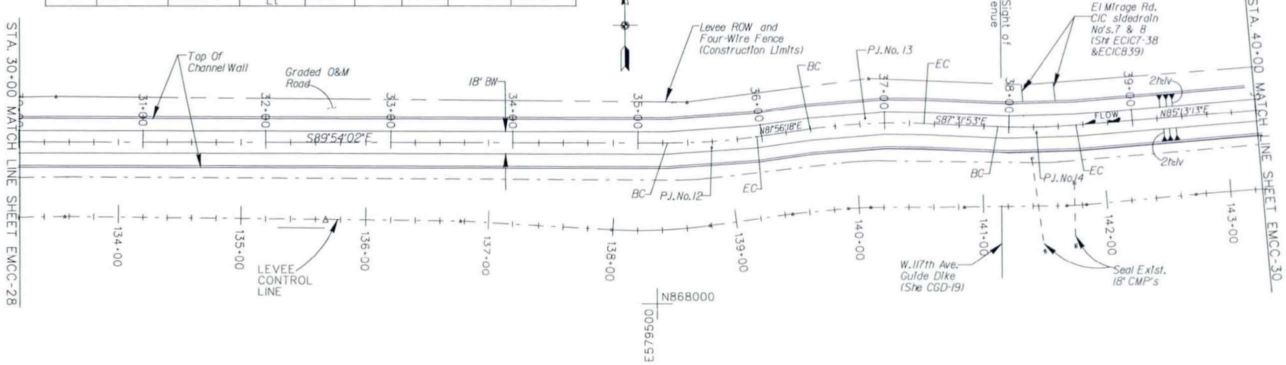
5 SAFETY PAYS 4

5 VALUE ENGINEERING PAYS 4



℄ PROFILE
VERT. SCALE: 1in = 5ft
HORIZ. SCALE: 1in = 50ft

CHANNEL ℄ HORIZONTAL CONTROL CURVE DATA								
P.I. No.	NORTHING	EASTING	Δ°	R(Ft)	T(Ft)	L(Ft)	B.C. STA.	E.C. STA.
12	868130.03	579544.09	8° 09'40" Lt	500.00	35.67	71.22	35+23.74	35+94.96
13	868147.76	579669.27	10° 31'49" Rt	500.00	46.08	91.89	36+39.64	37+31.53
14	868141.85	579806.45	7° 14'54" Lt	500.00	31.67	63.25	37+91.10	38+54.35



PLAN

50 25 0 50 100FT
SCALE: 1" = 50'

NOTES:

1. SEE SHEET CMCX-32 FOR CROSS SECTIONS.
2. SEE SHEET 5 FOR UTILITY RELOCATIONS/REMOVAL LIMITS.
3. SEE SHEET EMCT-34 FOR CHANNEL TYPICAL SECTIONS.
4. 4" THICK GRAVEL MULCH ON GRADING SLOPE IS NOT SHOWN ON THE PLAN.

CONSTRUCTION NOTES:

1. VERTICAL DISTANCE OF 5.0' INDICATED ON THE PROFILE IS THE DEPTH OF THE CONCRETE CHANNEL. THE CONTRACTOR SHALL GRADE (CUT/ FILL) EXISTING GROUND SURFACE FOR BOTH O&M ROADS ALONG NORTH AND SOUTH SIDES OF THE COLLECTOR CHANNEL. GRADING SHALL BE DONE IN SUCH A WAY THAT POSITIVE SLOPE(S) TOWARD THE COLLECTOR CHANNEL SHALL BE ACHIEVED. FINISHED GRADED GROUND SURFACE SHALL BE SURFACED WITH 3" ABC ROCK MULCH FOR THE O&M ROAD ALONG THE SOUTH SIDE OF THE CHANNEL.

AS-BUILT
PLATE 29

Two working days before you dig CALL FOR THE BLUE STAKES
602 263-1100
Blue Stake Center CALL COLLECT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
△	Changed Channel Wall and Invert slab thickness from 6" to 8"	8-12-07	P.W.U.

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVE.)
EL MIRAGE ROAD COLLECTOR CHANNEL
PLAN AND PROFILE
STA. 30+00 TO STA. 40+00

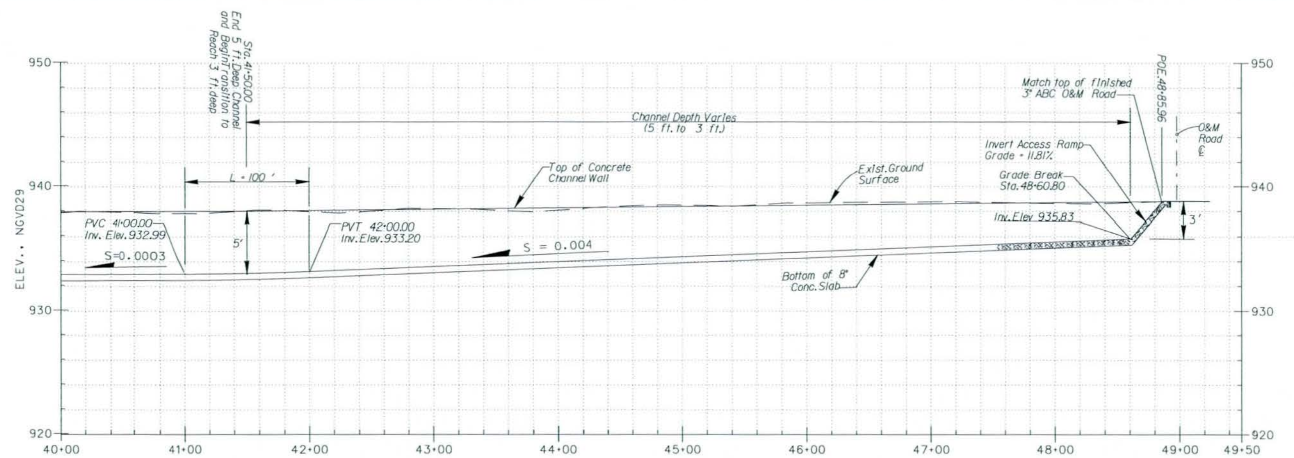
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.Y.
DRAWN BY: J.Y./D.P.
CHECKED BY: D.P.

SUBMITTED BY: THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

FILE NAME: EMCC29.DGN
SPEC. NO. W912PL-07-B-0003
DISTRICT FILE NO. 203/432
SCALE: 50'
SHEET EMCC-29
SHEETS

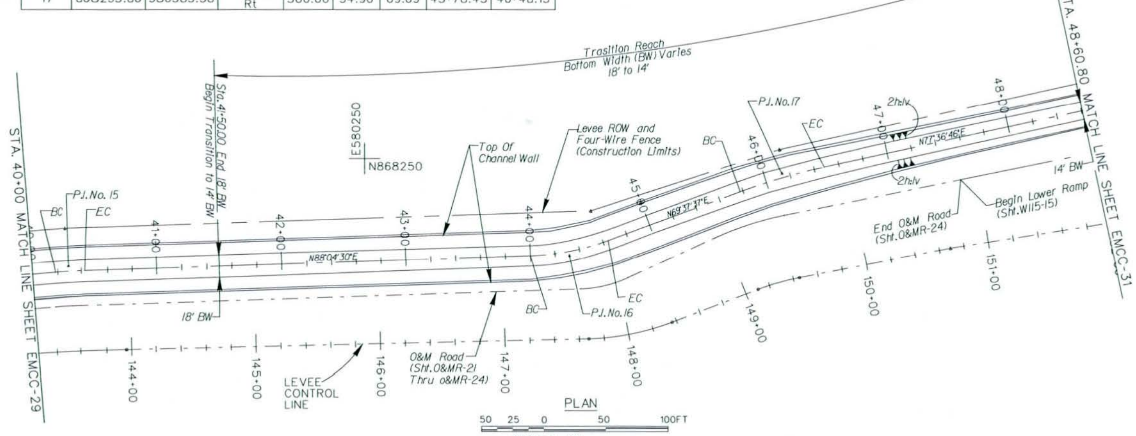
SAFETY PAYS



℄ PROFILE

VERT. SCALE: 1in = 5ft
HORIZ. SCALE: 1in = 50ft

CHANNEL ℄ HORIZONTAL CONTROL CURVE DATA								
P.I. No.	NORTHING	EASTING	Δ°	R(Ft)	T(Ft)	L(Ft)	B.C. STA.	E.C. STA.
15	868159.17	580013.57	2° 51'17" Rt	500.00	12.46	24.91	40+18.06	40+42.97
16	868172.67	580415.22	18° 26'52" Lt	200.00	32.48	64.40	43+99.92	44+64.31
17	868235.86	580585.38	7° 59'09" Rt	500.00	34.90	69.69	45+78.45	46+48.13



PLAN

SCALE: 1" = 50'

NOTES:

1. SEE SHEET CMCX-32 FOR CROSS SECTIONS.
2. SEE SHEET 5 FOR UTILITY RELOCATIONS/REMOVAL LIMITS.
3. SEE SHEET EMCT-34 FOR CHANNEL TYPICAL SECTIONS.
4. 4" THICK GRAVEL MULCH ON GRADING SLOPE IS NOT SHOWN ON THE PLAN.

CONSTRUCTION NOTES:

1. VERTICAL DISTANCE OF 5.0' INDICATED ON THE PROFILE IS THE DEPTH OF THE CONCRETE CHANNEL. THE CONTRACTOR SHALL GRADE (CUT/ FILL) EXISTING GROUND SURFACE FOR BOTH O&M ROADS ALONG NORTH AND SOUTH SIDES OF THE COLLECTOR CHANNEL. GRADING SHALL BE DONE IN SUCH A WAY THAT POSITIVE SLOPE(S) TOWARD THE COLLECTOR CHANNEL SHALL BE ACHIEVED. FINISHED GRADED GROUND SURFACE SHALL BE SURFACED WITH 3" ABC ROCK MULCH FOR THE O&M ROAD ALONG THE SOUTH SIDE OF THE CHANNEL.

Two working days before you dig CALL FOR THE BLUE STAKES
602 263-1100
Blue Stake Center CALL COLLECT

AS-BUILT
PLATE 30

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
C	Deleted Channel Sta. 48+60.8 to 51+00; Changed Channel Depth from 4' to 5' and Wall and invert slab thickness from 6" to 8"	8-12-07	P.W.U.

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVE.)
EL MIRAGE ROAD COLLECTOR CHANNEL
PLAN AND PROFILE
STA. 40+00 TO STA. 48+60.80

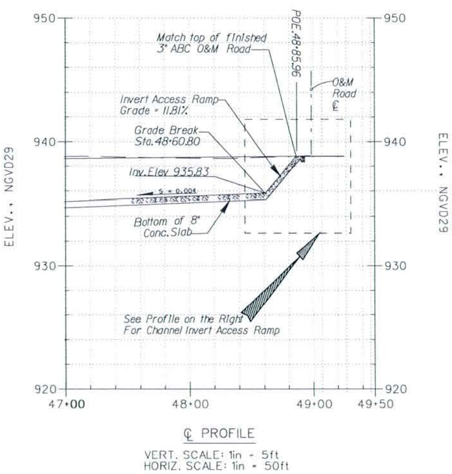
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.Y.
DRAWN BY: J.Y./D.P.
CHECKED BY: D.P.

SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

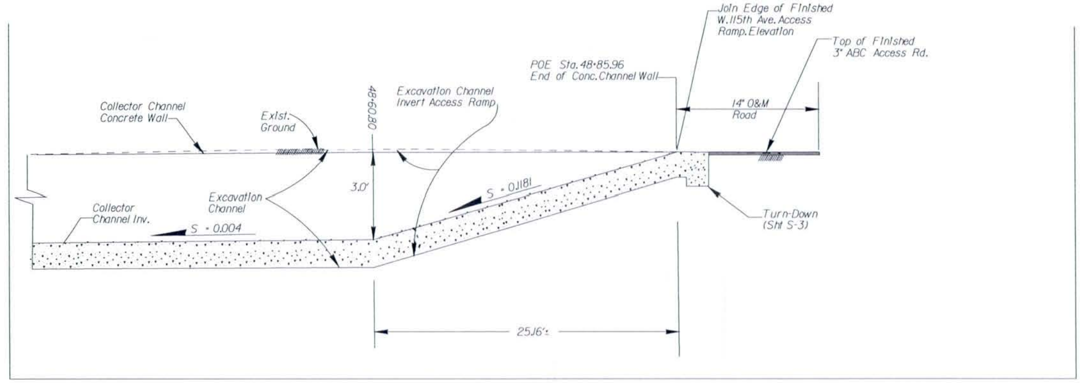
SCALE: 50:1
SHEET EMCC-30
SHEETS

DISTRICT FILE NO. 203/433
SPEC. NO. W912PL-07-B-0003
FILE NAME: EMCC30.DGN



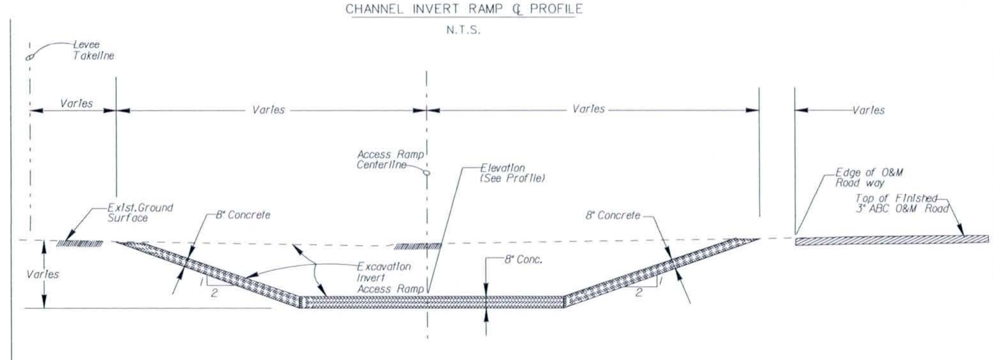
℄ PROFILE

VERT. SCALE: 1in = 5ft
HORIZ. SCALE: 1in = 50ft



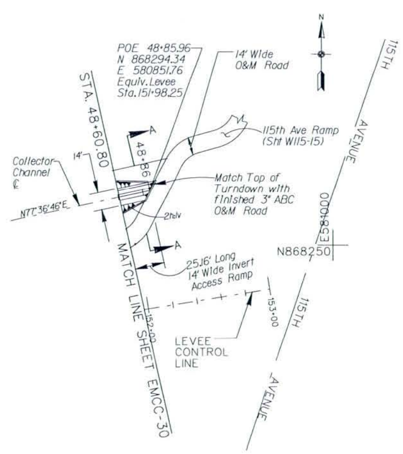
CHANNEL INVERT RAMP ℄ PROFILE

N.T.S.



SECTION A-A

N.T.S.



PLAN

50 25 0 50 100FT

SCALE: 1" = 50'

CONSTRUCTION NOTES:

1. VERTICAL DISTANCE OF 5.0' INDICATED ON THE PROFILE IS THE DEPTH OF THE CONCRETE CHANNEL. THE CONTRACTOR SHALL GRADE (CUT/ FILL) EXISTING GROUND SURFACE FOR BOTH O&M ROADS ALONG NORTH AND SOUTH SIDES OF THE COLLECTOR CHANNEL. GRADING SHALL BE DONE IN SUCH A WAY THAT POSITIVE SLOPE(S) TOWARD THE COLLECTOR CHANNEL SHALL BE ACHIEVED. FINISHED GRADED GROUND SURFACE SHALL BE SURFACED WITH 3" ABC ROCK MULCH FOR THE O&M ROAD ALONG THE SOUTH SIDE OF THE CHANNEL.

NOTES:

1. SEE SHEET EMCX-33 FOR CROSS SECTIONS.
2. SEE SHEET 5 FOR UTILITY RELOCATIONS/REMOVAL LIMITS.
3. SEE SHEET EMCT-34 FOR CHANNEL TYPICAL SECTIONS.
4. SEE SHEETS S-3 & S-4 FOR REINFORCEMENT AND STRUCTURAL DETAILS

AS-BUILT
PLATE 31

Two working days before you dig CALL FOR THE BLUE STAKES 602 263-1100 Blue Stake Center CALL COLLECT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
C	Changed Channel Wall and Invert slab thickness from 6" to 8"	8-12-07	P.W.U.

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVE.)
EL MIRAGE ROAD COLLECTOR CHANNEL
PLAN, PROFILE AND TYPICAL SECTION
STA. 48+60.80 TO STA. 48+85.96

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.Y.
DRAWN BY: J.Y.
CHECKED BY: D.P.

SUBMITTED BY: THOMAS H. SAGE, P.E. CHIEF, DESIGN BRANCH

FILE NAME: EMCC31.DGN

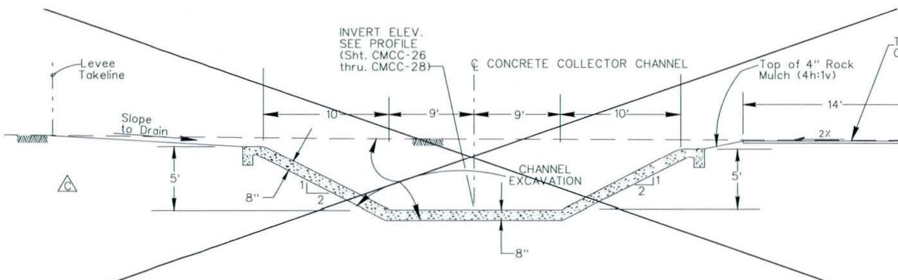
SPEC. NO. W912PL-07-B-0003

DISTRICT FILE NO. 203/

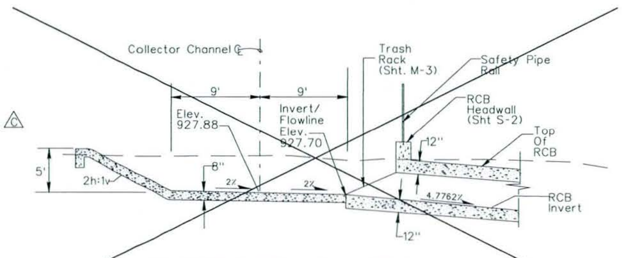
SCALE: 50:1

SHEET EMCC-31

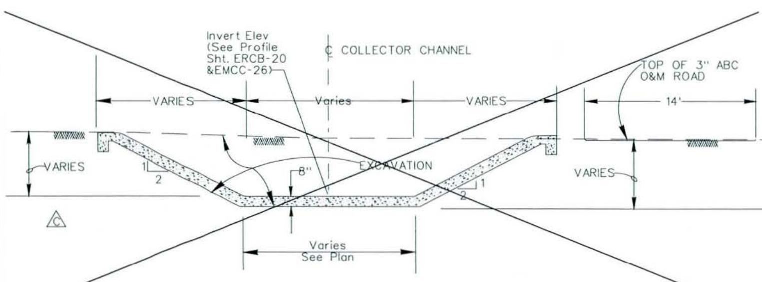
SHEETS



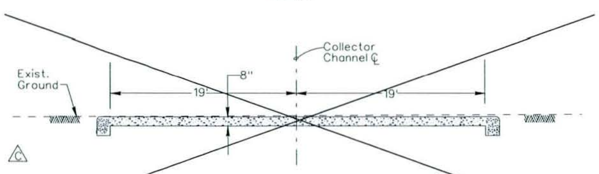
COLLECTOR CHANNEL TYPICAL SECTION
STA. 1+17.00 TO STA. 2+00.00
N.T.S.



COLLECTOR CHANNEL TYPICAL SECTION
STA. 0+84.55 TO STA. 1+17.55
N.T.S.



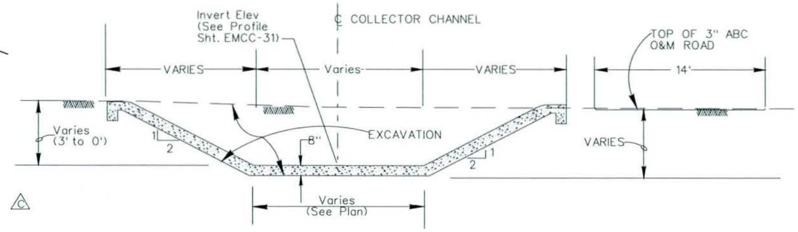
COLLECTOR CHANNEL TYPICAL SECTION
STA. 0+10.00 TO STA. 0+74.55
N.T.S.



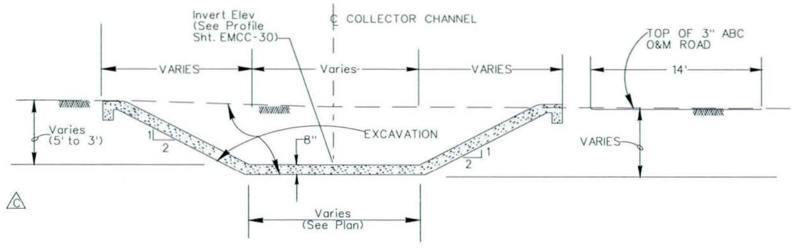
COLLECTOR CHANNEL TYPICAL SECTION
STA. 0+00.00 TO STA. 0+10.00
N.T.S.

NOTES:

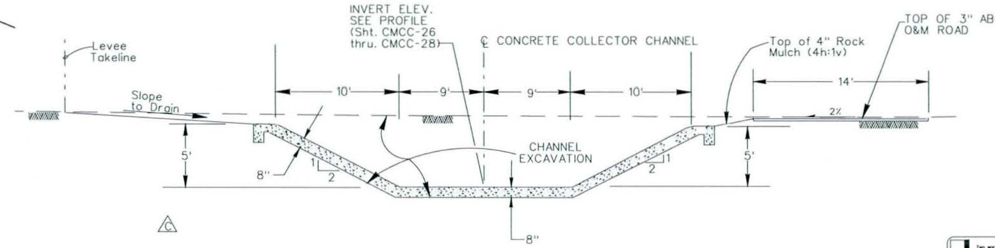
1. TYPICAL SECTIONS ARE DRAWN LOOKING UPSTREAM.
2. SEE SHEETS S-3 AND S-4 FOR STRUCTURAL DETAILS INCLUDING THICKNESSES AND MATERIAL..
3. 3' EXCAVATION LIMITS USED TO AID IN THE CONSTRUCTION OF FORM WORK FOR CHANNEL
4. VERTICAL DISTANCES OF 5' AND 3' INDICATED ON THESE CROSS SECTIONS INCLUDING TRANSITION ZONE ARE DEPTHS OF CONCRETE CHANNEL. THE CONTRACTOR SHALL MATCH TOP OF FINISHED CONCRETE SIDE SLOPES WITH THE EXISTING GROUND SURFACE BY GRADING (EXCAVATION/ COMPACTED FILL) EXIST. GROUND SURFACE. A POSITIVE SLOPE SHALL BE OBTAINED TOWARD THE COLLECTOR CHANNEL.



COLLECTOR CHANNEL TYPICAL SECTION
STA. 48+60.80 TO STA.48+85.96
N.T.S.



COLLECTOR CHANNEL TYPICAL SECTION
STA. 41+50.00 TO STA. 48+60.80
N.T.S.



COLLECTOR CHANNEL TYPICAL SECTION
STA. 7+60.00 TO STA. 41+50.00
N.T.S.

AS-BUILT
PLATE 32

Two working days before you dig CALL FOR THE BLUE STAKES
602 263-1100
Blue Stake Center CALL COLLECT

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
C	Revised and Deleted Typical Sections	6/8/07	P.M.U.
A	Revised Typical Sections Sta. 1+17 to Sta. 2+00 and 2+00 to 41+50	7/10/07	P.M.U.

REVISIONS

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVE.)
EL MIRAGE ROAD COLLECTOR CHANNEL
TYPICAL SECTIONS

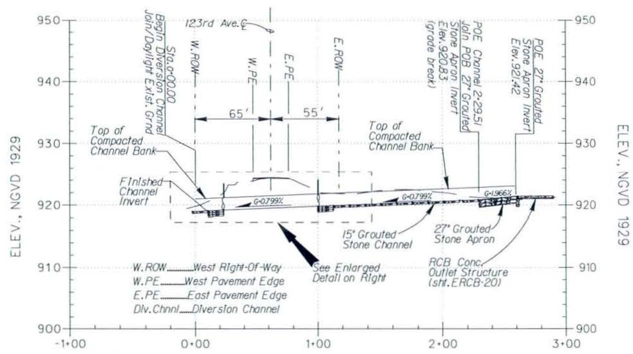
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:

SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

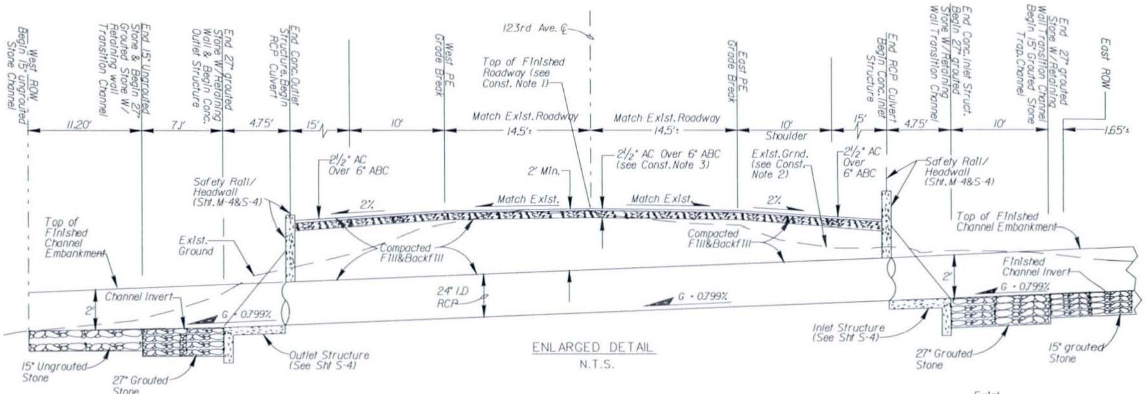
SCALE: 50:1
SHEET EMCT-34
SHEETS
DISTRICT FILE NO. 203/ 437
SPEC. NO. W912PL-07-B-0003
FILE NAME: EMCT34.Dgn

5 VALUE ENGINEERING PAYS 4



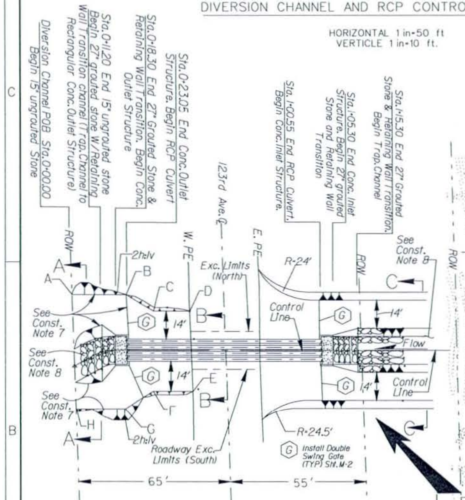
DIVERSION CHANNEL AND RCP CONTROL LINE PROFILE

HORIZONTAL 1 in=50 ft
VERTICLE 1 in=10 ft.

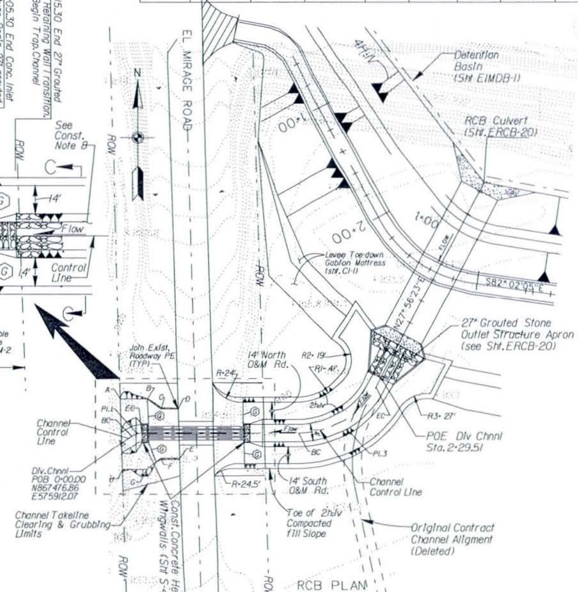


ENLARGED DETAIL
N.T.S.

Channel/RCP Culvert Horizontal Center Line-Curve Data								
P.I. No.	NORTHING	EASTING	Δ	R(FT)	T(FT.)	L(FT.)	B.C.Sta.	E.C.Sta.
1	867484.75	575923.47	34°41'28"Rt	14.25	4.45	8.63	0+09.41	0+18.04
2	867484.75	575096.89	62°03'37"Lt	70.00	42.11	75.82	1+44.90	2+20.72



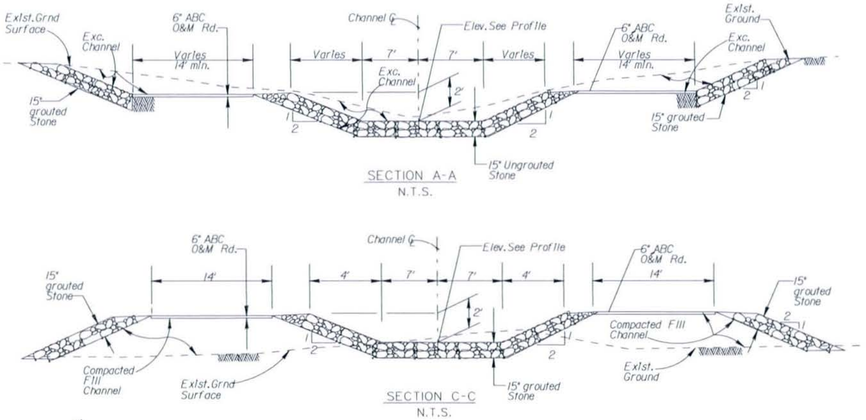
SCALE: NTS



RCB PLAN
SCALE: 1 IN. = 50 FT.

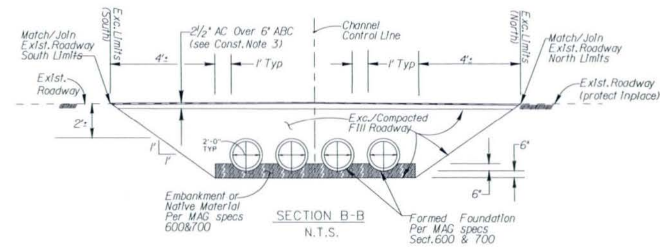
HORIZONTAL CONTROL
LINE-DATA POINTS

P.I.	NORTHING	EASTING
A	867512.43	575911.11
B	867512.48	575932.62
C	867504.25	575943.39
D	867504.29	575957.28
E	867464.21	575958.49
F	867464.25	575943.25
G	867455.31	575932.25
H	867455.27	575912.66

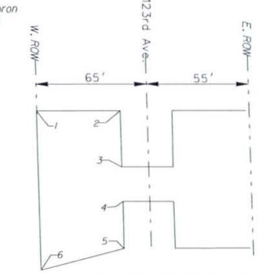


SECTION A-A
N.T.S.

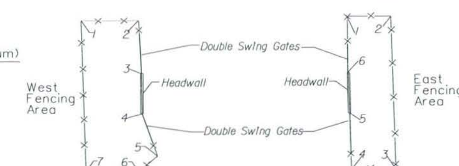
SECTION C-C
N.T.S.



SECTION B-B
N.T.S.



CHANNEL TAKELINE AND
CLEARING & GRUBBING AREA
(See table on sht. Divc-41 for Horiz Control Datum)
N.T.S.



CHANNEL FENCING PLAN
(see table on sht Divc-41 for horiz. control datum)
N.T.S.

CONSTRUCTION NOTES:

1. Elevation of top of finished 123rd Avenue shall match the existing roadway elevation. This applies to every point along the roadway cross section.
2. Exist.ground surface shown does not represent the current ground condition,especially the one on the east side of the 123rd Avenue where compacted fill channel will be required.
3. Minimum Pavement Replacement with 2-1/2" AC over 6" ABC or Match existing Pavement which ever is greater.
4. 15 Grouted Stone is required for levee Sta.1+37.74 to 1+47.74 on the west side of 123rd Ave.and Sta.1+94.35 to 3+38.05 on the east side of 123rd Avenue.
5. See Structure Sheets S-3,S-4 and S-7 for related structural details and trash rack.
6. The Contractor shall obtain all permits necessary and incidental to construction of the diversion channel and the RCP culvert with FCDMC,MCDOT and City of Phoenix.
7. Grading (Cut/Fill) is required to obtain a positive slope to drain toward west.
8. Install 15"Ungrouted stone/riprap for entire channel cross section including channel invert,inside and outside slopes for channel sta.00+00.00 to 0+11.20 (west portion) except noted otherwise.
Install 15" Grouted stone for entire channel cross section including channel invert,inside&outside slopes for channel Sta.1+15.30 to 2+29.51 (east portion).

AS-BUILT
PLATE 33

SAFETY PAYS

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
M2	Deleted Div. Channel Contract Plan, Sections & Details. Redesigned the Div. Channel and added 4-RCP Culvert	7/22/08	P.W.U.

REVISIONS

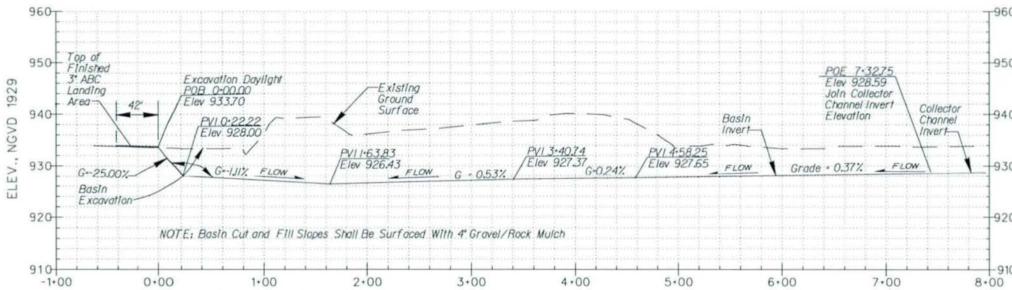
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: D.P.
DRAWN BY: D.P.
CHECKED BY: P.U.

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVENUE)

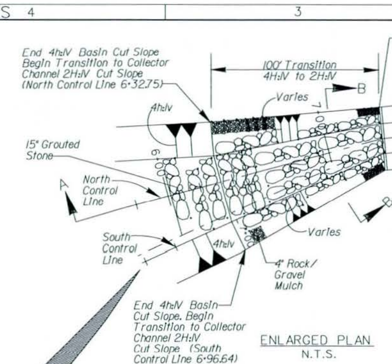
EL MIRAGE ROAD DIVERSION CHANNEL AND RCP CULVERT
PLAN, PROFILE, SECTIONS AND DETAILS

SCALE: 50:1
SHEET: Divc-40 M2
SUBMITTED BY: ARTHUR Y. JUNG, P.E. CHIEF, DESIGN BRANCH
DISTRICT FILE NO. 203/443
SPEC. NO. W912PL-07-B-0003
FILE NAME: Divc1.Dgn

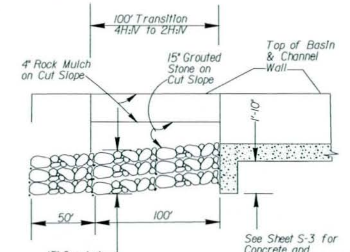


NORTH CONTROL LINE PROFILE
PROFILE WAS DRAWN LOOKING NORTH

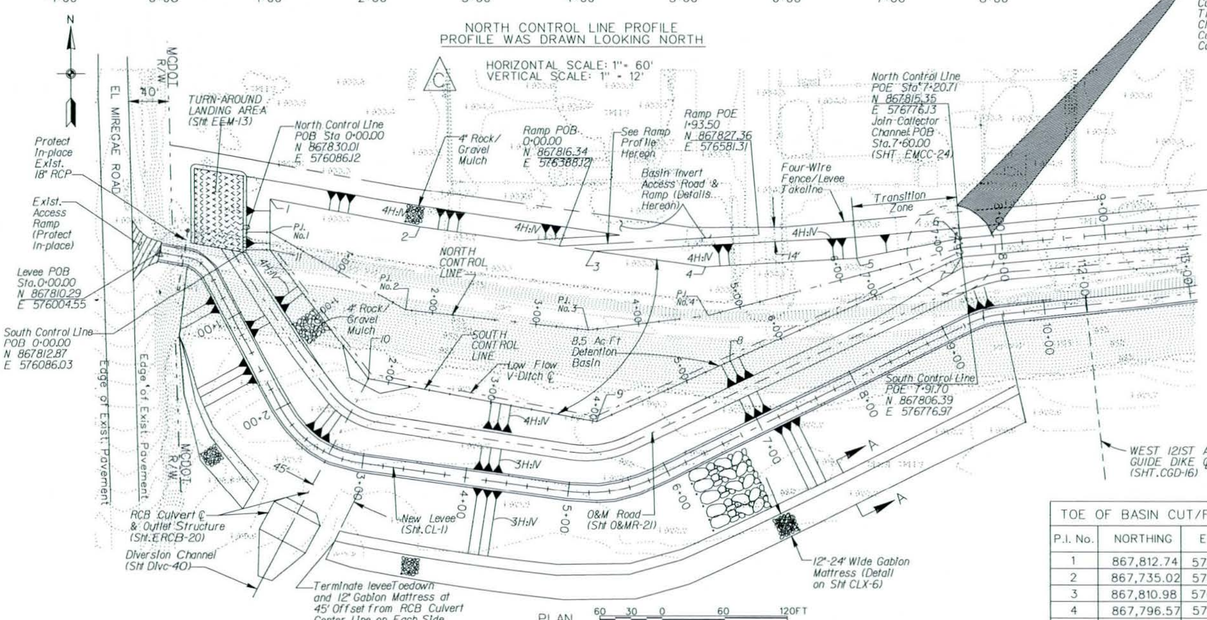
HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 1" = 12'



ENLARGED PLAN
N.T.S.



SECTION A-A
N.T.S.



PLAN

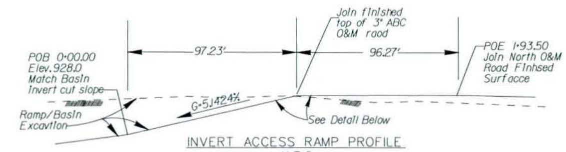
SCALE: 1" = 60'

NOTES:

1. CAPACITY OF THIS EL MIARAGE ROAD DETENTION BASIN = 8.5 ACRE-FT.
2. SEE SHEET ELMDB-2 FOR TYPICAL SECTIONS

CONSTRUCTION NOTES:

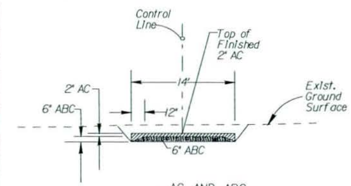
1. EXCAVATION OF THE DETENTION BASIN REQUIRES DEMOLITION AND REMOVAL OF THE EXIST. HOLLY ACRES LEVEE. P.I. POINTS DATA GIVEN IN THE TABLE BELOW ARE FOR TOE OF CUT/FILL SLOPE. THESE DATA SHALL BE USED TO DETERMINE LIMITS OF REMOVAL (FROM TOP TO BOTTOM) OF THE EXIST. HOLLY ACRES LEVEE. THE CONTRACTOR SHALL SALVAGE TO THE MAXIMUM EXTEND POSSIBLE MATERIALS EXCAVATED FROM THE EXIST. HOLLY ACRES LEVEE, INCLUDING STONE/RIPRAP PER SPECIFICATIONS SECTIONS 02380 & 02381. SEE SHEET ELMBE-3 FOR EXCAVATION PLAN.
2. HYDROSEED THE ENTIRE BOTTOM OF THE BASIN (AREA = 1.7 ACRES) PER SPECIFICATIONS



INVERT ACCESS RAMP PROFILE
N.T.S.

TOE OF BASIN CUT/FILL SLOPE (CATCH POINT) P.I. DATA

P.I. No.	NORTHING	EASTING	EXISTING GRADE ELEV.	FINISHED GRADE ELEV.
1	867,812.74	576,108.79	933.5	928.00
2	867,735.02	576,254.17	933.7	928.00
3	867,810.98	576,426.53	933.3	928.00
4	867,796.57	576,529.88	933.0	928.00
5	867,805.01	576,675.33	933.5	928.00
6	867,824.31	576775.30	933.8	928.59
7	867,806.40	576,776.97	933.8	928.59
8	867,704.57	576,553.02	932.0	927.26
9	867,645.82	576,423.81	919.8	926.65
10	867,687.36	576,204.39	926.15	925.00
11	867,812.65	576,097.39	934.1	928.00



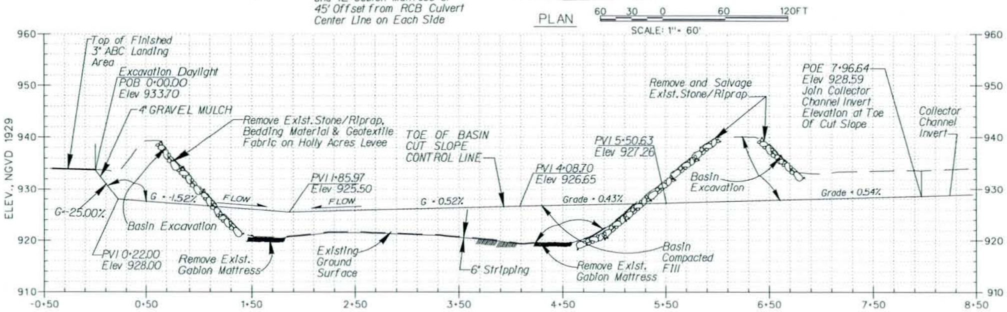
AC AND ABC
SECTION FOR ACCESS RAMP
N.T.S

NORTH CONTROL LINE HORIZONTAL CONTROL POINTS DATA

P.I. No.	STA.	NORTHING	EASTING
1	0+22.22	867,836.18	576,097.96
2	1+86.05	867,754.79	576,240.15
3	3+62.95	867,735.22	576,415.97
4	4+80.47	867,749.42	576,532.62

SOUTH CONTROL LINE HORIZONTAL CONTROL POINTS DATA

See Top of Basin Cut/Fill Slope P.I. Data Table Above for Horiz. Control Points 8 thru. 11



SOUTH CONTROL LINE PROFILE
PROFILE WAS DRAWN LOOKING NORTH

HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 1" = 12'

AS-BUILT
PLATE 34

Two working days before you dig CALL FOR THE BLUE STAKES 602 263-1100 Blue Stake Center CALL COLLECT

REVISIONS

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
A	Deleted 760' long Collector Channel and added 8.5 Ac-Ft. Detention Basin (NEW SHEET)		

TRES RIOS-RIVER, MARICOPA COUNTY, ARIZONA
ENVIRONMENTAL RESTORATION
FLOOD CONTROL NORTH LEVEE
PHASE 1B (EL MIRAGE ROAD TO 115TH AVE.)
EL MIRAGE ROAD DETENTION BASIN
PLAN, PROFILE AND SECTIONS

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: D.P. DRAWN BY: T.C. CHECKED BY: P.U.

FILE NAME: EMDB1.dgn

SUBMITTED BY: THOMAS H. SAGE, P.E. CHIEF, DESIGN BRANCH

SPEC. NO. W912PL-07-B-0003

DISTRICT FILE NO. 203/ 469

SCALE: 60:1 SHEET ELMDB-1 SHEETS

APPENDIX A

COST ESTIMATE
IN MCACES FORMAT

Phase 1A

Tres Rios Project
Environmental Restoration
North Levee (Phase I) Upper
Reach (St. 153+00 to 293+00)
DDR Cost Estimate

Designed By: Design Engineering, Section A
Estimated By: Cost/Structural Eng'rg Section

Prepared By: Cost/Structural Eng'rg Section
Phillip Eng

Preparation Date: 07/05/05
Effective Date of Pricing: 07/05/05
Est Construction Time: 375 Days

Sales Tax: 0.00%

This project cost estimate consists of two major construction features. They are "Levee" and "Interiror Drainage".

"Levee" is composed of the following cost components:
(a) Diversion and Control of Water, (b) Mob/Demob, (c) Clear Site and Remove Obstructions, (d) Removal and Stockpiling of the existing 15" riprap and 6" filter material, (e) 2" Gravel Mulch Protection, (f) 15" thick rounded grouted stone protection, (g) Compacted fill, (h) 15" thick rounded ungrouted stone protection, (i) 12" Gabion Material, (j) 6" thick gravel blanket, (k) Geotextile fabric, (l) 27" angular riprap protection, (m) 3" thick ABC for O&M Roads, (n) Excavation and compacted backfill, (o) Four-Wire R/W Fence, (p) 14' Wide Double Swing Gate

"Interior Drainage" is composed of the following cost components:
(a) Existing CMPs, RCPs, CICs, and Concrete Catch Basin Removal, (b) 3'x5' Reinforced Concrete Box, (c) Collector Channels (115th Avenue & 99th Avenue) (d) Stormdrain Channel (97th Ave/Roeser Road), (e) Catch Basin (115th Ave. and 99th Avenue)

** PROJECT SETTINGS **

ESTIMATE TYPE : A-Crews with Auto Reprice

SALES TAX : 0.00%

DATE OF ESCALATION SCHEDULE : 07/05/05

PROJECT DIRECT COST COLUMNS

Col Type	H	L	E	M	U
Rep Width	8	9	9	9	8
Title	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER

PROJECT INDIRECT COST COLUMNS

Col Type	O	U	B	X	X
Rep Width	12	12	12	0	0
Title	OVERHEAD	HOME OFC	BOND	(Unused)	(Unused)

PROJECT OWNER COST COLUMNS

Col Type	X	X	X	X	X
Rep Width	0	0	0	0	0
Title	(Unused)	(Unused)	(Unused)	(Unused)	(Unused)

PROJECT BREAKDOWN

PROJECT ID	Length	Trail Sep	Level Title	2nd View Order
Level 1 ID :	2	.	Scope	1
Level 2 ID :	2	.	Facility	2
Level 3 ID :	3	.	System	3
Level 4 ID :	3	.	Subsystm	0
Level 5 ID :	3	.	Assm Cat	0
Level 6 ID :	3	.	Assembly	0

Owner Cost Level : 0

** PROJECT SETTINGS **

2ND VIEW COLUMNS

Quantity Column Width : 10

Col Type	X	X	X	X	X
Rep Width	0	0	0	0	0
Title	(Unused)	(Unused)	(Unused)	(Unused)	(Unused)
Shadow	X	X	X	X	X

DETAIL REPORT FORMATTING

PAGE OPTIONS
Page Break Levels : 2
Table of Contents Levels : 2

		0	1	2	3	4	5	6	7
ROW OPTIONS	Print Titles at Levels :		Y	Y	Y	Y	Y	Y	
	Print Totals at Levels :		Y	Y	Y	Y	Y	Y	
	Print Notes at Levels :	Y	Y	Y	Y	Y	N	N	Y

Print Unit Cost Row : Y
Print Page Footer : Y
Show Cost Codes : Y

COLUMNS OPTIONS
Print Crew Id : Y
Crew Output : Y
Unit Cost : Y

UPB TITLES
No. of Levels to Print : 0
Bracket Titles With : N N
Include titles Notes : N

** PROJECT SETTINGS **

OTHER REPORT FORMATTING

COLUMN TITLES FOR SUMMARY REPORTS

Column 1 OVERHEAD : OVERHEAD
Column 2 HOME OFC : HOME OFC
Column 3 BOND : BOND
Column 4 (Unused) : (Unused)
Column 5 (Unused) : (Unused)

Column 1 (Unused) :
Column 2 (Unused) :
Column 3 (Unused) :
Column 4 (Unused) :
Column 5 (Unused) :

STANDARD COLUMN WIDTHS		SUMMARY FEATURES	
Quantity Columns	10	Round Totals Column	N-None
Total cost Columns	12	Contingency Notes	No
Unit Cost Columns	10	Show Project Totals	Yes

SPECIAL REPORT FORMATTING OPTIONS

First Alternate ID : (None)
Show Markup at Level : 0
Display Indirect/Owner Markup as : A - Unit Costs Only
CSI Sort at Level : (None)

** PROJECT SETTINGS **

REPORT SELECTION

Project Settings :	Y	Profit Guidelines :	N
Contractor Settings :	N		
Link Listing :	N	Measurement Units :	U.S.

	REPORT FORMAT TYPE			FOR LEVEL (S)						
	Direct	Indirect	Owner	0	1	2	3	4	5	6
Detail :	Y									
Project :	Y	Y	N		Y	Y	Y	Y	N	N
Contractor :	N	N		N	N	N	N	N	N	N
Division :	N	N	N	N	N	N	N	N	N	N
System :	N	N	N	N	N	N	N	N	N	N
2nd View :	N									
Crew :	Y			Y	N	N	N	N	N	N
Labor :	Y									
Equipment :	Y									
Prime Labor Cost Level :	0									

02.01. Diversion and Control of Water	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST

02. Tres Rios (115th Ave to 105th Av
North Levee Phase 1A
Proj. No. W912PL-05-B-0004, 8(a) Competitive
Contract Bid Administrator: Sandra Oliver-Hall
Bid-Opening Date: 07/12/05

Sta. 153+72.90 to Sta. 224+62.57 and Interior Drainage Structures
This project consists of construction of a 1.4 mile compacted earth fill levee armoring with 15" thick stone and 2" rock/mulch protection including 3" ABC O&M roads, invert access ramps, an approximate 1.3 mile of trapezoidal RCC, RCB culverts, grouted stone, a 14-acre-feet catch basin, agricultural side drain connections, guide dikes, four-wire right of way fence and gates, removal and disposal of debris and incidentals. Earthwork consists of excavation, compacted fill and disposal of excess unsuitable solid material to mandatory disposal sites.

Items 1 - 22 are the "Levee" items.
Items 23 - 38 are the "Interior Drainage" items.

	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
TOTAL Diversion and Control of Water	1.00	EA			0	0	0	0	50,000	50,000	50000.00

02.02. Clear Site & Remove Obstruction	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.02. Clear Site & Remove Obstruction Levee, Collector Channel, Cash Basin (4.67 acres) and Dikes											
MIL PC <02109 0152 > Clear & grub, cut & chip medium trees, 10" dia					80.00	1940.23	1474.01	0.00	0.00	3414.24	
	11.00	ACR	CODFB7	0.08	880	21,343	16,214	0	0	37,557	3414.24
Assume 1/4 of the total acreage will need to be cleared and grubbed. Then, 1/4 * 44 = 11 acres											
AF PC <02110 1060 > Clearing, dry, medium size brush, average grub & trees					7.53	242.23	347.21	0.00	0.00	589.45	
	11.00	ACR	COMCB88	0.93	83	2,665	3,819	0	0	6,484	589.45
L MIL PC <02110 2000 > Clearing, machine load spoils, 2 mi haul to dump					0.04	1.02	0.63	0.00	0.00	1.65	
	25760	CY	COEIB17	100.00	1,030	26,301	16,113	0	0	42,414	1.65
Previous estimate = 32,200 cy @ 55 acres. Now, for 44 acres, 25,760 cy required.											
TOTAL Clear Site & Remove Obstruction	44.00	ACR			1,993	50,308	36,146	0	0	86,454	1964.87

02.03. Removal, Stockpile & Salvage of	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.03. Removal, Stockpile & Salvage of the existing 15" Slope Protection (Riprap) and 6" Bedding (Filter) Material Sta. 153+72.90 to Sta. 168+00 and Box Culverts Existing Holly Acres Levee											
MAP PC < > LDR,FE, WH, 3.25 CY, ARTIC, 950F					0.00	0.00	51.67	0.00	0.00	51.67	
	16.93	HR	L40CA005	1.00	0	0	875	0	0	875	51.67
MAP PC < > BLADE, UNIVERSAL, HYDR, D-9					0.00	0.00	12.84	0.00	0.00	12.84	
(ADD D-9 TRACTOR)	16.93	HR	T10CA022	1.00	0	0	217	0	0	217	12.84
MAP PC < > DOZER,CWLR, D-9R PS,W/BLADE					0.00	0.00	99.64	0.00	0.00	99.64	
(ADD ATTACHMENTS)	16.93	HR	T15CA017	1.00	0	0	1,687	0	0	1,687	99.64
EP PC < > HYD EXCAV,TRK MTD,1.00CY BKT,4X4					0.00	0.00	46.17	0.00	0.00	46.17	
	16.93	HR	H30CA005	1.00	0	0	782	0	0	782	46.17
EP PC < > TRK,OFF-HWY,R-DUMP, 22-30CY, 35T					0.00	0.00	67.72	0.00	0.00	67.72	
	16.93	HR	T55CA001	1.00	0	0	1,146	0	0	1,146	67.72
EP PC < > AIR COMPR, 250 CFM, 100 PSI					0.00	0.00	10.53	0.00	0.00	10.53	
(ADD HOSES & ATTACHMENTS)	16.93	HR	A15SR005	1.00	0	0	178	0	0	178	10.53
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
	50.79	HR	X-EQOPRMED	1.00	51	1,635	0	0	0	1,635	32.20
MIL PC < > Outside Laborer (4)					1.00	20.47	0.00	0.00	0.00	20.47	
	67.72	HR	X-LABORER	1.00	68	1,386	0	0	0	1,386	20.47
MIL PC < > Outside Laborer					1.00	21.47	0.00	0.00	0.00	21.47	
	16.93	HR	X-LABORER	1.00	17	364	0	0	0	364	21.47
MIL PC < > Outside Truck Driver, Heavy					1.00	31.60	0.00	0.00	0.00	31.60	
	16.93	HR	X-TRKDVRHV	1.00	17	535	0	0	0	535	31.60
TOTAL Removal, Stockpile & Salvage of	1693.00	CY			152	3,920	4,885	0	0	8,806	5.20

02.04. 2" Rock Mulch Protection	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.04. 2" Rock Mulch Protection											
Levee (973 cy) + Catch Basin (250 cy) = 1,223 cy											
TOTAL 2" Rock Mulch Protection	1223.00	CY			0	12,426	0	50,204	0	62,630	51.21

02.05. Grout Protection, Access Ramps,	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.05. Grout Protection, Access Ramps, Turn-arounds, RCB Culverts and Collector Channel											
MIL PC < > Outside Equip. Operator, Light					1.00	30.80	0.00	0.00	0.00	30.80	
	20.00	HR	X-EQOPRLT	1.00	20	616	0	0	0	616	30.80
MIL PC < > Outside Laborer					1.00	21.47	0.00	0.00	0.00	21.47	
	20.00	HR	X-LABORER	1.00	20	429	0	0	0	429	21.47
MIL PC < > Outside Laborer					1.00	21.47	0.00	0.00	0.00	21.47	
	60.00	HR	X-LABORER	1.00	60	1,288	0	0	0	1,288	21.47
EP PC < > CONC PUMP, 65CY/HR, TRAILER MTD					0.00	0.00	26.99	0.00	0.00	26.99	
	20.00	HR	C55MO004	1.00	0	0	540	0	0	540	26.99
NON PC < > MISC. POWER TOOLS					0.00	0.00	6.40	0.00	0.00	6.40	
	20.00	HR	XMIXX010	1.00	0	0	128	0	0	128	6.40
USR PC < > Sand and Ready Mix Delivered					0.00	0.00	0.00	80.00	0.00	80.00	
	600.00	CY	N/A	0.00	0	0	0	48,000	0	48,000	80.00
TOTAL Grout Protection, Access Ramps,	600.00	CY			100	2,334	668	48,000	0	51,002	85.00

02.06. Stripping & Disposal of 6" Top	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.06. Stripping & Disposal of 6" Top (CODTB10B) Soil, Levee (6400 cy) and Dikes (1700 cy) = 8,100 cy											
MIL PC < > Equip. Operators, Medium					1.00	33.86	0.00	0.00	0.00	33.86	
	162.00	HR	B-EQOPRMED	1.00	162	5,485	0	0	0	5,485	33.86
MIL PC < > Laborers, (Semi-Skilled)					1.00	22.13	0.00	0.00	0.00	22.13	
	81.00	HR	B-LABORER	1.00	81	1,793	0	0	0	1,793	22.13
GEN PC < > DOZER, CRAWLER, 181-250HP					0.00	0.00	65.93	0.00	0.00	65.93	
(135-186KW), PS, LGP (W/U BLADE)	162.00	HR	T15Z6520	1.00	0	0	10,680	0	0	10,680	65.93
TOTAL Stripping & Disposal of 6" Top	8100.00	CY			243	7,278	10,680	0	0	17,958	2.22

02.07. Compacted Fill Levee (55,800 cy)	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.07. Compacted Fill Levee (55,800 cy) and Dikes (12,656 cy)											
02.07.001. Load and Haul (COEIB34B)											
MIL PC < > Truck Drivers, Heavy					1.00	27.03	0.00	0.00	0.00	27.03	
	342.28	HR	B-TRKDVRHV	1.00	342	9,252	0	0	0	9,252	27.03
GEN PC < > TRUCK, HWY 45,000 (20,412KG)GVW					0.00	0.00	45.79	0.00	0.00	45.79	
6X4, 3 AXLE, (ADD ACCESSORIES)	342.28	HR	T50Z7420	1.00	0	0	15,671	0	0	15,671	45.79
GEN PC < > REAR DUMP BODY, 16-23.5CY (12.2-					0.00	0.00	2.14	0.00	0.00	2.14	
18M3) (ADD 40,000-45,000GVW TRK)	342.28	HR	T40Z6860	1.00	0	0	733	0	0	733	2.14
GEN PC < > LOADER, F/E, WHEEL, 3.25CY					0.00	0.00	51.67	0.00	0.00	51.67	
(2.5M3), 4WD	342.28	HR	L40Z4397	1.00	0	0	17,684	0	0	17,684	51.67
MAP PC < > BLADE, UNIVERSAL, HYDR, D-8					0.00	0.00	8.92	0.00	0.00	8.92	
(ADD D-8 TRACTOR)	342.28	HR	T10CA017	1.00	0	0	3,053	0	0	3,053	8.92
MAP PC < > DOZER,CWLR, D-8R PS,W/BLADE					0.00	0.00	73.32	0.00	0.00	73.32	
(ADD ATTACHMENTS)	342.28	HR	T15CA016	1.00	0	0	25,097	0	0	25,097	73.32
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
(Loader)	342.28	HR	X-EQOPRMED	1.00	342	11,021	0	0	0	11,021	32.20
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
(Dozer)	342.28	HR	X-EQOPRMED	1.00	342	11,021	0	0	0	11,021	32.20
MIL PC < > Outside Laborer					1.00	20.47	0.00	0.00	0.00	20.47	
	1026.84	HR	X-LABORER	1.00	1,027	21,021	0	0	0	21,021	20.47
TOTAL Load and Haul	68456	CY			2,054	52,316	62,239	0	0	114,555	1.67
02.07.002. Place and Compact											
MIL PC <02220 5900 > Compaction of backfill,					0.01	0.38	0.40	0.00	0.00	0.78	
structural, SP roller, 6" lift	68456	CY	COFCB10F	117.50	876	26,171	27,109	0	0	53,279	0.78
M MIL PC <02220 9000 > Compaction, water, truck, 3000					0.01	0.26	0.24	0.20	0.00	0.70	
gal, 3 mile haul	68456	CY	COKBB45	236.00	582	17,662	16,765	13,691	0	48,118	0.70
TOTAL Place and Compact	68456	CY			1,458	43,832	43,873	13,691	0	101,397	1.48
TOTAL Compacted Fill Levee (55,800 cy)	68456	CY			3,512	96,148	106,112	13,691	0	215,952	3.15

02.08. 15" Stone/Riprap Slope Protectin	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.08. 15" Stone/Riprap Slope Protectin											
Levee (Haul distance approximately 3 miles one way)											
02.08.001. Stone Price & Transportation											
Stone price and transportaion cost is quoted from old projects.											
TOTAL Stone Price & Transportation	24110	TON			0	0	0	265,210	289,320	554,530	23.00
02.08.002. Stone Placement											
MAP PC < > HYD EXCAV, CRWLR, 77,220 LBS, 2.09 CY BKT,MASS BOOM					0.00	0.00	72.24	0.00	0.00	72.24	
	160.73	HR	H25CA027	1.00	0	0	11,612	0	0	11,612	72.24
MAP PC < > LDR,FE, WH, 4.50 CY, ARTIC, 966F					0.00	0.00	70.75	0.00	0.00	70.75	
	160.73	HR	L40CA006	1.00	0	0	11,372	0	0	11,372	70.75
MAP PC < > TRK,HWY, 8,800GVW,4X4, 3/4T-PKUP					0.00	0.00	9.53	0.00	0.00	9.53	
	160.73	HR	T50FO004	1.00	0	0	1,532	0	0	1,532	9.53
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
	160.73	HR	X-EQOPRMED	1.00	161	5,175	0	0	0	5,175	32.20
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
	160.73	HR	X-EQOPRMED	1.00	161	5,175	0	0	0	5,175	32.20
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
	160.73	HR	X-EQOPRMED	1.00	161	5,175	0	0	0	5,175	32.20
MIL PC < > Outside Laborer					1.00	20.47	0.00	0.00	0.00	20.47	
	321.47	HR	X-LABORER	1.00	321	6,581	0	0	0	6,581	20.47
MIL PC < > Outside Rodman					1.00	39.79	0.00	0.00	0.00	39.79	
	160.73	HR	X-RODMAN	1.00	161	6,396	0	0	0	6,396	39.79
MIL PC < > Outside Equip. Oiler					1.00	26.58	0.00	0.00	0.00	26.58	
	160.73	HR	X-EQOPROIL	1.00	161	4,272	0	0	0	4,272	26.58
TOTAL Stone Placement	24110	TON			1,125	32,775	24,516	0	0	57,291	2.38
TOTAL 15" Stone/Riprap Slope Protectin	24110	TON			1,125	32,775	24,516	265,210	289,320	611,821	25.38

02.09. 15" Stone Protection,	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.09. 15" Stone Protection, 107th Avenue Access Ramps (251 tons) + 115th Avenue RCB (32 tons) + Collector Channel (86 tons) = 369 tons											
TOTAL 15" Stone Protection,	369.00	TON			0	502	376	4,059	4,428	9,365	25.38

02.10. 12" Gabion Mattress, Scour Apron	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.10. 12" Gabion Mattress, Scour Apron Holy Acre Levee (470 tons) + and Dikes (5600 tons) = 6,070 tons											
M USR PC <02270 0600 > Rip-rap, gabions, stone filled,					0.00	0.00	4.95	23.71	0.00	28.66	
12" deep, galv steel mesh mats/boxes	11380	SY	N/A	0.00	0	0	56,331	269,820	0	326,151	28.66
Assume the Gabion Mattress is laid for 12", and we use the conversion factor of 1.575 ton/ccy (for in-fill average riprap rock) Then, (6070 ton / 1.6ton/cy) /(12") = 11,380 sy											
MIL PC < > Laborers, (Semi-Skilled)					1.00	23.13	0.00	0.00	0.00	23.13	
	21.45	HR	B-LABORER	1.00	21	496	0	0	0	496	23.13
MIL PC < > Laborers, (Semi-Skilled)					1.00	22.13	0.00	0.00	0.00	22.13	
	85.80	HR	B-LABORER	1.00	86	1,899	0	0	0	1,899	22.13
MIL PC < > Equip. Operators, Crane/Shovel					1.00	35.19	0.00	0.00	0.00	35.19	
	21.45	HR	B-EQOPRCRN	1.00	21	755	0	0	0	755	35.19
MIL PC < > Equip. Operators, Oilers					1.00	28.24	0.00	0.00	0.00	28.24	
	21.45	HR	B-EQOPROIL	1.00	21	606	0	0	0	606	28.24
GEN PC < > CRANE, HYD, TRUCK MTD, 65T					0.00	0.00	94.68	0.00	0.00	94.68	
126' BOOM (59.0MT, 38.4M), 8X4	21.45	HR	C80Z2280	1.00	0	0	2,031	0	0	2,031	94.68
TOTAL 12" Gabion Mattress, Scour Apron	6070.00	TON			150	3,756	58,362	269,820	0	331,937	54.68

02.11. 4" Bedding Mat'l (Earth)	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.11. 4" Bedding Mat'l (Earth) Levee (2358 cy) and Dikes (846 cy) = 3,204 cy											
02.11.003. Placement of 4" Bedding Material Use topsoil as the bedding material											
M MIL PC <02241 0705 > Loam or topsoil, furnish &					0.09	2.76	1.77	5.00	0.00	9.53	
place, imported, 4" deep	3204.00	CY	CODFB10S	16.25	296	8,857	5,665	16,020	0	30,542	9.53
TOTAL Placement of 4" Bedding Material	3204.00	CY			296	8,857	5,665	16,020	0	30,542	9.53
TOTAL 4" Bedding Mat'l (Earth)	3204.00	CY			296	8,857	5,665	16,020	0	30,542	9.53

02.12. Filter Fabric,	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.12. Filter Fabric, Levee (22156 sy) and Dikes (5074 sy) + access ramp = 27,230 sy											
USR PC < > Geotextile Filter Fabric					0.00	0.00	0.00	1.25	0.00	1.25	
Material quote: Means 2004, 02620-300-0100.	27230	SY		0.00	0	0	0	34,038	0	34,038	1.25
NON PC < > SMALL TOOLS					0.00	0.00	1.57	0.00	0.00	1.57	
	44.34	HR	XMIXX020	1.00	0	0	70	0	0	70	1.57
EP PC < > TRK,HWY, 8,600GVW,4X2, 3/4T-PKUP					0.00	0.00	10.23	0.00	0.00	10.23	
	70.95	HR	T50GM006	1.00	0	0	726	0	0	726	10.23
MIL PC < > Laborer (Semi-Skilled)					1.00	23.13	0.00	0.00	0.00	23.13	
	177.38	HR	B-LABORER	1.00	177	4,103	0	0	0	4,103	23.13
MIL PC < > Laborer (Semi-Skilled) (2 ea)					1.00	23.13	0.00	0.00	0.00	23.13	
	354.75	HR	B-LABORER	1.00	355	8,206	0	0	0	8,206	23.13
TOTAL Filter Fabric,	27230	SY			532	12,309	795	34,038	0	47,142	1.73

02.13. 27" Riprap Protection, Dikes	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.13. 27" Riprap Protection, Dikes (Rock source is approx. 2 miles away)											
02.13.001. Stone Price & Transportation											
Stone price and transportaion cost is quoted from old projects.											
TOTAL Stone Price & Transportation	7000.00	TON			0	0	0	98,000	84,000	182,000	26.00
02.13.002. Stone Placement											
MAP PC < > HYD EXCAV, CRWLR, 77,220 LBS,					0.00	0.00	72.24	0.00	0.00	72.24	
2.09 CY BKT,MASS BOOM	70.00	HR	H25CA027	1.00	0	0	5,057	0	0	5,057	72.24
MAP PC < > LDR,FE, WH, 4.50 CY, ARTIC, 966F					0.00	0.00	70.75	0.00	0.00	70.75	
	70.00	HR	L40CA006	1.00	0	0	4,953	0	0	4,953	70.75
MAP PC < > TRK,HWY, 8,800GVW,4X4, 3/4T-PKUP					0.00	0.00	9.53	0.00	0.00	9.53	
	70.00	HR	T50FO004	1.00	0	0	667	0	0	667	9.53
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
	70.00	HR	X-EQOPRMED	1.00	70	2,254	0	0	0	2,254	32.20
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
	70.00	HR	X-EQOPRMED	1.00	70	2,254	0	0	0	2,254	32.20
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
	70.00	HR	X-EQOPRMED	1.00	70	2,254	0	0	0	2,254	32.20
MIL PC < > Outside Laborer					1.00	20.47	0.00	0.00	0.00	20.47	
	140.00	HR	X-LABORER	1.00	140	2,866	0	0	0	2,866	20.47
MIL PC < > Outside Rodman					1.00	39.79	0.00	0.00	0.00	39.79	
	70.00	HR	X-RODMAN	1.00	70	2,785	0	0	0	2,785	39.79
MIL PC < > Outside Equip. Oiler					1.00	26.58	0.00	0.00	0.00	26.58	
	70.00	HR	X-EQOPROIL	1.00	70	1,861	0	0	0	1,861	26.58
TOTAL Stone Placement	7000.00	TON			490	14,274	10,677	0	0	24,950	3.56
TOTAL 27" Riprap Protection, Dikes	7000.00	TON			490	14,274	10,677	98,000	84,000	206,950	29.56

02.14. 33" Riprap Slope Protection,	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.14. 33" Riprap Slope Protection, Dikes (within 3.5 miles to 15 miles)											
02.14.001. Stone Price & Transportation											
Stone price and transportaion cost is quoted from old projects.											
TOTAL Stone Price & Transportation	850.00	TON			0	0	0	23,800	10,200	34,000	40.00
02.14.002. Stone Placement											
MAP PC < > HYD EXCAV, CRWLR, 77,220 LBS,					0.00	0.00	72.24	0.00	0.00	72.24	
2.09 CY BKT,MASS BOOM	8.50	HR	H25CA027	1.00	0	0	614	0	0	614	72.24
MAP PC < > LDR,FE, WH, 4.50 CY, ARTIC, 966F					0.00	0.00	70.75	0.00	0.00	70.75	
	8.50	HR	L40CA006	1.00	0	0	601	0	0	601	70.75
MAP PC < > TRK,HWY, 8,800GVW,4X4, 3/4T-PKUP					0.00	0.00	9.53	0.00	0.00	9.53	
	8.50	HR	T50FO004	1.00	0	0	81	0	0	81	9.53
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
	8.50	HR	X-EQOPRMED	1.00	9	274	0	0	0	274	32.20
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
	8.50	HR	X-EQOPRMED	1.00	9	274	0	0	0	274	32.20
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
	8.50	HR	X-EQOPRMED	1.00	9	274	0	0	0	274	32.20
MIL PC < > Outside Laborer					1.00	20.47	0.00	0.00	0.00	20.47	
	17.00	HR	X-LABORER	1.00	17	348	0	0	0	348	20.47
MIL PC < > Outside Rodman					1.00	39.79	0.00	0.00	0.00	39.79	
	8.50	HR	X-RODMAN	1.00	9	338	0	0	0	338	39.79
MIL PC < > Outside Equip. Oiler					1.00	26.58	0.00	0.00	0.00	26.58	
	8.50	HR	X-EQOPROIL	1.00	9	226	0	0	0	226	26.58
TOTAL Stone Placement	850.00	TON			60	1,733	1,296	0	0	3,030	3.56
TOTAL 33" Riprap Slope Protection,	850.00	TON			60	1,733	1,296	23,800	10,200	37,030	43.56

02.15. 3" ABC, O&M Roads	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
TOTAL 3" ABC, O&M Roads	2500.00	TON			0	23,850	15,825	0	0	39,675	15.87

02.16. Excavation, Levee Toe-Down		QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.16. Excavation, Levee Toe-Down												
MAP PC <	> SCRAPER,TAND, 32-44CY, 52T PS					0.00	0.00	197.82	0.00	0.00	197.82	
		135.90	HR	S20CA005	1.00	0	0	26,883	0	0	26,883	197.82
MAP PC <	> DOZER,CWLR, D7R PS,W/BLADE					0.00	0.00	92.76	0.00	0.00	92.76	
	(ADD ATTACHMENTS)	33.97	HR	T15CA012	1.00	0	0	3,151	0	0	3,151	92.76
MAP PC <	> BLADE, UNIVERSAL, HYDR, D-7					0.00	0.00	7.55	0.00	0.00	7.55	
	(ADD D-7 TRACTOR)	33.97	HR	T10CA013	1.00	0	0	257	0	0	257	7.55
USR PC <	> Water Truck, w/ operator					0.00	35.00	30.00	0.00	0.00	65.00	
		33.97	HR	N/A	0.00	0	1,189	1,019	0	0	2,208	65.00
EP PC <	> TRK,HWY,10,000GVW,4X2, 1T-PICKUP					0.00	0.00	9.76	0.00	0.00	9.76	
		33.97	HR	T50FO005	1.00	0	0	331	0	0	331	9.76
MIL PC <	> Outside Equip. Operator, Medium					1.00	33.20	0.00	0.00	0.00	33.20	
		33.97	HR	X-EQOPRMED	1.00	34	1,128	0	0	0	1,128	33.20
MIL PC <	> Outside Equip. Operator, Medium					1.00	33.20	0.00	0.00	0.00	33.20	
		169.87	HR	X-EQOPRMED	1.00	170	5,640	0	0	0	5,640	33.20
MIL PC <	> Outside Laborer					1.00	21.47	0.00	0.00	0.00	21.47	
		33.97	HR	X-LABORER	1.00	34	729	0	0	0	729	21.47
	TOTAL Excavation, Levee Toe-Down	11891	CY			238	8,686	31,642	0	0	40,328	3.39

02.17. Miscellaneous Backfill, Levee	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.17. Miscellaneous Backfill, Levee											
Toe-Down											
RSM PC <02216 2000 > Backfill, strl, sand & gravel,					0.01	0.33	0.20	0.00	0.00	0.53	
no cmpct, 75 HP dozer, 50' haul	2691.00	CY	CODTB10L	137.50	29	879	539	0	0	1,418	0.53
MIL PC <02220 5900 > Compaction of backfill,					0.01	0.38	0.40	0.00	0.00	0.78	
structural, SP roller, 6" lift	2691.00	CY	COFCB10F	117.50	34	1,029	1,066	0	0	2,094	0.78
M MIL PC <02220 9000 > Compaction, water, truck, 3000					0.01	0.26	0.24	0.20	0.00	0.70	
gal, 3 mile haul	2691.00	CY	COKBB45	236.00	23	694	659	538	0	1,892	0.70
TOTAL Miscellaneous Backfill, Levee	2691.00	CY			87	2,602	2,263	538	0	5,404	2.01

02.18. Four-Wire R/W Fence	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.18. Four-Wire R/W Fence 4'H, 10'oc Posts are 1' apart.											
M USR PC <02831 6540 > Fence, CL, 4' H, galv line post @ 10' OC, 9g mesh, 1-5/8" top rail	7500.00	LF	N/A	0.00	0.00 0	0.00 0	1.01 7,575	4.20 31,500	0.00 0	5.21 39,075	5.21
MIL PC < > Laborers, (Semi-Skilled)	93.75	HR	B-LABORER	1.00	1.00 94	23.13 2,169	0.00 0	0.00 0	0.00 0	23.13 2,169	23.13
MIL PC < > Laborers, (Semi-Skilled)	93.75	HR	B-LABORER	1.00	1.00 94	22.13 2,075	0.00 0	0.00 0	0.00 0	22.13 2,075	22.13
MIL PC < > Truck Drivers, Light	93.75	HR	B-TRKDVRLT	1.00	1.00 94	26.57 2,491	0.00 0	0.00 0	0.00 0	26.57 2,491	26.57
MIL PC < > Equip. Operators, Light	93.75	HR	B-EQOPRLT	1.00	1.00 94	30.80 2,888	0.00 0	0.00 0	0.00 0	30.80 2,888	30.80
GEN PC < > DRILL, AUGER, FENCE POST, TOWED 550 DIG-R-MOBILE - GENERAL EQUIP	93.75	HR	XMEZ9300	1.00	0.00 0	0.00 0	1.72 161	0.00 0	0.00 0	1.72 161	1.72
GEN PC < > TRUCK, HWY 25,000 (11,340KG)GVW 4X2, 2 AXLE, (ADD ACCESSORIES)	93.75	HR	T50Z7400	1.00	0.00 0	0.00 0	17.77 1,666	0.00 0	0.00 0	17.77 1,666	17.77
GEN PC < > TRK FLATBED, 8'X 20'(2.4MX 6.1M) (ADD 25,000GVW TRK)	93.75	HR	T40Z7000	1.00	0.00 0	0.00 0	1.04 98	0.00 0	0.00 0	1.04 98	1.04
TOTAL Four-Wire R/W Fence	7500.00	LF			375	9,623	9,501	31,500	0	50,623	6.75

02.19. 14' Wide Double Swing Gate	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.19. 14' Wide Double Swing Gate											
M USR PC <02835 7130 > Fence, CL, 4' high, dbl, 14'W,					2.00	0.00	12.55	287.19	0.00	299.74	
indl, gates, swing, galv, w/o barb wire	4.00	EA	N/A	0.00	8	0	50	1,149	0	1,199	299.74
MIL PC < > Laborers, (Semi-Skilled)					1.00	22.13	0.00	0.00	0.00	22.13	
	6.00	HR	B-LABORER	1.00	6	133	0	0	0	133	22.13
GEN PC < > TRK FLATBED, 8'X 20'(2.4MX 6.1M)					0.00	0.00	1.04	0.00	0.00	1.04	
(ADD 25,000GVW TRK)	2.00	HR	T40Z7000	1.00	0	0	2	0	0	2	1.04
GEN PC < > TRUCK, HWY 25,000 (11,340KG)GVW					0.00	0.00	17.77	0.00	0.00	17.77	
4X2, 2 AXLE, (ADD ACCESSORIES)	2.00	HR	T50Z7400	1.00	0	0	36	0	0	36	17.77
TOTAL 14' Wide Double Swing Gate	4.00	EA			14	133	88	1,149	0	1,369	342.35

02.20. Excavation and Spreading, Levee	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.20. Excavation and Spreading, Levee 317 cy + Dikes 3220 cy = 3,537 cy Gabion Mattress Scour Aprons											
02.20.001. Excavation											
MAP PC < > SCRAPER,TAND, 32-44CY, 52T PS					0.00	0.00	197.82	0.00	0.00	197.82	
	35.37	HR	S20CA005	1.00	0	0	6,997	0	0	6,997	197.82
MAP PC < > DOZER,CWLR, D7R PS,W/BLADE					0.00	0.00	92.76	0.00	0.00	92.76	
(ADD ATTACHMENTS)	8.84	HR	T15CA012	1.00	0	0	820	0	0	820	92.76
MAP PC < > BLADE, UNIVERSAL, HYDR, D-7					0.00	0.00	7.55	0.00	0.00	7.55	
(ADD D-7 TRACTOR)	8.84	HR	T10CA013	1.00	0	0	67	0	0	67	7.55
USR PC < > Water Truck, w/ operator					0.00	35.00	30.00	0.00	0.00	65.00	
	8.84	HR	N/A	0.00	0	309	265	0	0	575	65.00
EP PC < > TRK,HWY,10,000GVW,4X2, 1T-PICKUP					0.00	0.00	9.76	0.00	0.00	9.76	
	8.84	HR	T50FO005	1.00	0	0	86	0	0	86	9.76
MIL PC < > Outside Equip. Operator, Medium					1.00	33.20	0.00	0.00	0.00	33.20	
	8.84	HR	X-EQOPRMED	1.00	9	294	0	0	0	294	33.20
MIL PC < > Outside Equip. Operator, Medium					1.00	33.20	0.00	0.00	0.00	33.20	
	44.21	HR	X-EQOPRMED	1.00	44	1,468	0	0	0	1,468	33.20
MIL PC < > Outside Laborer					1.00	21.47	0.00	0.00	0.00	21.47	
	8.84	HR	X-LABORER	1.00	9	190	0	0	0	190	21.47
TOTAL Excavation	3537.00	CY			62	2,261	8,235	0	0	10,496	2.97
02.20.002. Spreading											
MIL PC <02239 0110 > Spread/compact, 200 HP dozer					0.01	0.17	0.30	0.00	0.00	0.47	
w/sheepsfoot roller, 6" lift, embankment	3537.00	CY	COFCB32E	468.75	21	595	1,057	0	0	1,652	0.47
TOTAL Spreading	3537.00	CY			21	595	1,057	0	0	1,652	0.47
TOTAL Excavation and Spreading, Levee	3537.00	CY			83	2,856	9,292	0	0	12,148	3.43

02.21. Survey Markers Installation,	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.21. Survey Markers Installation, Levee											
MIL PC < > Outside Laborer					1.00	20.47	0.00	0.00	0.00	20.47	
	6.67	HR	X-LABORER	1.00	7	136	0	0	0	136	20.47
USR PC < > Survey Markers					0.00	20.47	0.00	20.00	0.00	40.47	
	10.00	EA	X-LABORER	1.00	0	205	0	200	0	405	40.47
TOTAL Survey Markers Installation,	10.00	EA			7	341	0	200	0	541	54.12

02.22. As-Built Drawings	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
TOTAL As-Built Drawings					0	0	0	0	10,000	10,000	

02.23. Seal the Existing 18" CMP's	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.23. Seal the Existing 18" CMP's and RCP's with Control Low Strength Material (CLSM) or Ready Mixed Flowable Fill.											
Material price quoted from Raineri Ready-Mix Concrete, (314) 781-1573.											
MIL PC < > Outside Plumber					1.00	43.07	0.00	0.00	0.00	43.07	
	20.00	HR	X-PLUMBER	1.00	20	861	0	0	0	861	43.07
USR PC < > Control Low Strength Material					0.00	43.07	0.00	65.00	0.00	108.07	
	20.00	CY	X-PLUMBER	1.00	0	861	0	1,300	0	2,161	108.07
TOTAL Seal the Existing 18" CMP's	20.00	CY			20	1,723	0	1,300	0	3,023	151.15

02.24. Relocation of Existing CIC's and	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.24. Relocation of Existing CIC's and Concrete Irrigation Pipes (CIP's)											
02.24.010. Removal & Disposal of Exist. CICs and Concrete Irrigation Pipes (CIP's)											
TOTAL Removal & Disposal of Exist.	1.00	EA			0	0	0	0	75,000	75,000	75000.00
TOTAL Relocation of Existing CIC's and					0	0	0	0	75,000	75,000	

02.25. Concrete (RCB Culvert)		QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.25. Concrete (RCB Culvert)												
MIL PC <	> Laborers, (Semi-Skilled)					1.00	23.13	0.00	0.00	0.00	23.13	
		51.10	HR	B-LABORER	1.00	51	1,182	0	0	0	1,182	23.13
MIL PC <	> Laborers, (Semi-Skilled)					1.00	22.13	0.00	0.00	0.00	22.13	
		255.50	HR	B-LABORER	1.00	256	5,655	0	0	0	5,655	22.13
MIL PC <	> Cement Finishers					1.00	31.59	0.00	0.00	0.00	31.59	
		51.10	HR	B-CEMTFINR	1.00	51	1,614	0	0	0	1,614	31.59
MIL PC <	> Equip. Operators, Medium					1.00	33.86	0.00	0.00	0.00	33.86	
		51.10	HR	B-EQOPRMED	1.00	51	1,730	0	0	0	1,730	33.86
GEN PC <	> CONC VIBRATOR, 2.5" (63.5MM) DIA					0.00	0.00	3.70	0.00	0.00	3.70	
	(W/ 7.5HP (5.6KW) GENERATOR)	102.20	HR	XMEZ9520	1.00	0	0	378	0	0	378	3.70
GEN PC <	> CONC PUMP,117CY/HR (89 M3/HR)					0.00	0.00	76.36	0.00	0.00	76.36	
	75'(23M)BM (W/ 23,100 GVW TRK)	51.10	HR	C55Z1960	1.00	0	0	3,902	0	0	3,902	76.36
M RSM PC <03326 0150	> Concrete ready mix, regular					0.00	0.00	0.00	60.00	0.00	60.00	
	weight, 3000 psi	511.00	CY	N/A	0.00	0	0	0	30,660	0	30,660	60.00
	TOTAL Concrete (RCB Culvert)	511.00	CY			409	10,181	4,280	30,660	0	45,121	88.30

02.26. Rebar (RCB Culvert)	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.26. Rebar (RCB Culvert)											
MIL PC < > Rodmen, (Reinforcing)					1.00	39.79	0.00	0.00	0.00	39.79	
	275.56	HR	B-RODMAN	1.00	276	10,965	0	0	0	10,965	39.79
M USR PC <03217 0700 > Reinforcing in place, walls, #3 to #7					0.00	0.00	0.00	870.00	0.00	870.00	
	31.00	TON	N/A	0.00	0	0	0	26,970	0	26,970	870.00
Material cost is increased by 50% on 03/30/04. Thus, $580.01 x 1.5 = $870.00											
TOTAL Rebar (RCB Culvert)	31.00	TON			276	10,965	0	26,970	0	37,935	1223.70

02.27. Structural Excavation (Earth =	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.27. Structural Excavation (Earth = 4469 cy & riprap/bedding material = 233 cy)											
(RCB Culvert)											
L MIL PC <02238 3500 > Ripping, rock, dozer, 370 HP,					0.01	0.22	0.50	0.00	0.00	0.72	
dbl shank ripper, clay	4702.00	CY	XXQNB11T	200.00	35	1,056	2,343	0	0	3,399	0.72
L MIL PC <02232 0265 > Excavate & load, wheeled loader,					0.01	0.22	0.40	0.00	0.00	0.63	
5 CY, medium matl	4702.00	CY	CODFB10U	200.00	35	1,056	1,893	0	0	2,949	0.63
MIL PC <02234 0340 > Hauling, hwy haulers, 12 CY, 1					0.03	0.68	1.20	0.00	0.00	1.87	
mi round trip @ 20 MPH (4.2 cyc/hr)	4702.00	CY	COEIB34B	40.00	118	3,178	5,634	0	0	8,812	1.87
TOTAL Structural Excavation (Earth =	4702.00	CY			188	5,290	9,869	0	0	15,159	3.22

02.28. Structural Compaction (RCB Culv)	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.28. Structural Compaction (RCB Culv)											
RSM PC <02216 2000 > Backfill, strl, sand & gravel,					0.01	0.33	0.20	0.00	0.00	0.53	
no cmpct, 75 HP dozer, 50' haul	3283.00	CY	CODTB10L	137.50	36	1,073	657	0	0	1,730	0.53
MIL PC <02220 5900 > Compaction of backfill,					0.01	0.38	0.40	0.00	0.00	0.78	
structural, SP roller, 6" lift	3283.00	CY	COFCB10F	117.50	42	1,255	1,300	0	0	2,555	0.78
M MIL PC <02220 9000 > Compaction, water, truck, 3000					0.01	0.26	0.24	0.20	0.00	0.70	
gal, 3 mile haul	3283.00	CY	COKBB45	236.00	28	847	804	657	0	2,308	0.70
TOTAL Structural Compaction (RCB Culv)	3283.00	CY			106	3,175	2,761	657	0	6,593	2.01

02.29. Interior Drainage Head Walls,	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.29. Interior Drainage Head Walls, RCB Culvert											
M USR PC <02753 0210 > Headwall, precast, 18" dia pipe					0.00	0.00	12.10	5000.00	0.00	5012.10	
	4.00	EA	N/A	0.00	0	0	48	20,000	0	20,048	5012.10
MIL PC < > Laborers, (Semi-Skilled)					1.00	22.13	0.00	0.00	0.00	22.13	
	6.40	HR	B-LABORER	1.00	6	142	0	0	0	142	22.13
MIL PC < > Equip. Operators, Light					1.00	30.80	0.00	0.00	0.00	30.80	
	3.20	HR	B-EQOPRLT	1.00	3	99	0	0	0	99	30.80
GEN PC < > LOADER/BCK-HOE,WH, 0.80CY(0.6M3)					0.00	0.00	15.12	0.00	0.00	15.12	
F/E BKT, 9.8'(3.0M)DEPTH OF HOE	3.20	HR	L50Z4640	1.00	0	0	48	0	0	48	15.12
TOTAL Interior Drainage Head Walls,	4.00	EA			10	240	97	20,000	0	20,337	5084.25

02.30. Interior Drainage Flap Gates,	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.30. Interior Drainage Flap Gates, RCB Culvert											
USR PC <05914 0100 > Hydraulic structures, flap					0.00	0.00	70.86	1821.85	0.00	1892.71	
gates, aluminum, 18" dia	5.00	EA	N/A	0.00	0	0	354	9,109	0	9,464	1892.71
MIL PC < > Structural Steel Workers					1.00	43.93	0.00	0.00	0.00	43.93	
	8.33	HR	B-STRSTEEL	1.00	8	366	0	0	0	366	43.93
MIL PC < > Structural Steel Workers					1.00	42.93	0.00	0.00	0.00	42.93	
	16.67	HR	B-STRSTEEL	1.00	17	715	0	0	0	715	42.93
MIL PC < > Equip. Operators, Crane/Shovel					1.00	35.19	0.00	0.00	0.00	35.19	
	8.33	HR	B-EQOPRCRN	1.00	8	293	0	0	0	293	35.19
GEN PC < > CRANE, HYD, R/T, 20T, 70' BOOM					0.00	0.00	44.29	0.00	0.00	44.29	
(18MT, 21.3M), 4WD, SP, 4X4	8.33	HR	C75Z2160	1.00	0	0	369	0	0	369	44.29
TOTAL Interior Drainage Flap Gates,	5.00	EA			33	1,375	723	9,109	0	11,207	2241.47

02.31. Concrete (Int. Drng, CC, RCB Cul	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.31. Concrete (Int. Drng, CC, RCB Cul											
02.31.001. Placement (CLABC20)											
MIL PC < > Laborers, (Semi-Skilled)					1.00	23.13	0.00	0.00	0.00	23.13	
	284.80	HR	B-LABORER	1.00	285	6,588	0	0	0	6,588	23.13
MIL PC < > Laborers, (Semi-Skilled)					1.00	22.13	0.00	0.00	0.00	22.13	
	1424.00	HR	B-LABORER	1.00	1,424	31,516	0	0	0	31,516	22.13
MIL PC < > Cement Finishers					1.00	31.59	0.00	0.00	0.00	31.59	
	284.80	HR	B-CEMTFINR	1.00	285	8,997	0	0	0	8,997	31.59
MIL PC < > Equip. Operators, Medium					1.00	33.86	0.00	0.00	0.00	33.86	
	284.80	HR	B-EQOPRMED	1.00	285	9,643	0	0	0	9,643	33.86
GEN PC < > CONC VIBRATOR, 2.5" (63.5MM) DIA					0.00	0.00	3.70	0.00	0.00	3.70	
(W/ 7.5HP (5.6KW) GENERATOR)	569.60	HR	XMEZ9520	1.00	0	0	2,108	0	0	2,108	3.70
GEN PC < > CONC PUMP,117CY/HR (89 M3/HR)					0.00	0.00	76.36	0.00	0.00	76.36	
75'(23M)BM (W/ 23,100 GVW TRK)	284.80	HR	C55Z1960	1.00	0	0	21,748	0	0	21,748	76.36
M RSM PC <03326 0150 > Concrete ready mix, regular					0.00	0.00	0.00	60.00	0.00	60.00	
weight, 3000 psi	2848.00	CY	N/A	0.00	0	0	0	170,880	0	170,880	60.00
TOTAL Placement	2848.00	CY			2,278	56,743	23,856	170,880	0	251,479	88.30
TOTAL Concrete (Int. Drng, CC, RCB Cul	2848.00	CY			2,278	56,743	23,856	170,880	0	251,479	88.30

02.32. Interior Drainage Rebar,	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.32. Interior Drainage Rebar, Collector Channel and RCB Culvert											
MIL PC < > Rodmen, (Reinforcing)					1.00	39.79	0.00	0.00	0.00	39.79	
	1520.00	HR	B-RODMAN	1.00	1,520	60,483	0	0	0	60,483	39.79
M USR PC <03217 0700 > Reinforcing in place, walls, #3 to #7					0.00	0.00	0.00	870.00	0.00	870.00	
	171.00	TON	N/A	0.00	0	0	0	148,770	0	148,770	870.00
Material cost is increased by 50% on 03/30/04. Thus, $580.01 x 1.5 = $870.00											
TOTAL Interior Drainage Rebar,	171.00	TON			1,520	60,483	0	148,770	0	209,253	1223.70

02.33. Interior Drainage Excavation,	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.33. Interior Drainage Excavation, Collector Channel and RCB Culvert											
MAP PC < > SCRAPER,TAND, 32-44CY, 52T PS					0.00	0.00	197.82	0.00	0.00	197.82	
	278.47	HR	S20CA005	1.00	0	0	55,087	0	0	55,087	197.82
MAP PC < > DOZER,CWLR, D7R PS,W/BLADE					0.00	0.00	92.76	0.00	0.00	92.76	
(ADD ATTACHMENTS)	69.62	HR	T15CA012	1.00	0	0	6,457	0	0	6,457	92.76
MAP PC < > BLADE, UNIVERSAL, HYDR, D-7					0.00	0.00	7.55	0.00	0.00	7.55	
(ADD D-7 TRACTOR)	69.62	HR	T10CA013	1.00	0	0	526	0	0	526	7.55
USR PC < > Water Truck, w/ operator					0.00	35.00	30.00	0.00	0.00	65.00	
	69.62	HR	N/A	0.00	0	2,437	2,089	0	0	4,525	65.00
EP PC < > TRK,HWY,10,000GVW,4X2, 1T-PICKUP					0.00	0.00	9.76	0.00	0.00	9.76	
	69.62	HR	T50FO005	1.00	0	0	679	0	0	679	9.76
MIL PC < > Outside Equip. Operator, Medium					1.00	33.20	0.00	0.00	0.00	33.20	
	69.62	HR	X-EQOPRMED	1.00	70	2,311	0	0	0	2,311	33.20
MIL PC < > Outside Equip. Operator, Medium					1.00	33.20	0.00	0.00	0.00	33.20	
	348.08	HR	X-EQOPRMED	1.00	348	11,556	0	0	0	11,556	33.20
MIL PC < > Outside Laborer					1.00	21.47	0.00	0.00	0.00	21.47	
	69.62	HR	X-LABORER	1.00	70	1,495	0	0	0	1,495	21.47
TOTAL Interior Drainage Excavation,	20885	CY			487	17,799	64,837	0	0	82,636	3.96

02.34. Interior Drainage Structural	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.34. Interior Drainage Structural											
Compaction, Collector Channel and RCB Culvert											
02.34.001. Load and Haul (COEIB34B)											
MIL PC < > Truck Drivers, Heavy					1.00	27.03	0.00	0.00	0.00	27.03	
	18.62	HR	B-TRKDVRHV	1.00	19	503	0	0	0	503	27.03
GEN PC < > TRUCK, HWY 45,000 (20,412KG)GVW					0.00	0.00	45.79	0.00	0.00	45.79	
6X4, 3 AXLE, (ADD ACCESSORIES)	18.62	HR	T50Z7420	1.00	0	0	852	0	0	852	45.79
GEN PC < > REAR DUMP BODY, 16-23.5CY (12.2-					0.00	0.00	2.14	0.00	0.00	2.14	
18M3) (ADD 40,000-45,000GVW TRK)	18.62	HR	T40Z6860	1.00	0	0	40	0	0	40	2.14
GEN PC < > LOADER, F/E, WHEEL, 3.25CY					0.00	0.00	51.67	0.00	0.00	51.67	
(2.5M3), 4WD	18.62	HR	L40Z4397	1.00	0	0	962	0	0	962	51.67
MAP PC < > BLADE, UNIVERSAL, HYDR, D-8					0.00	0.00	8.92	0.00	0.00	8.92	
(ADD D-8 TRACTOR)	18.62	HR	T10CA017	1.00	0	0	166	0	0	166	8.92
MAP PC < > DOZER,CWLR, D-8R PS,W/BLADE					0.00	0.00	73.32	0.00	0.00	73.32	
(ADD ATTACHMENTS)	18.62	HR	T15CA016	1.00	0	0	1,365	0	0	1,365	73.32
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
(Loader)	18.62	HR	X-EQOPRMED	1.00	19	599	0	0	0	599	32.20
MIL PC < > Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
(Dozer)	18.62	HR	X-EQOPRMED	1.00	19	599	0	0	0	599	32.20
MIL PC < > Outside Laborer					1.00	20.47	0.00	0.00	0.00	20.47	
	55.85	HR	X-LABORER	1.00	56	1,143	0	0	0	1,143	20.47
TOTAL Load and Haul	3723.00	CY			112	2,845	3,385	0	0	6,230	1.67
02.34.002. Place and Compact											
MIL PC <02220 5900 > Compaction of backfill,					0.01	0.38	0.40	0.00	0.00	0.78	
structural, SP roller, 6" lift	3723.00	CY	COFCB10F	117.50	48	1,423	1,474	0	0	2,898	0.78
M MIL PC <02220 9000 > Compaction, water, truck, 3000					0.01	0.26	0.24	0.20	0.00	0.70	
gal, 3 mile haul	3723.00	CY	COKBB45	236.00	32	961	912	745	0	2,617	0.70
TOTAL Place and Compact	3723.00	CY			79	2,384	2,386	745	0	5,515	1.48
TOTAL Interior Drainage Structural	3723.00	CY			191	5,229	5,771	745	0	11,745	3.15

02.35. Excavation, Catch Basin	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.35. Excavation, Catch Basin											
MAP PC < > SCRAPER,TAND, 32-44CY, 52T PS					0.00	0.00	197.82	0.00	0.00	197.82	
	323.41	HR	S20CA005	1.00	0	0	63,978	0	0	63,978	197.82
MAP PC < > DOZER,CWLR, D7R PS,W/BLADE					0.00	0.00	92.76	0.00	0.00	92.76	
(ADD ATTACHMENTS)	80.85	HR	T15CA012	1.00	0	0	7,500	0	0	7,500	92.76
MAP PC < > BLADE, UNIVERSAL, HYDR, D-7					0.00	0.00	7.55	0.00	0.00	7.55	
(ADD D-7 TRACTOR)	80.85	HR	T10CA013	1.00	0	0	611	0	0	611	7.55
USR PC < > Water Truck, w/ operator					0.00	35.00	30.00	0.00	0.00	65.00	
	80.85	HR	N/A	0.00	0	2,830	2,426	0	0	5,255	65.00
EP PC < > TRK,HWY,10,000GVW,4X2, 1T-PICKUP					0.00	0.00	9.76	0.00	0.00	9.76	
	80.85	HR	T50FO005	1.00	0	0	789	0	0	789	9.76
MIL PC < > Outside Equip. Operator, Medium					1.00	33.20	0.00	0.00	0.00	33.20	
	80.85	HR	X-EQOPRMED	1.00	81	2,684	0	0	0	2,684	33.20
MIL PC < > Outside Equip. Operator, Medium					1.00	33.20	0.00	0.00	0.00	33.20	
	404.27	HR	X-EQOPRMED	1.00	404	13,421	0	0	0	13,421	33.20
MIL PC < > Outside Laborer					1.00	21.47	0.00	0.00	0.00	21.47	
	80.85	HR	X-LABORER	1.00	81	1,736	0	0	0	1,736	21.47
TOTAL Excavation, Catch Basin	24256	CY			566	20,671	75,303	0	0	95,974	3.96

02.36. Grading, Catch Basin		QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.36. Grading, Catch Basin Assume the grading volume is 7 acre-feet, per phone discussion with D. Pham on 07/07/05. Then, convert to 11,293 cy.												
MAP PC <	> BLADE, UNIVERSAL, HYDR, D-9					0.00	0.00	12.84	0.00	0.00	12.84	
	(ADD D-9 TRACTOR)	80.66	HR	T10CA022	1.00	0	0	1,036	0	0	1,036	12.84
MAP PC <	> DOZER,CWLR, D-9R PS,W/BLADE					0.00	0.00	99.64	0.00	0.00	99.64	
	(ADD ATTACHMENTS)	80.66	HR	T15CA017	1.00	0	0	8,038	0	0	8,038	99.64
MAP PC <	> TRK,HWY, 8,600GVW,4X2, 3/4T-PKUP					0.00	0.00	8.17	0.00	0.00	8.17	
		80.66	HR	T50FO003	1.00	0	0	659	0	0	659	8.17
MIL PC <	> Outside Laborer (Grade Checker)					1.00	20.47	0.00	0.00	0.00	20.47	
		80.66	HR	X-LABORER	1.00	81	1,651	0	0	0	1,651	20.47
MIL PC <	> Outside Equip. Operator, Medium					1.00	32.20	0.00	0.00	0.00	32.20	
		161.33	HR	X-EQOPRMED	1.00	161	5,195	0	0	0	5,195	32.20
MIL PC <	> Outside Equip. Operator, Medium					1.00	33.20	0.00	0.00	0.00	33.20	
		80.66	HR	X-EQOPRMED	1.00	81	2,678	0	0	0	2,678	33.20
GEN PC <	> GRADER, MOTOR, 135 HP (101KW)					0.00	0.00	35.31	0.00	0.00	35.31	
	12'(3.6M)BLADE WIDTH, SP, ARTIC	80.66	HR	G15Z3080	1.00	0	0	2,848	0	0	2,848	35.31
	TOTAL Grading, Catch Basin	11293	CY			323	9,524	12,581	0	0	22,105	1.96

02.37. Hydroseeding, Catch Basin	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.37. Hydroseeding, Catch Basin 14 acres = 609,840 sf Historic cost is quoted from Norco Bluffs.											
TOTAL Hydroseeding, Catch Basin	609840	SF			0	0	0	0	372,002	372,002	0.61

02.38. Maintenance During Seed Establ-	QUANTY	UOM	CREW ID	OUTPUT	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.38. Maintenance During Seed Establishment (6 months)											
There are approx. 2080 working hours in 12 months.											
EP PC < > TRK,HWY, 4,900GVW,4X2, 1/2T-PKUP					0.00	0.00	7.72	0.00	0.00	7.72	
	520.00	HR	T50FO001	1.00	0	0	4,015	0	0	4,015	7.72
NON PC < > SMALL TOOLS					0.00	0.00	1.57	0.00	0.00	1.57	
	520.00	HR	XMIXX020	1.00	0	0	816	0	0	816	1.57
MIL PC < > Outside Laborer (2)					1.00	20.47	0.00	0.00	0.00	20.47	
	1040.00	HR	X-LABORER	1.00	1,040	21,290	0	0	0	21,290	20.47
MIL PC < > Outside Laborer					1.00	21.47	0.00	0.00	0.00	21.47	
	520.00	HR	X-LABORER	1.00	520	11,165	0	0	0	11,165	21.47
TOTAL Maintenance During Seed Establ-	1040.00	HR			1,560	32,456	4,832	0	0	37,287	35.85
TOTAL Tres Rios (115th Ave to 105th Av	1.00	EA			17,423	530,564	533,700	1265319	894,950	3,224,534	3224534
TOTAL Tres Rios Project	1.00	EA			17,423	530,564	533,700	1265319	894,950	3,224,534	3224534

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	BOND	TOTAL COST	UNIT COST
02 Tres Rios (115th Ave to 105th Av	1.00	EA	3,224,534	257,963	174,125	27,234	3,683,855	3683855
TOTAL Tres Rios Project	1.00	EA	3,224,534	257,963	174,125	27,234	3,683,855	3683855

		QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	BOND	TOTAL COST	UNIT COST
02	Tres Rios (115th Ave to 105th Av								
02.01	Diversion and Control of Water	1.00	EA	50,000	4,000	2,700	422	57,122	57122.29
02.02	Clear Site & Remove Obstruction	44.00	ACR	86,454	6,916	4,669	730	98,769	2244.76
02.03	Removal, Stockpile & Salvage of	1693.00	CY	8,806	704	476	74	10,060	5.94
02.04	2" Rock Mulch Protection	1223.00	CY	62,630	5,010	3,382	529	71,551	58.50
02.05	Grout Protection, Access Ramps,	600.00	CY	51,002	4,080	2,754	431	58,267	97.11
02.06	Stripping & Disposal of 6" Top	8100.00	CY	17,958	1,437	970	152	20,516	2.53
02.07	Compacted Fill Levee (55,800 cy)	68456.00	CY	215,952	17,276	11,661	1,824	246,713	3.60
02.08	15" Stone/Riprap Slope Protectin	24110.00	TON	611,821	48,946	33,038	5,167	698,972	28.99
02.09	15" Stone Protection,	369.00	TON	9,365	749	506	79	10,699	29.00
02.10	12" Gabion Mattress, Scour Apron	6070.00	TON	331,937	26,555	17,925	2,804	379,220	62.47
02.11	4" Bedding Mat'l (Earth)	3204.00	CY	30,542	2,443	1,649	258	34,893	10.89
02.12	Filter Fabric,	27230.00	SY	47,142	3,771	2,546	398	53,857	1.98
02.13	27" Riprap Protection, Dikes	7000.00	TON	206,950	16,556	11,175	1,748	236,430	33.78
02.14	33" Riprap Slope Protection,	850.00	TON	37,030	2,962	2,000	313	42,304	49.77
02.15	3" ABC, O&M Roads	2500.00	TON	39,675	3,174	2,142	335	45,327	18.13
02.16	Excavation, Levee Toe-Down	11891.00	CY	40,328	3,226	2,178	341	46,073	3.87
02.17	Miscellaneous Backfill, Levee	2691.00	CY	5,404	432	292	46	6,174	2.29
02.18	Four-Wire R/W Fence	7500.00	LF	50,623	4,050	2,734	428	57,834	7.71
02.19	14' Wide Double Swing Gate	4.00	EA	1,369	110	74	12	1,564	391.11
02.20	Excavation and Spreading, Levee	3537.00	CY	12,148	972	656	103	13,878	3.92
02.21	Survey Markers Installation,	10.00	EA	541	43	29	5	618	61.83
02.22	As-Built Drawings			10,000	800	540	84	11,424	
02.23	Seal the Existing 18" CMP's	20.00	CY	3,023	242	163	26	3,454	172.68
02.24	Relocation of Existing CIC's and			75,000	6,000	4,050	633	85,683	
02.25	Concrete (RCB Culvert)	511.00	CY	45,121	3,610	2,437	381	51,549	100.88
02.26	Rebar (RCB Culvert)	31.00	TON	37,935	3,035	2,048	320	43,338	1398.01
02.27	Structural Excavation (Earth =	4702.00	CY	15,159	1,213	819	128	17,318	3.68
02.28	Structural Compaction (RCB Culv)	3283.00	CY	6,593	527	356	56	7,532	2.29
02.29	Interior Drainage Head Walls,	4.00	EA	20,337	1,627	1,098	172	23,234	5808.48
02.30	Interior Drainage Flap Gates,	5.00	EA	11,207	897	605	95	12,804	2560.76
02.31	Concrete (Int. Drng, CC, RCB Cul	2848.00	CY	251,479	20,118	13,580	2,124	287,301	100.88
02.32	Interior Drainage Rebar,	171.00	TON	209,253	16,740	11,300	1,767	239,060	1398.01
02.33	Interior Drainage Excavation,	20885.00	CY	82,636	6,611	4,462	698	94,407	4.52
02.34	Interior Drainage Structural	3723.00	CY	11,745	940	634	99	13,418	3.60
02.35	Excavation, Catch Basin	24256.00	CY	95,974	7,678	5,183	811	109,645	4.52
02.36	Grading, Catch Basin	11293.00	CY	22,105	1,768	1,194	187	25,254	2.24
02.37	Hydroseeding, Catch Basin	609840.00	SF	372,002	29,760	20,088	3,142	424,993	0.70
02.38	Maintenance During Seed Establ-	1040.00	HR	37,287	2,983	2,014	315	42,599	40.96
TOTAL	Tres Rios (115th Ave to 105th Av	1.00	EA	3,224,534	257,963	174,125	27,234	3,683,855	3683855
TOTAL	Tres Rios Project	1.00	EA	3,224,534	257,963	174,125	27,234	3,683,855	3683855

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	BOND	TOTAL COST	UNIT COST
02 Tres Rios (115th Ave to 105th Av								
02.01 Diversion and Control of Water	1.00	EA	50,000	4,000	2,700	422	57,122	57122.29
02.02 Clear Site & Remove Obstruction	44.00	ACR	86,454	6,916	4,669	730	98,769	2244.76
02.03 Removal, Stockpile & Salvage of	1693.00	CY	8,806	704	476	74	10,060	5.94
02.04 2" Rock Mulch Protection	1223.00	CY	62,630	5,010	3,382	529	71,551	58.50
02.05 Grout Protection, Access Ramps,	600.00	CY	51,002	4,080	2,754	431	58,267	97.11
02.06 Stripping & Disposal of 6" Top	8100.00	CY	17,958	1,437	970	152	20,516	2.53
02.07 Compacted Fill Levee (55,800 cy)								
02.07.001 Load and Haul	68456.00	CY	114,555	9,164	6,186	968	130,872	1.91
02.07.002 Place and Compact	68456.00	CY	101,397	8,112	5,475	856	115,841	1.69
TOTAL Compacted Fill Levee (55,800 cy)	68456.00	CY	215,952	17,276	11,661	1,824	246,713	3.60
02.08 15" Stone/Riprap Slope Protectin								
02.08.001 Stone Price & Transportation	24110.00	TON	554,530	44,362	29,945	4,683	633,521	26.28
02.08.002 Stone Placement	24110.00	TON	57,291	4,583	3,094	484	65,452	2.71
TOTAL 15" Stone/Riprap Slope Protectin	24110.00	TON	611,821	48,946	33,038	5,167	698,972	28.99
02.09 15" Stone Protection,	369.00	TON	9,365	749	506	79	10,699	29.00
02.10 12" Gabion Mattress, Scour Apron	6070.00	TON	331,937	26,555	17,925	2,804	379,220	62.47
02.11 4" Bedding Mat'l (Earth)								
02.11.003 Placement of 4" Bedding Material	3204.00	CY	30,542	2,443	1,649	258	34,893	10.89
TOTAL 4" Bedding Mat'l (Earth)	3204.00	CY	30,542	2,443	1,649	258	34,893	10.89
02.12 Filter Fabric,	27230.00	SY	47,142	3,771	2,546	398	53,857	1.98
02.13 27" Riprap Protection, Dikes								
02.13.001 Stone Price & Transportation	7000.00	TON	182,000	14,560	9,828	1,537	207,925	29.70
02.13.002 Stone Placement	7000.00	TON	24,950	1,996	1,347	211	28,505	4.07
TOTAL 27" Riprap Protection, Dikes	7000.00	TON	206,950	16,556	11,175	1,748	236,430	33.78
02.14 33" Riprap Slope Protection,								
02.14.001 Stone Price & Transportation	850.00	TON	34,000	2,720	1,836	287	38,843	45.70
02.14.002 Stone Placement	850.00	TON	3,030	242	164	26	3,461	4.07
TOTAL 33" Riprap Slope Protection,	850.00	TON	37,030	2,962	2,000	313	42,304	49.77

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	BOND	TOTAL COST	UNIT COST
02.15 3" ABC, O&M Roads	2500.00	TON	39,675	3,174	2,142	335	45,327	18.13
02.16 Excavation, Levee Toe-Down	11891.00	CY	40,328	3,226	2,178	341	46,073	3.87
02.17 Miscellaneous Backfill, Levee	2691.00	CY	5,404	432	292	46	6,174	2.29
02.18 Four-Wire R/W Fence	7500.00	LF	50,623	4,050	2,734	428	57,834	7.71
02.19 14' Wide Double Swing Gate	4.00	EA	1,369	110	74	12	1,564	391.11
02.20 Excavation and Spreading, Levee								
02.20.001 Excavation	3537.00	CY	10,496	840	567	89	11,991	3.39
02.20.002 Spreading	3537.00	CY	1,652	132	89	14	1,887	0.53
TOTAL Excavation and Spreading, Levee	3537.00	CY	12,148	972	656	103	13,878	3.92
02.21 Survey Markers Installation,	10.00	EA	541	43	29	5	618	61.83
02.22 As-Built Drawings			10,000	800	540	84	11,424	
02.23 Seal the Existing 18" CMP's	20.00	CY	3,023	242	163	26	3,454	172.68
02.24 Relocation of Existing CIC's and								
02.24.010 Removal & Disposal of Exist.	1.00	EA	75,000	6,000	4,050	633	85,683	85683.44
TOTAL Relocation of Existing CIC's and			75,000	6,000	4,050	633	85,683	
02.25 Concrete (RCB Culvert)	511.00	CY	45,121	3,610	2,437	381	51,549	100.88
02.26 Rebar (RCB Culvert)	31.00	TON	37,935	3,035	2,048	320	43,338	1398.01
02.27 Structural Excavation (Earth =	4702.00	CY	15,159	1,213	819	128	17,318	3.68
02.28 Structural Compaction (RCB Culv)	3283.00	CY	6,593	527	356	56	7,532	2.29
02.29 Interior Drainage Head Walls,	4.00	EA	20,337	1,627	1,098	172	23,234	5808.48
02.30 Interior Drainage Flap Gates,	5.00	EA	11,207	897	605	95	12,804	2560.76
02.31 Concrete (Int. Drng, CC, RCB Cul								
02.31.001 Placement	2848.00	CY	251,479	20,118	13,580	2,124	287,301	100.88
TOTAL Concrete (Int. Drng, CC, RCB Cul	2848.00	CY	251,479	20,118	13,580	2,124	287,301	100.88
02.32 Interior Drainage Rebar,	171.00	TON	209,253	16,740	11,300	1,767	239,060	1398.01
02.33 Interior Drainage Excavation,	20885.00	CY	82,636	6,611	4,462	698	94,407	4.52
02.34 Interior Drainage Structural								
02.34.001 Load and Haul	3723.00	CY	6,230	498	336	53	7,118	1.91
02.34.002 Place and Compact	3723.00	CY	5,515	441	298	47	6,300	1.69
TOTAL Interior Drainage Structural	3723.00	CY	11,745	940	634	99	13,418	3.60
02.35 Excavation, Catch Basin	24256.00	CY	95,974	7,678	5,183	811	109,645	4.52
02.36 Grading, Catch Basin	11293.00	CY	22,105	1,768	1,194	187	25,254	2.24
02.37 Hydroseeding, Catch Basin	609840.00	SF	372,002	29,760	20,088	3,142	424,993	0.70
02.38 Maintenance During Seed Establ-	1040.00	HR	37,287	2,983	2,014	315	42,599	40.96

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	BOND	TOTAL COST	UNIT COST
TOTAL Tres Rios (115th Ave to 105th Av	1.00	EA	3,224,534	257,963	174,125	27,234	3,683,855	3683855
TOTAL Tres Rios Project	1.00	EA	3,224,534	257,963	174,125	27,234	3,683,855	3683855

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02 Tres Rios (115th Ave to 105th Av	1.00	EA	17,423	530,564	533,700	1265319	894,950	3,224,534	3224534
TOTAL Tres Rios Project	1.00	EA	17,423	530,564	533,700	1265319	894,950	3,224,534	3224534
OVERHEAD								257,963	
SUBTOTAL								3,482,496	
HOME OFC								174,125	
SUBTOTAL								3,656,621	
BOND								27,234	
TOTAL INCL INDIRECTS								3,683,855	

		QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02	Tres Rios (115th Ave to 105th Av									
02.01	Diversion and Control of Water	1.00	EA	0	0	0	0	50,000	50,000	50000.00
02.02	Clear Site & Remove Obstruction	44.00	ACR	1,993	50,308	36,146	0	0	86,454	1964.87
02.03	Removal, Stockpile & Salvage of	1693.00	CY	152	3,920	4,885	0	0	8,806	5.20
02.04	2" Rock Mulch Protection	1223.00	CY	0	12,426	0	50,204	0	62,630	51.21
02.05	Grout Protection, Access Ramps,	600.00	CY	100	2,334	668	48,000	0	51,002	85.00
02.06	Stripping & Disposal of 6" Top	8100.00	CY	243	7,278	10,680	0	0	17,958	2.22
02.07	Compacted Fill Levee (55,800 cy)	68456.00	CY	3,512	96,148	106,112	13,691	0	215,952	3.15
02.08	15" Stone/Riprap Slope Protectin	24110.00	TON	1,125	32,775	24,516	265,210	289,320	611,821	25.38
02.09	15" Stone Protection,	369.00	TON	0	502	376	4,059	4,428	9,365	25.38
02.10	12" Gabion Mattress, Scour Apron	6070.00	TON	150	3,756	58,362	269,820	0	331,937	54.68
02.11	4" Bedding Mat'l (Earth)	3204.00	CY	296	8,857	5,665	16,020	0	30,542	9.53
02.12	Filter Fabric,	27230.00	SY	532	12,309	795	34,038	0	47,142	1.73
02.13	27" Riprap Protection, Dikes	7000.00	TON	490	14,274	10,677	98,000	84,000	206,950	29.56
02.14	33" Riprap Slope Protection,	850.00	TON	60	1,733	1,296	23,800	10,200	37,030	43.56
02.15	3" ABC, O&M Roads	2500.00	TON	0	23,850	15,825	0	0	39,675	15.87
02.16	Excavation, Levee Toe-Down	11891.00	CY	238	8,686	31,642	0	0	40,328	3.39
02.17	Miscellaneous Backfill, Levee	2691.00	CY	87	2,602	2,263	538	0	5,404	2.01
02.18	Four-Wire R/W Fence	7500.00	LF	375	9,623	9,501	31,500	0	50,623	6.75
02.19	14' Wide Double Swing Gate	4.00	EA	14	133	88	1,149	0	1,369	342.35
02.20	Excavation and Spreading, Levee	3537.00	CY	83	2,856	9,292	0	0	12,148	3.43
02.21	Survey Markers Installation,	10.00	EA	7	341	0	200	0	541	54.12
02.22	As-Built Drawings			0	0	0	0	10,000	10,000	
02.23	Seal the Existing 18" CMP's	20.00	CY	20	1,723	0	1,300	0	3,023	151.15
02.24	Relocation of Existing CIC's and			0	0	0	0	75,000	75,000	
02.25	Concrete (RCB Culvert)	511.00	CY	409	10,181	4,280	30,660	0	45,121	88.30
02.26	Rebar (RCB Culvert)	31.00	TON	276	10,965	0	26,970	0	37,935	1223.70
02.27	Structural Excavation (Earth =	4702.00	CY	188	5,290	9,869	0	0	15,159	3.22
02.28	Structural Compaction (RCB Culv)	3283.00	CY	106	3,175	2,761	657	0	6,593	2.01
02.29	Interior Drainage Head Walls,	4.00	EA	10	240	97	20,000	0	20,337	5084.25
02.30	Interior Drainage Flap Gates,	5.00	EA	33	1,375	723	9,109	0	11,207	2241.47
02.31	Concrete (Int. Drng, CC, RCB Cul	2848.00	CY	2,278	56,743	23,856	170,880	0	251,479	88.30
02.32	Interior Drainage Rebar,	171.00	TON	1,520	60,483	0	148,770	0	209,253	1223.70
02.33	Interior Drainage Excavation,	20885.00	CY	487	17,799	64,837	0	0	82,636	3.96
02.34	Interior Drainage Structural	3723.00	CY	191	5,229	5,771	745	0	11,745	3.15
02.35	Excavation, Catch Basin	24256.00	CY	566	20,671	75,303	0	0	95,974	3.96
02.36	Grading, Catch Basin	11293.00	CY	323	9,524	12,581	0	0	22,105	1.96
02.37	Hydroseeding, Catch Basin	609840.00	SF	0	0	0	0	372,002	372,002	0.61
02.38	Maintenance During Seed Establ-	1040.00	HR	1,560	32,456	4,832	0	0	37,287	35.85
	TOTAL Tres Rios (115th Ave to 105th Av	1.00	EA	17,423	530,564	533,700	1265319	894,950	3,224,534	3224534
	TOTAL Tres Rios Project	1.00	EA	17,423	530,564	533,700	1265319	894,950	3,224,534	3224534
	OVERHEAD								257,963	
	SUBTOTAL								3,482,496	
	HOME OFC								174,125	

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
SUBTOTAL								3,656,621	
BOND								27,234	
TOTAL INCL INDIRECTS								3,683,855	

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02 Tres Rios (115th Ave to 105th Av									
02.01 Diversion and Control of Water	1.00	EA	0	0	0	0	50,000	50,000	50000.00
02.02 Clear Site & Remove Obstruction	44.00	ACR	1,993	50,308	36,146	0	0	86,454	1964.87
02.03 Removal, Stockpile & Salvage of	1693.00	CY	152	3,920	4,885	0	0	8,806	5.20
02.04 2" Rock Mulch Protection	1223.00	CY	0	12,426	0	50,204	0	62,630	51.21
02.05 Grout Protection, Access Ramps,	600.00	CY	100	2,334	668	48,000	0	51,002	85.00
02.06 Stripping & Disposal of 6" Top	8100.00	CY	243	7,278	10,680	0	0	17,958	2.22
02.07 Compacted Fill Levee (55,800 cy)									
02.07.001 Load and Haul	68456.00	CY	2,054	52,316	62,239	0	0	114,555	1.67
02.07.002 Place and Compact	68456.00	CY	1,458	43,832	43,873	13,691	0	101,397	1.48
TOTAL Compacted Fill Levee (55,800 cy)	68456.00	CY	3,512	96,148	106,112	13,691	0	215,952	3.15
02.08 15" Stone/Riprap Slope Protectin									
02.08.001 Stone Price & Transportation	24110.00	TON	0	0	0	265,210	289,320	554,530	23.00
02.08.002 Stone Placement	24110.00	TON	1,125	32,775	24,516	0	0	57,291	2.38
TOTAL 15" Stone/Riprap Slope Protectin	24110.00	TON	1,125	32,775	24,516	265,210	289,320	611,821	25.38
02.09 15" Stone Protection,	369.00	TON	0	502	376	4,059	4,428	9,365	25.38
02.10 12" Gabion Mattress, Scour Apron	6070.00	TON	150	3,756	58,362	269,820	0	331,937	54.68
02.11 4" Bedding Mat'l (Earth)									
02.11.003 Placement of 4" Bedding Material	3204.00	CY	296	8,857	5,665	16,020	0	30,542	9.53
TOTAL 4" Bedding Mat'l (Earth)	3204.00	CY	296	8,857	5,665	16,020	0	30,542	9.53
02.12 Filter Fabric,	27230.00	SY	532	12,309	795	34,038	0	47,142	1.73
02.13 27" Riprap Protection, Dikes									
02.13.001 Stone Price & Transportation	7000.00	TON	0	0	0	98,000	84,000	182,000	26.00
02.13.002 Stone Placement	7000.00	TON	490	14,274	10,677	0	0	24,950	3.56
TOTAL 27" Riprap Protection, Dikes	7000.00	TON	490	14,274	10,677	98,000	84,000	206,950	29.56
02.14 33" Riprap Slope Protection,									
02.14.001 Stone Price & Transportation	850.00	TON	0	0	0	23,800	10,200	34,000	40.00
02.14.002 Stone Placement	850.00	TON	60	1,733	1,296	0	0	3,030	3.56
TOTAL 33" Riprap Slope Protection,	850.00	TON	60	1,733	1,296	23,800	10,200	37,030	43.56

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
02.15 3" ABC, O&M Roads	2500.00	TON	0	23,850	15,825	0	0	39,675	15.87
02.16 Excavation, Levee Toe-Down	11891.00	CY	238	8,686	31,642	0	0	40,328	3.39
02.17 Miscellaneous Backfill, Levee	2691.00	CY	87	2,602	2,263	538	0	5,404	2.01
02.18 Four-Wire R/W Fence	7500.00	LF	375	9,623	9,501	31,500	0	50,623	6.75
02.19 14' Wide Double Swing Gate	4.00	EA	14	133	88	1,149	0	1,369	342.35
02.20 Excavation and Spreading, Levee									
02.20.001 Excavation	3537.00	CY	62	2,261	8,235	0	0	10,496	2.97
02.20.002 Spreading	3537.00	CY	21	595	1,057	0	0	1,652	0.47
TOTAL Excavation and Spreading, Levee	3537.00	CY	83	2,856	9,292	0	0	12,148	3.43
02.21 Survey Markers Installation,	10.00	EA	7	341	0	200	0	541	54.12
02.22 As-Built Drawings			0	0	0	0	10,000	10,000	
02.23 Seal the Existing 18" CMP's	20.00	CY	20	1,723	0	1,300	0	3,023	151.15
02.24 Relocation of Existing CIC's and									
02.24.010 Removal & Disposal of Exist.	1.00	EA	0	0	0	0	75,000	75,000	75000.00
TOTAL Relocation of Existing CIC's and			0	0	0	0	75,000	75,000	
02.25 Concrete (RCB Culvert)	511.00	CY	409	10,181	4,280	30,660	0	45,121	88.30
02.26 Rebar (RCB Culvert)	31.00	TON	276	10,965	0	26,970	0	37,935	1223.70
02.27 Structural Excavation (Earth =	4702.00	CY	188	5,290	9,869	0	0	15,159	3.22
02.28 Structural Compaction (RCB Culv)	3283.00	CY	106	3,175	2,761	657	0	6,593	2.01
02.29 Interior Drainage Head Walls,	4.00	EA	10	240	97	20,000	0	20,337	5084.25
02.30 Interior Drainage Flap Gates,	5.00	EA	33	1,375	723	9,109	0	11,207	2241.47
02.31 Concrete (Int. Drng, CC, RCB Cul									
02.31.001 Placement	2848.00	CY	2,278	56,743	23,856	170,880	0	251,479	88.30
TOTAL Concrete (Int. Drng, CC, RCB Cul	2848.00	CY	2,278	56,743	23,856	170,880	0	251,479	88.30
02.32 Interior Drainage Rebar,	171.00	TON	1,520	60,483	0	148,770	0	209,253	1223.70
02.33 Interior Drainage Excavation,	20885.00	CY	487	17,799	64,837	0	0	82,636	3.96
02.34 Interior Drainage Structural									
02.34.001 Load and Haul	3723.00	CY	112	2,845	3,385	0	0	6,230	1.67
02.34.002 Place and Compact	3723.00	CY	79	2,384	2,386	745	0	5,515	1.48
TOTAL Interior Drainage Structural	3723.00	CY	191	5,229	5,771	745	0	11,745	3.15
02.35 Excavation, Catch Basin	24256.00	CY	566	20,671	75,303	0	0	95,974	3.96
02.36 Grading, Catch Basin	11293.00	CY	323	9,524	12,581	0	0	22,105	1.96
02.37 Hydroseeding, Catch Basin	609840.00	SF	0	0	0	0	372,002	372,002	0.61
02.38 Maintenance During Seed Establ-	1040.00	HR	1,560	32,456	4,832	0	0	37,287	35.85

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
TOTAL Tres Rios (115th Ave to 105th Av	1.00	EA	17,423	530,564	533,700	1265319	894,950	3,224,534	3224534
TOTAL Tres Rios Project	1.00	EA	17,423	530,564	533,700	1265319	894,950	3,224,534	3224534
OVERHEAD								257,963	
SUBTOTAL								3,482,496	
HOME OFC								174,125	
SUBTOTAL								3,656,621	
BOND								27,234	
TOTAL INCL INDIRECTS								3,683,855	

** LABOR COST TO PRIME SUMMARY **

SRC	LABOR ID	DESCRIPTION	TYPE	HOURS	*** DATABASE *** RATE	TOTAL	*** TO PRIME *** RATE	TOTAL
MIL	B-CEMTFINR	Cement Finisher	Laborer	335.90	31.59	10611.08	31.59	10611.08
MIL	B-EQOPRCRN	Equip. Operator, Crane/Shovel	Laborer	29.78	35.19	1048.02	35.19	1048.02
MIL	B-EQOPRLT	Equip. Operator, Light	Laborer	354.55	30.80	10921.45	30.80	10921.45
MIL	B-EQOPRMED	Equip. Operator, Medium	Laborer	2007.01	33.86	67952.18	33.86	67952.18
MIL	B-EQOPROIL	Equip. Operator, Oiler	Laborer	21.45	28.24	605.69	28.24	605.69
MIL	B-LABORER	Laborer (Semi-Skilled)	Foreman	1132.16	23.13	26189.16	23.13	26189.16
			Laborer	3546.30	22.13	78486.75	22.13	78486.75
MIL	B-RODMAN	Rodman (Reinforcing)	Laborer	1795.56	39.79	71447.49	39.79	71447.49
MIL	B-STRSTEEL	Structural Steel Worker	Foreman	8.33	43.93	366.06	43.93	366.06
			Laborer	16.67	42.93	715.46	42.93	715.46
MIL	B-TRKDVRHV	Truck Driver, Heavy	Laborer	1074.75	27.03	29052.36	27.03	29052.36
MIL	B-TRKDVRLT	Truck Driver, Light	Laborer	93.75	26.57	2491.17	26.57	2491.17
MIL	X-EQOPRLT	Outside Equip. Operator, Light	Laborer	20.00	30.80	616.07	30.80	616.07
MIL	X-EQOPRMED	Outside Equip. Operator, Medium	Foreman	1240.39	33.20	41179.67	33.20	41179.67
			Laborer	1651.61	32.20	53180.31	32.20	53180.31
MIL	X-EQOPROIL	Outside Equip. Oiler	Laborer	239.23	26.58	6358.56	26.58	6358.56
MIL	X-LABORER	Outside Laborer	Foreman	810.22	21.47	17396.65	21.47	17396.65
			Laborer	2766.20	20.47	56628.60	20.47	56628.60
MIL	X-PLUMBER	Outside Plumber	Laborer	40.00	43.07	1722.97	43.07	1722.97
MIL	X-RODMAN	Outside Rodman	Laborer	239.23	39.79	9519.40	39.79	9519.40
MIL	X-TRKDVRHV	Outside Truck Driver, Heavy	Foreman	16.93	31.60	534.96	31.60	534.96
			Total	17440.01				487024.06

SRC	ITEM ID	DESCRIPTION	NO.	UOM	RATE	**** LABOR **** HOURS	COST	**** EQUIP **** HOURS	COST	TOTAL COST
	CODFB10S	1 eqoprmed + 1 loader, F/E, wheel, 4WD, 1.50 CY			PROD =	100%		CREW HOURS =		197
MIL	B-EQOPRMEDL	Equip. Operators, Medium	1.00	HR	33.86	1.00	33.86			33.86
MIL	B-LABORER L	Laborers, (Semi-Skilled)	0.50	HR	22.13	0.50	11.07			11.07
GEN	L40Z4390 E	LOADER, F/E, WHEEL, 1.75CY	1.00	HR	28.73			1.00	28.73	28.73
	TOTAL					1.50	44.92	1.00	28.73	73.65
	CODFB10U	1 eqoprmed + 1 loader, F/E, wheel, 4WD, 5.50 CY			PROD =	100%		CREW HOURS =		24
MIL	B-EQOPRMEDL	Equip. Operators, Medium	1.00	HR	33.86	1.00	33.86			33.86
MIL	B-LABORER L	Laborers, (Semi-Skilled)	0.50	HR	22.13	0.50	11.07			11.07
GEN	L40Z4420 E	LOADER, F/E, WHEEL, 5.50CY	1.00	HR	80.49			1.00	80.49	80.49
	TOTAL					1.50	44.92	1.00	80.49	125.41
	CODFB7	2 eqoprmed + 1 laoder, F/E, crawler, 2.60 CY			PROD =	100%		CREW HOURS =		147
MIL	B-LABORER F	Laborers, (Semi-Skilled)	1.00	HR	23.13	1.00	23.13			23.13
MIL	B-LABORER L	Laborers, (Semi-Skilled)	4.00	HR	22.13	4.00	88.53			88.53
MIL	B-EQOPRMEDL	Equip. Operators, Medium	1.00	HR	33.86	1.00	33.86			33.86
GEN	B20Z0890 E	BRUSH CHIPPER, 12"(305MM)DIA LO	1.00	HR	26.18			1.00	26.18	26.18
GEN	L35Z4260 E	LOADER, F/E, CRWLR, 2.60CY	1.00	HR	80.76			1.00	80.76	80.76
GEN	C05Z1210 E	CHAINSAW, 24" - 42" LONG BAR	2.00	HR	1.80			2.00	3.60	3.60
	TOTAL					6.00	145.52	4.00	110.55	256.07
	CODTB10L	1 eqoprmed + 1 dozer, crawler, 76-100 HP			PROD =	100%		CREW HOURS =		43
MIL	B-EQOPRMEDL	Equip. Operators, Medium	1.00	HR	33.86	1.00	33.86			33.86
MIL	B-LABORER L	Laborers, (Semi-Skilled)	0.50	HR	22.13	0.50	11.07			11.07
GEN	T15Z6440 E	DOZER, CRAWLER, 76-100HP	1.00	HR	27.53			1.00	27.53	27.53
	TOTAL					1.50	44.92	1.00	27.53	72.45
	COEIB17	1 trkdvrhv + 1 truck, dump, 12 CY			PROD =	100%		CREW HOURS =		258
MIL	B-LABORER L	Laborers, (Semi-Skilled)	2.00	HR	22.13	2.00	44.26			44.26
MIL	B-EQOPRLT L	Equip. Operators, Light	1.00	HR	30.80	1.00	30.80			30.80
MIL	B-TRKDVRHVL	Truck Drivers, Heavy	1.00	HR	27.03	1.00	27.03			27.03
GEN	L50Z4640 E	LOADER/BCK-HOE,WH, 0.80CY(0.6M3	1.00	HR	15.12			1.00	15.12	15.12
GEN	T50Z7420 E	TRUCK, HWY 45,000 (20,412KG)GVW	1.00	HR	45.79			1.00	45.79	45.79
GEN	T40Z7090 E	REAR DUMP BODY, 12CY (9.2M3)	1.00	HR	1.64			1.00	1.64	1.64
	TOTAL					4.00	102.10	3.00	62.55	164.64
	COEIB34B	1 trkdvrhv + 1 truck, dump, 16-23.5 CY			PROD =	100%		CREW HOURS =		118
MIL	B-TRKDVRHVL	Truck Drivers, Heavy	1.00	HR	27.03	1.00	27.03			27.03
GEN	T50Z7420 E	TRUCK, HWY 45,000 (20,412KG)GVW	1.00	HR	45.79			1.00	45.79	45.79
GEN	T40Z6860 E	REAR DUMP BODY, 16-23.5CY (12.2	1.00	HR	2.14			1.00	2.14	2.14
	TOTAL					1.00	27.03	2.00	47.93	74.96

SRC	ITEM ID	DESCRIPTION	NO.	UOM	RATE	LABOR HOURS	LABOR COST	EQUIP HOURS	EQUIP COST	TOTAL COST
	COFCB10F	1 eqoprmed + 1 roller, vib, tandem, S/P, 12 ton			PROD =	100%			CREW HOURS =	665
MIL	B-EQOPRMEDL	Equip. Operators, Medium	1.00	HR	33.86	1.00	33.86			33.86
MIL	B-LABORER L	Laborers, (Semi-Skilled)	0.50	HR	22.13	0.50	11.07			11.07
GEN	R45Z5690 E	ROLLER, VIB, DD, SP 12.0T	1.00	HR	46.53			1.00	46.53	46.53
	TOTAL					1.50	44.92	1.00	46.53	91.46
	COFCB32E	1 eqoprmed + 1 dozer, crawler, 181-250 HP, PS			PROD =	100%			CREW HOURS =	8
MIL	B-LABORER F	Laborers, (Semi-Skilled)	0.30	HR	23.13	0.30	6.94			6.94
MIL	B-LABORER L	Laborers, (Semi-Skilled)	0.50	HR	22.13	0.50	11.07			11.07
MIL	B-EQOPRMEDL	Equip. Operators, Medium	1.00	HR	33.86	1.00	33.86			33.86
MIL	B-TRKDVRHVL	Truck Drivers, Heavy	1.00	HR	27.03	1.00	27.03			27.03
GEN	R40Z5670 E	ROLLER, VIB, SD, TOWED 25.5T	1.00	HR	24.12			1.00	24.12	24.12
GEN	T15Z6520 E	DOZER, CRAWLER, 181-250HP	1.00	HR	65.93			1.00	65.93	65.93
GEN	T40Z7055 E	WATER TANK, 3,000 GAL (11,356L)	1.00	HR	4.20			1.00	4.20	4.20
GEN	T50Z7420 E	TRUCK, HWY 45,000 (20,412KG)GVW	1.00	HR	45.79			1.00	45.79	45.79
	TOTAL					2.80	78.89	4.00	140.03	218.93
	COKBB45	1 eqoprmed + 1 asphalt distributor, 3,000 gal			PROD =	100%			CREW HOURS =	331
MIL	B-EQOPRMEDL	Equip. Operators, Medium	1.00	HR	33.86	1.00	33.86			33.86
MIL	B-TRKDVRHVL	Truck Drivers, Heavy	1.00	HR	27.03	1.00	27.03			27.03
GEN	A25Z0580 E	ASPHALT DISTR, 3,000GAL (11355L	1.00	HR	16.10			1.00	16.10	16.10
GEN	T50Z7580 E	TRUCK, HWY 45,000 (20,412KG)GVW	1.00	HR	41.71			1.00	41.71	41.71
	TOTAL					2.00	60.89	2.00	57.81	118.70
	COMCB88	6 eqoprmeds + 1 log chipper, 22" capacity			PROD =	100%			CREW HOURS =	12
MIL	B-LABORER L	Laborers, (Semi-Skilled)	1.00	HR	22.13	1.00	22.13			22.13
MIL	B-EQOPRMEDL	Equip. Operators, Medium	6.00	HR	33.86	6.00	203.15			203.15
GEN	L60Z4800 E	TREE, FELLER/BUNCHER, 20"(508MM	2.00	HR	49.23			2.00	98.45	98.45
GEN	B20Z1000 E	BRUSH CHIPPER, 22"(559MM)DIA LO	1.00	HR	122.19			1.00	122.19	122.19
GEN	L60Z4760 E	TREE /LOG SKIDDER /TRACTOR, 4WD	2.00	HR	36.47			2.00	72.93	72.93
GEN	T15Z6440 E	DOZER, CRAWLER, 76-100HP	1.00	HR	27.53			1.00	27.53	27.53
GEN	C05Z1210 E	CHAINSAW, 24" - 42" LONG BAR	1.00	HR	1.80			1.00	1.80	1.80
	TOTAL					7.00	225.28	7.00	322.91	548.19
	XXQNB11T	1 eqoprmed + 1 dozer, crawler, 341-440 HP			PROD =	100%			CREW HOURS =	24
MIL	B-EQOPRMEDL	Equip. Operators, Medium	1.00	HR	33.86	1.00	33.86			33.86
MIL	B-LABORER L	Laborers, (Semi-Skilled)	0.50	HR	22.13	0.50	11.07			11.07
GEN	T15Z6600 E	DOZER, CRAWLER, 341-440HP	1.00	HR	99.64			1.00	99.64	99.64
	TOTAL					1.50	44.92	1.00	99.64	144.57

SRC	LABOR ID	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	RATE	UOM	UPDATE	**** TOTAL **** DEFAULT	HOURS
MIL	B-CEMTFINR	Cement Finisher	20.00	0.0%	27.9%	6.01	0.00	31.59	HR	02/06/04	28.47	336
MIL	B-EQOPRCRN	Equip. Operator, Crane/Shovel	22.22	0.0%	29.2%	6.48	0.00	35.19	HR	05/19/05	32.62	30
MIL	B-EQOPRLT	Equip. Operator, Light	19.91	0.0%	29.2%	5.08	0.00	30.80	HR	02/06/04	28.51	355
MIL	B-EQOPRMED	Equip. Operator, Medium	21.19	0.0%	29.2%	6.48	0.00	33.86	HR	05/19/05	30.27	2007
MIL	B-EQOPROIL	Equip. Operator, Oiler	16.84	0.0%	29.2%	6.48	0.00	28.24	HR	05/19/05	24.69	21
MIL	B-LABORER	Laborer (Semi-Skilled)	13.07	0.0%	37.2%	4.20	0.00	22.13	HR	05/19/05	23.81	4678
MIL	B-RODMAN	Rodman (Reinforcing)	20.91	0.0%	40.8%	10.35	0.00	39.79	HR	02/06/04	36.56	1796
MIL	B-STRSTEEL	Structural Steel Worker	20.91	0.0%	55.8%	10.35	0.00	42.93	HR	02/06/04	39.57	25
MIL	B-TRKDVRHV	Truck Driver, Heavy	16.33	0.0%	35.1%	4.97	0.00	27.03	HR	05/19/05	24.66	1075
MIL	B-TRKDVRLT	Truck Driver, Light	15.99	0.0%	35.1%	4.97	0.00	26.57	HR	05/19/05	23.25	94
MIL	X-EQOPRLT	Outside Equip. Operator, Light	19.91	0.0%	29.2%	5.08	0.00	30.80	HR	02/06/04	28.22	20
MIL	X-EQOPRMED	Outside Equip. Operator, Medium	20.99	0.0%	29.2%	5.08	0.00	32.20	HR	02/06/04	30.68	2892
MIL	X-EQOPROIL	Outside Equip. Oiler	16.64	0.0%	29.2%	5.08	0.00	26.58	HR	02/06/04	24.82	239
MIL	X-LABORER	Outside Laborer	12.37	0.0%	37.2%	3.50	0.00	20.47	HR	02/06/04	24.50	3566
MIL	X-PLUMBER	Outside Plumber	27.35	0.0%	25.5%	8.75	0.00	43.07	HR	02/06/04	34.03	20
MIL	X-RODMAN	Outside Rodman	20.91	0.0%	40.8%	10.35	0.00	39.79	HR	02/06/04	35.88	239
MIL	X-TRKDVRHV	Outside Truck Driver, Heavy	18.97	0.0%	35.1%	4.97	0.00	30.60	HR	05/19/05	24.81	17

SRC	ID.NO.	EQUIPMENT DESCRIPTION	DEPR	FCCM	FUEL	FOG	TR WR	TR REP	EQ REP	TOTAL RATE		** TOTAL ** HOURS
EP	A15SR005	AIR COMPR, 250 CFM, 100 PSI	1.57	0.45	4.93	1.73			1.85	10.53	HR	17
GEN	A25Z0580	ASPHALT DISTR, 3,000GAL (11355L)	5.59	1.19		1.80			7.52	16.10	HR	331
GEN	B20Z0890	BRUSH CHIPPER, 12"(305MM)DIA LOG	2.06	0.45	14.83	5.90	0.06	0.01	2.88	26.18	HR	147
GEN	B20Z1000	BRUSH CHIPPER, 22"(559MM)DIA LOG	29.93	6.43	31.28	12.48	0.30	0.05	41.73	122.19	HR	12
GEN	C05Z1210	CHAINSAW, 24" - 42" LONG BAR	0.13	0.01	0.87	0.34			0.45	1.80	HR	305
EP	C55MO004	CONC PUMP, 65CY/HR, TRAILER MTD	6.98	1.36	6.26	2.20	0.03	0.00	10.17	26.99	HR	20
GEN	C55Z1960	CONC PUMP,117CY/HR (89 M3/HR)	21.54	4.25	13.76	4.83	0.48	0.08	31.42	76.36	HR	336
GEN	C75Z2160	CRANE, HYD, R/T, 20T, 70' BOOM	13.56	4.48	6.47	2.42	1.17	0.20	15.98	44.29	HR	8
GEN	C80Z2280	CRANE, HYD, TRUCK MTD, 65T	28.95	10.65	18.25	5.98	0.92	0.16	29.77	94.68	HR	21
GEN	G15Z3080	GRADER, MOTOR, 135 HP (101KW)	9.86	3.91	6.61	2.79	0.47	0.08	11.59	35.31	HR	81
MAP	H25CA027	HYD EXCAV, CRWLR, 77,220 LBS,	21.63	6.64	11.58	5.42			26.98	72.24	HR	239
EP	H30CA005	HYD EXCAV,TRK MTD,1.00CY BKT,4X4	18.23	3.96	6.27	2.79	0.57	0.10	14.26	46.17	HR	17
GEN	L35Z4260	LOADER, F/E, CRWLR, 2.60CY	20.44	4.36	9.10	4.26			42.60	80.76	HR	147
MAP	L40CA005	LDR,FE, WH, 3.25 CY, ARTIC, 950F	14.21	4.27	8.86	4.67	2.72	0.48	16.47	51.67	HR	17
MAP	L40CA006	LDR,FE, WH, 4.50 CY, ARTIC, 966F	19.85	5.96	11.47	6.04	3.76	0.66	23.01	70.75	HR	239
GEN	L40Z4390	LOADER, F/E, WHEEL, 1.75CY	7.89	2.33	5.47	2.88	0.90	0.16	9.10	28.73	HR	197
GEN	L40Z4397	LOADER, F/E, WHEEL, 3.25CY	14.21	4.27	8.86	4.67	2.72	0.48	16.47	51.67	HR	361
GEN	L40Z4420	LOADER, F/E, WHEEL, 5.50CY	22.86	7.17	15.64	5.86	4.88	0.86	23.24	80.49	HR	24
GEN	L50Z4640	LOADER/BCK-HOE,WH, 0.80CY(0.6M3)	3.76	1.14	3.13	1.24	0.72	0.13	5.00	15.12	HR	261
GEN	L60Z4760	TREE /LOG SKIDDER /TRACTOR, 4WD	11.10	2.26	6.31	2.21	1.47	0.26	12.86	36.47	HR	24
GEN	L60Z4800	TREE, FELLER/BUNCHER, 20"(508MM)	14.65	3.00	8.86	3.11	2.21	0.39	17.00	49.23	HR	24
GEN	R40Z5670	ROLLER, VIB, SD, TOWED 25.5T	7.82	1.67	3.63	1.45			9.55	24.12	HR	8
GEN	R45Z5690	ROLLER, VIB, DD, SP 12.0T	12.58	2.68	7.27	2.89			21.12	46.53	HR	665
MAP	S20CA005	SCRAPER,TAND, 32-44CY, 52T PS	50.18	19.95	48.03	15.74	13.23	2.32	48.38	197.82	HR	773
MAP	T10CA013	BLADE, UNIVERSAL, HYDR, D-7	2.99	0.78		0.08			3.70	7.55	HR	193
MAP	T10CA017	BLADE, UNIVERSAL, HYDR, D-8	3.52	0.92		0.13			4.35	8.92	HR	361
MAP	T10CA022	BLADE, UNIVERSAL, HYDR, D-9	5.07	1.32		0.19			6.26	12.84	HR	98
MAP	T15CA012	DOZER,CWLR, D7R PS,W/BLADE	22.64	6.48	13.08	5.82			44.74	92.76	HR	193
MAP	T15CA016	DOZER,CWLR, D-8R PS,W/BLADE	16.67	7.47	17.35	6.09			25.74	73.32	HR	361
MAP	T15CA017	DOZER,CWLR, D-9R PS,W/BLADE	22.90	10.26	23.04	8.09			35.36	99.64	HR	98
GEN	T15Z6440	DOZER, CRAWLER, 76-100HP	6.42	1.84	4.55	2.02			12.69	27.53	HR	55
GEN	T15Z6520	DOZER, CRAWLER, 181-250HP	15.87	7.11	13.65	4.79			24.50	65.93	HR	170
GEN	T15Z6600	DOZER, CRAWLER, 341-440HP	22.90	10.26	23.04	8.09			35.36	99.64	HR	24
GEN	T40Z6860	REAR DUMP BODY, 16-23.5CY (12.2-	0.93	0.20					1.01	2.14	HR	478
GEN	T40Z7000	TRK FLATBED, 8'X 20'(2.4MX 6.1M)	0.49	0.10					0.45	1.04	HR	96
GEN	T40Z7055	WATER TANK, 3,000 GAL (11,356L)	1.96	0.42					1.82	4.20	HR	8
GEN	T40Z7090	REAR DUMP BODY, 12CY (9.2M3)	0.71	0.15					0.77	1.64	HR	258
EP	T50FO001	TRK,HWY, 4,900GVW,4X2, 1/2T-PKUP	1.56	0.33	2.97	1.04	0.14	0.03	1.66	7.72	HR	520
MAP	T50FO003	TRK,HWY, 8,600GVW,4X2, 3/4T-PKUP	1.67	0.37	2.97	1.04	0.29	0.05	1.79	8.17	HR	81
MAP	T50FO004	TRK,HWY, 8,800GVW,4X4, 3/4T-PKUP	1.94	0.42	3.47	1.22	0.34	0.06	2.08	9.53	HR	239
EP	T50FO005	TRK,HWY,10,000GVW,4X2, 1T-PICKUP	1.97	0.44	3.47	1.22	0.46	0.08	2.12	9.76	HR	193
EP	T50GM006	TRK,HWY, 8,600GVW,4X2, 3/4T-PKUP	1.83	0.40	4.18	1.47	0.32	0.06	1.96	10.23	HR	71
GEN	T50Z7400	TRUCK, HWY 25,000 (11,340KG)GVW	3.48	0.87	6.88	2.25	0.70	0.12	3.47	17.77	HR	96
GEN	T50Z7420	TRUCK, HWY 45,000 (20,412KG)GVW	10.97	2.40	15.62	5.48	0.97	0.17	10.16	45.79	HR	744
GEN	T50Z7580	TRUCK, HWY 45,000 (20,412KG)GVW	10.88	2.42	12.30	4.32	1.43	0.25	10.10	41.71	HR	331
EP	T55CA001	TRK,OFF-HWY,R-DUMP, 22-30CY, 35T	15.57	9.03	14.93	6.29	6.87	1.21	13.82	67.72	HR	17
GEN	XMEZ9300	DRILL, AUGER, FENCE POST, TOWED	0.53	0.13	0.67	0.25		0.12	0.02	1.72	HR	94
GEN	XMEZ9520	CONC VIBRATOR, 2.5" (63.5MM) DIA	1.04	0.16	0.69	0.48			1.33	3.70	HR	672
NON	XMIXX010	MISC. POWER TOOLS	2.17	0.76	0.60	0.27			2.60	6.40	HR	20
NON	XMIXX020	SMALL TOOLS	0.50	0.22	0.16	0.07			0.63	1.57	HR	564

No errors detected...

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SUMMARY REPORTS SUMMARY PAGE

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Phase 1B

U.S. Army Corps of Engineers
Project : TresRiosPh1B
Environmental Restoration, Flood Control, North Levee

TresRiosPh1B
Fair and Reasonable Government Estimate

Estimated by	LA District Cost/Structural Engineering Section
Designed by	LA District, Design Section A
Prepared by	Phillip Eng Cost/Structural Engineering Section
Preparation Date	8/15/2007
Effective Date of Pricing	8/15/2007
Estimated Construction Time	360 Days

Designed by
LA District, Design Section A
Estimated by
LA District Cost/Structural Engineering Section
Prepared by
Phillip Eng Cost/Structural Engineering Section

Design Document	Plan and Specs
Document Date	8/15/2007
District	Los Angeles District
Contact	(213) 452-3744
Budget Year	2007
UOM System	Original

Direct Costs
LaborCost
EQCost
MatlCost
SubBidCost
ShipCost
UserCost1

Timeline/Currency

Preparation Date	8/15/2007
Escalation Date	8/15/2007
Eff. Pricing Date	8/15/2007
Estimated Duration	360 Day(s)
Currency	US dollars
Exchange Rate	1.000000

Costbook CB06EB: MII English Cost Book 2006

Labor LB07AZ: Labor_Maricopa,Pima,Pinal,Yuma_ AZ 2007
Note: Taxable fringe: vacation. Non-taxable fringe: health, welfare, training, 401K, pension and travel.

Labor Rates
LaborCost1
LaborCost2
LaborCost3
LaborCost4

Equipment EP05R07: MII Equipment Region 7 2005

07 WEST

Sales Tax	8.25
Working Hours per Year	1,630
Labor Adjustment Factor	1.16
Cost of Money	5.25
Cost of Money Discount	25.00
Tire Recap Cost Factor	1.50
Tire Recap Wear Factor	1.80
Tire Repair Factor	0.15
Equipment Cost Factor	1.00
Standby Depreciation Factor	0.50

Fuel

Electricity	0.087
Gas	3.000
Diesel Off-Road	3.150
Diesel On-Road	3.250

Shipping Rates

Over 0 CWT	2.71
Over 240 CWT	2.81
Over 300 CWT	3.48
Over 400 CWT	6.17
Over 500 CWT	6.73
Over 700 CWT	5.05
Over 800 CWT	4.49

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Date	Author	Note
11/13/2006	Phillip Eng	IFB No. W912PL-07-B-0003 Tres Rios Ecosystem Restoration, Flood Control North Levee, Ph. 1B (El Mirage Road to 115th Avenue) Phoenix, Maricopa County, Arizona. Labor rates are updated with Davis-Bacon Wage Rates associated with Maricopa County of Arizona. See website http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=Davis-Bacon&docid=AZ20030012 for reference. The AZ Transaction Privilege Tax (TPT) for Maricopa County in the Construction Category is 6.3% (State and County rates combined) , effective Dec. 1, 2006. Business Class Code: 15. Ref: http://www.azdor.gov/TpT/tptrates/Dec1.pdf [Arizona Department of Revenue]. Computation: [6.3% - 0.056% (Credit Rate for State Tax)] * 65% (35% standard deduction) = 4.06% 8 (a) Competitive

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Direct Cost Markups			**Category**		**Method**		
Productivity			Productivity		Productivity		
Overtime			Overtime		Overtime		
	Days/Week		*Hours/Shift*	*Shifts/Day*	*1st Shift*	*2nd Shift*	*3rd Shift*
Standard	*5.00*		*8.00*	*1.00*	*8.00*	*0.00*	*0.00*
Actual	*5.00*		*8.00*	*1.00*	*8.00*	*0.00*	*0.00*

Day	*OT Factor*	*Working*	*OT Percent*	*FCCM Percent*
Monday	*1.50*	*Yes*	*0.00*	*0.00*
Tuesday	*1.50*	*Yes*		
Wednesday	*1.50*	*Yes*		
Thursday	*1.50*	*Yes*		
Friday	*1.50*	*Yes*		
Saturday	*1.50*	*No*		
Sunday	*2.00*	*No*		

Sales Tax	TaxAdj	Running % on Selected Costs
MatlCost		

Contractor Markups	**Category**	**Method**
JOOH (Small Tools)	Allowance	% of Labor
JOOH	JOOH	JOOH (Calculated)
HOOH	HOOH	Running %
Profit	Profit	Running %
Bond	Bond	Bond Table

Class B, Tiered, 24 months, 1.00% Surcharge

Contract Price	*Bond Rate*
500,000	*15.84*
2,000,000	*9.57*
2,500,000	*7.59*
2,500,000	*6.93*
7,500,000	*6.34*

Excise Tax	Excise	Running %

Owner Markups		**Category**		**Method**	
Escalation		Escalation		Escalation	
	StartDate	*StartIndex*	*EndDate*	*EndIndex*	*Escalation*
	8/21/2007	*0.00*	*8/21/2007*	*0.00*	*0.00*

Contingency	Contingency	Running %
SIOH	SIOH	Running %

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
Project Summary Report			**3,338,159.09**	**3,752,393.08**	**3,752,393.08**	**4,860,466.75**	**4,860,466.75**
			3,338,159.09	*3,752,393.08*	*3,752,393.08*	*4,860,466.75*	*4,860,466.75*
Bid Schedule	**1**	**EA**	**3,338,159.09**	**3,752,393.08**	**3,752,393.08**	**4,860,466.75**	**4,860,466.75**
			42,392.96	*48,901.59*	*48,901.59*	*63,342.12*	*63,342.12*
01 Diversion and Control of Water	**1**	**EA**	**42,392.96**	**48,901.59**	**48,901.59**	**63,342.12**	**63,342.12**
(Note: Assume that dewatering will be required for one month. Account for 1 pump tender and 1 laborer to locate or relocate the pump within the pumping zone) EQOPRLT (Foreman), LABORER, P60Z5405, Productivity = 0.014 mon/hr)							
			200.00	*200.00*	*200.00*	*259.06*	*259.06*
01 K-rails	**100**	**EA**	**20,000.00**	**20,000.00**	**20,000.00**	**25,905.96**	**25,905.96**
(Note: (32" (h) x 20' (L)) Assume 2000 lf for both sides of the drainage ditch. Therefore, we need a total of 100 K-rails.)							
			10.00	*10.00*	*10.00*	*12.95*	*12.95*
USR 01 Precast Concrete Barricades	2,000	LF	20,000.00	20,000.00	20,000.00	25,905.96	25,905.96
			22,392.96	*28,901.59*	*28,901.59*	*37,436.17*	*37,436.17*
02 Pump Water	**1**	**EA**	**22,392.96**	**28,901.59**	**28,901.59**	**37,436.17**	**37,436.17**
(Note: Assume the pump will work 75% of the time for a whole month. Then, 30 days/mon x 24 hours/day x 0.75 = 540 hours. The pump tender and laborer will work 40% of the time. Then, 30 x 24 x 0.40 = 288 hours.)							
			31.66	*42.73*	*42.73*	*55.35*	*55.35*
MIL X-EQOPRLT Outside Equip. Operators, Light (Pump Tender)	288	HR	9,118.08	12,305.99	12,305.99	15,939.92	15,939.92
			18.36	*25.00*	*25.00*	*32.38*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	288	HR	5,287.68	7,198.90	7,198.90	9,324.72	9,324.72
			14.79	*17.40*	*17.40*	*22.54*	*22.54*
GEN P60Z5405 PUMP, WATER, CENTRIFUGAL, DEWATERING, WHEEL, ENGINE DRIVE, 4" (102 MM) DIA, 570 GPM (2,158 LPM) @ 40' (12.2 M) HEAD (ADD HOSES)	540	HR	7,987.20	9,396.70	9,396.70	12,171.53	12,171.53
			5,861.71	*6,620.62*	*6,620.62*	*8,575.68*	*8,575.68*
02 Clear Site and Remove Obstructions, All Areas (Except Diversion Channel)	**10**	**ACR**	**58,617.05**	**66,206.24**	**66,206.24**	**85,756.80**	**85,756.80**
			3,103.79	*3,949.75*	*3,949.75*	*5,116.10*	*5,116.10*
MIL 022301000152 Clear and grub, cut and chip, medium trees, to 10" diameter	3	ACR	7,759.47	9,874.37	9,874.37	12,790.25	12,790.25
(Note: Assume 1/4 of the total acreage will need to be cleared and grubbed. Then, 10 acres x 1/4 = 2.5 acre.)							
			677.66	*834.91*	*834.91*	*1,081.46*	*1,081.46*
AF 022302001060 Selective clearing, dry clearing, medium size brush, average grub and trees, excludes removal offsite	3	ACR	1,694.14	2,087.28	2,087.28	2,703.65	2,703.65
			13.67	*17.57*	*17.57*	*22.75*	*22.75*
MIL 022302002000 Selective clearing, load spoils, by machine, includes 2 mile haul to dump	1,305	CY	17,843.44	22,924.60	22,924.60	29,694.18	29,694.18
(Note: Assume 1 truck-load for every 1,000 sf. Say 12 CY/1,000 SF = 0.012 cy/sf --> 2.5 acres x 43,560 sf/acr x 0.012 cy/sf = 1305 cy)							

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
			24.00	*24.00*	*24.00*	*31.09*	*31.09*
USR Disposal Fee	1,305	CY	31,320.00	31,320.00	31,320.00	40,568.73	40,568.73
			7.50	*7.50*	*7.50*	*9.71*	*9.71*
03 Removal, Stockpile, Salvage and Disposal of the Exist. 15" Stone/Riprap Protection, 6" Bedding Material and Filter Fabric, and Gabion Mattress, Levee Sta. 103+00.00 to Sta. 152+00.00 and RCB Culvert	**7,425**	**CY**	**55,687.50**	**55,687.50**	**55,687.50**	**72,131.90**	**72,131.90**
(Note: Former quantity = 5600 cy. New quantity = 7425 cy (08/15/07) Production: 10 cy/hr per truck Hours needed = 742.5 hours Assume a truck fleet of 20 @ $75/hr (for truck+driver). Then, 742.5 hours x $75.00 = $55,688)							
			75.00	*75.00*	*75.00*	*97.15*	*97.15*
USR Trucking Cost	743	HR	55,687.50	55,687.50	55,687.50	72,131.90	72,131.90
			438.35	*536.10*	*536.10*	*694.41*	*694.41*
04 Reconstruction of Existing Concrete/Earthen Irrigation Canals (CIC/EIC)	**40**	**HR**	**17,533.83**	**21,444.04**	**21,444.04**	**27,776.42**	**27,776.42**
(Note: Allow 40 hours for this crew to do reconstruction and relocation of CIC and EIC. According to the designer, there will be a max of 10 cy of concrete needed.)							
			91.68	*107.86*	*107.86*	*139.72*	*139.72*
MAP H25CA027 HYDRAULIC EXCAVATOR, CRAWLER, 75,700 LBS, 2.09 CY BUCKET, 21.58' MAX DIGGING DEPTH	40	HR	3,667.36	4,314.54	4,314.54	5,588.61	5,588.61
			18.75	*22.06*	*22.06*	*28.57*	*28.57*
GEN L50Z4640 LOADER / BACKHOE, WHEEL, 0.80 CY (0.6M3) FRONT END BUCKET, 9.8' (3.0M) DEPTH OF HOE, 24" (0.61M) DIPPER, 4X4	40	HR	750.05	882.41	882.41	1,142.99	1,142.99
			49.99	*58.81*	*58.81*	*76.18*	*76.18*
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	40	HR	1,999.69	2,352.57	2,352.57	3,047.28	3,047.28
			27.53	*32.39*	*32.39*	*41.95*	*41.95*
EP R30B0006 ROLLER, STATIC, SELF-PROPELLED, SMOOTH DRUM, DOUBLE DRUM, 10 TON, 50" WIDE ASPHALT COMPACTOR	40	HR	1,101.13	1,295.45	1,295.45	1,677.99	1,677.99
			61.36	*72.19*	*72.19*	*93.51*	*93.51*
GEN T60Z7910 TRUCK, WATER, OFF-HIGHWAY, 5,000 GAL (18,927 L), W/175 HP (130 KW) TRACTOR	20	HR	1,227.20	1,443.77	1,443.77	1,870.11	1,870.11
(Note: allow half the time for the water truck.)							
			30.74	*41.44*	*41.44*	*53.67*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (3 men)	120	HR	3,688.80	4,972.47	4,972.47	6,440.83	6,440.83
			32.74	*44.25*	*44.25*	*57.31*	*57.31*
MIL X-EQOPRMED Outside Equip. Operators, Medium	40	HR	1,309.60	1,769.83	1,769.83	2,292.45	2,292.45
			26.39	*35.33*	*35.33*	*45.76*	*45.76*
MIL X-EQOPROIL Outside Equip. Oilers	40	HR	1,055.60	1,413.16	1,413.16	1,830.47	1,830.47
			18.36	*25.00*	*25.00*	*32.38*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled) (checker/grader)	40	HR	734.40	999.85	999.85	1,295.10	1,295.10

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
			200.00	*200.00*	*200.00*	*259.06*	*259.06*
MIL 033102200150 Structural concrete, ready mix, normal weight, 3000 psi, includes material only	10	CY	2,000.00	2,000.00	2,000.00	2,590.60	2,590.60
			330.32	*409.95*	*409.95*	*531.01*	*531.01*
05 Seal Existing 18" CMP's and RCP's, with Controlled Low Strength Material (CLSM), Levee	**35**	**CY**	**11,561.20**	**14,348.39**	**14,348.39**	**18,585.44**	**18,585.44**
(Note: Productivity = 1cy/hr Hours needed = 20 hours. Allow 3 laborers.)							
			110.00	*110.00*	*110.00*	*142.48*	*142.48*
USR Control Slow Strength Material	35	CY	3,850.00	3,850.00	3,850.00	4,986.90	4,986.90
			18.36	*25.00*	*25.00*	*32.38*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	420	HR	7,711.20	10,498.39	10,498.39	13,598.54	13,598.54
			16.77	*18.33*	*18.33*	*23.75*	*23.75*
06 Stripping and Disposal of 6" Topsoil, Levees and Dikes and Dention Basin	**4,920**	**CY**	**82,505.31**	**90,194.27**	**90,194.27**	**116,828.44**	**116,828.44**
(Note: Former quantity = 2,500 cy. New quantity = 4,920 cy (08/17/07) Assume disposal site is 10-mile radius, per designer.)							
			30.74	*41.44*	*41.44*	*53.67*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (1 for dozer, 1 for loader)	197	HR	6,049.63	8,154.85	8,154.85	10,562.97	10,562.97
			18.36	*25.00*	*25.00*	*32.38*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	98	HR	1,806.62	2,459.62	2,459.62	3,185.94	3,185.94
			115.56	*135.95*	*135.95*	*176.10*	*176.10*
GEN T15Z6520 TRACTOR, CRAWLER (DOZER), 181-250 HP (135-186 KW), POWERSHIFT, LGP, W/UNIVERSAL BLADE	98	HR	11,370.99	13,377.64	13,377.64	17,328.03	17,328.03
			79.91	*94.01*	*94.01*	*121.77*	*121.77*
GEN L35Z4260 LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	98	HR	7,862.68	9,250.21	9,250.21	11,981.77	11,981.77
			39.22	*46.15*	*46.15*	*59.77*	*59.77*
GEN T50Z7580 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	98	HR	3,859.69	4,540.81	4,540.81	5,881.71	5,881.71
			23.94	*32.63*	*32.63*	*42.27*	*42.27*
MIL X-TRKDVRHV Outside Truck Drivers, Heavy	98	HR	2,355.70	3,211.13	3,211.13	4,159.37	4,159.37
			10.00	*10.00*	*10.00*	*12.95*	*12.95*
USR Disposal Fee	4,920	CY	49,200.00	49,200.00	49,200.00	63,728.65	63,728.65
			9.80	*11.73*	*11.73*	*15.20*	*15.20*
07 Compacted Fill, Levee, Detention Basin and Dikes	**42,540**	**CY**	**416,880.44**	**499,105.81**	**499,105.81**	**646,490.69**	**646,490.69**
(Note: Former quantity = 29,560 cy. New quantity = 42,540 cy.)							
			8.23	*9.82*	*9.82*	*12.72*	*12.72*
01 Load and Haul	**42,540**	**CY**	**350,195.74**	**417,875.05**	**417,875.05**	**541,272.65**	**541,272.65**
			56.46	*66.42*	*66.42*	*86.04*	*86.04*

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
GEN L40Z4397 LOADER, FRONT END, WHEEL, ARTICULATED, 3.25 CY (2.5 M3) BUCKET, 4X4	284	HR	16,011.52	18,837.08	18,837.08	24,399.63	24,399.63
			133.97	*157.62*	*157.62*	*204.16*	*204.16*
MAP T15CA016 TRACTOR, CRAWLER (DOZER), 310 HP, POWERSHIFT, W/15.3 CY SEMI-U BLADE (ADD ATTACHMENTS)	284	HR	37,994.80	44,699.77	44,699.77	57,899.52	57,899.52
			30.74	*41.44*	*41.44*	*53.67*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Loader)	284	HR	8,717.86	11,751.61	11,751.61	15,221.84	15,221.84
			30.74	*41.44*	*41.44*	*53.67*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Dozer)	284	HR	8,717.86	11,751.61	11,751.61	15,221.84	15,221.84
			18.36	*25.00*	*25.00*	*32.38*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	851	HR	15,620.69	21,266.74	21,266.74	27,546.77	27,546.77
			117.00	*137.65*	*137.65*	*178.29*	*178.29*
USR 1 trkdriver + 1 truck, 16 - 23.5 cy per load	2,249	HR	263,133.00	309,568.24	309,568.24	400,983.07	400,983.07
(Note: Reference for Unit Labor Cost, see Excel Spreadsheet file: "Hauling Cost for TresRios Ph 1B.xls" [08/08/07])							
			1.57	*1.91*	*1.91*	*2.47*	*2.47*
02 Place and Compact	**42,540**	**CY**	**66,684.71**	**81,230.76**	**81,230.76**	**105,218.03**	**105,218.03**
			0.88	*1.09*	*1.09*	*1.41*	*1.41*
MIL 023153105900 Compaction, of backfill, structural, 6" lifts, self propelled roller	42,540	ECY	37,235.90	46,330.62	46,330.62	60,011.95	60,011.95
			0.69	*0.82*	*0.82*	*1.06*	*1.06*
MIL 023153109000 Water for compaction, 3000 gallon truck, 3 mile haul	42,540	ECY	29,448.80	34,900.15	34,900.15	45,206.08	45,206.08
			39.61	*39.80*	*39.80*	*51.55*	*51.55*
08 4" Rock Mulch Protection, Levee, Access Ramp and Detention Basin	**2,120**	**TON**	**83,969.13**	**84,375.60**	**84,375.60**	**109,291.53**	**109,291.53**
(Note: Former quantity = 1,500 tons (06/28/07). New quantity = 2,120 tons. (08/17/07) Item Description is changed to "4-inch" instead of "2-inch". Bid Abstract Info from Tres Rios Ph 1A (07/14/2005): Quantity required: 1,223 CY (1) GE = $58.00 (2) TPA-CKY = $65.00 (3) Macro-Z = $105.00 (4) Hal Hays = $75.00 (5) Miramar = $78.50 (6) MRM = $146.00 Average w/o GE = $93.90. Average w/ GE = $87.92)							
			32.00	*32.00*	*32.00*	*41.45*	*41.45*
USR Rock cost	2,120	TON	67,840.00	67,840.00	67,840.00	87,873.01	87,873.01
			0.85	*1.12*	*1.12*	*1.45*	*1.45*
USR 029105001200JD 4" Rock placement (1.4 ton/cy)	1,514	CY	1,289.13	1,695.60	1,695.60	2,196.30	2,196.30
(Note: 1,500 ton / 1.4 ton/cy = 1,071 cy)							
			7.00	*7.00*	*7.00*	*9.07*	*9.07*
USR Trucking Cost	2,120	TON	14,840.00	14,840.00	14,840.00	19,222.22	19,222.22
(Note: Quoted from Pioneer Sand Co., (480) 833-0441 (Ken))							
			127.36	*129.67*	*129.67*	*167.96*	*167.96*
09 Grout and Asphalt Protection, New Levee, Landing Area, RCB Culvert and Detention Basin	**300**	**CY**	**38,206.53**	**38,900.99**	**38,900.99**	**50,388.36**	**50,388.36**

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
(Note: Per designer, the grout protection is for the riprap at RCB Culvert, and the asphalt is used for the road surface. Productivity: 20 cy/hr Hours needed = 15 hours. (let's give them 16 hours))							
			29.66	*39.92*	*39.92*	*51.71*	*51.71*
MIL X-EQOPRLT Outside Equip. Operators, Light	16	HR	474.56	638.73	638.73	827.35	827.35
			20.36	*27.80*	*27.80*	*36.02*	*36.02*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	16	HR	325.76	444.87	444.87	576.24	576.24
			18.36	*25.00*	*25.00*	*32.38*	*32.38*
MIL B-LABORER Laborers (3)	48	HR	881.28	1,199.82	1,199.82	1,554.12	1,554.12
			32.81	*38.60*	*38.60*	*50.00*	*50.00*
EP C55MO003 CONCRETE PUMP, 50 CY/HR, TRAILER MTD	16	HR	524.93	617.56	617.56	799.93	799.93
			120.00	*120.00*	*120.00*	*155.44*	*155.44*
MIL 040607500300 Sand (ready-mix), screened and washed, includes 30 mile haul	300	CY	36,000.00	36,000.00	36,000.00	46,630.72	46,630.72
			50.60	*50.75*	*50.75*	*65.74*	*65.74*
10 15" & 27" Stone Protection, New Levee, Landing Area, RCB Culvert and Detention Basin	**2,400**	**TON**	**121,434.72**	**121,808.50**	**121,808.50**	**157,778.29**	**157,778.29**
(Note: Quantity is changed from 45 ton to 50 tons [06/28/07] New quantity = 2400 tons. (08/17/07))							
			50.00	*50.00*	*50.00*	*64.76*	*64.76*
01 Stone Price and Transportation	**2,400**	**TON**	**120,000.00**	**120,000.00**	**120,000.00**	**155,435.74**	**155,435.74**
			50.00	*50.00*	*50.00*	*64.76*	*64.76*
USR 01 Stone Price and Transporation	2,400	TON	120,000.00	120,000.00	120,000.00	155,435.74	155,435.74
			0.60	*0.75*	*0.75*	*0.98*	*0.98*
02 Stone Placement	**2,400**	**TON**	**1,434.72**	**1,808.50**	**1,808.50**	**2,342.55**	**2,342.55**
(Note: Productivity = 120 ton/hr Needed hours = 2 (let's allow 4 hours))							
			91.68	*107.86*	*107.86*	*139.72*	*139.72*
MAP H25CA027 HYDRAULIC EXCAVATOR, CRAWLER, 75,700 LBS, 2.09 CY BUCKET, 21.58' MAX DIGGING DEPTH	4	HR	366.74	431.45	431.45	558.86	558.86
			79.22	*93.21*	*93.21*	*120.73*	*120.73*
EP L40CA014 LOADER, WHEEL, INTEGRATED TOOL CARRIER, 4.25 CY LOADER; 13,670 LB @ 12.42' HIGH, FORK LIFT, OR 5,040 LB @ 22.67' HIGH, MATERIAL HANDLING ARM	4	HR	316.90	372.82	372.82	482.92	482.92
			0.00	*0.00*	*0.00*	*0.00*	*0.00*
MAP T50XX002 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X2	4	HR	0.00	0.00	0.00	0.00	0.00
			30.74	*41.44*	*41.44*	*53.67*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium	8	HR	245.92	331.50	331.50	429.39	429.39
			21.30	*28.93*	*28.93*	*37.47*	*37.47*
MIL X-TRKDVRLT Outside Truck Drivers, Light	4	HR	85.20	115.71	115.71	149.87	149.87

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
			39.30	*51.96*	*51.96*	*67.31*	*67.31*
MIL B-RODMAN Rodmen	8	HR	314.40	415.71	415.71	538.46	538.46
			26.39	*35.33*	*35.33*	*45.76*	*45.76*
MIL X-EQOPROIL Outside Equip. Oilers	4	HR	105.56	141.32	141.32	183.05	183.05
			38.32	*43.55*	*43.55*	*56.42*	*56.42*
11 Bedding Materials, Levee and Dikes (Assume 4" Thick)	**2,250**	**CY**	**86,227.08**	**97,996.27**	**97,996.27**	**126,934.36**	**126,934.36**
(Note: Designer: "Bedding Materials are natural soils (4" thick). The purpose of using 4" bedding layer is to protect geotextile fabric from tearing apart caused by placing 15" riprap." Former quantity = 2,250 cy. New quantity = 3,220 cy (08/15/07))							
			4.26	*4.84*	*4.84*	*6.27*	*6.27*
Base Preparation	**20,250**	**SY**	**86,227.08**	**97,996.27**	**97,996.27**	**126,934.36**	**126,934.36**
(Note: Base preparation assumed to be performed with grader with toothed blade, compacted, and covered)							
			1.87	*2.34*	*2.34*	*3.03*	*3.03*
03 Scarify & Compact	**20,250**	**SY**	**37,787.92**	**47,415.58**	**47,415.58**	**61,417.30**	**61,417.30**
			1.87	*2.34*	*2.34*	*3.03*	*3.03*
USR 02340500Channel Soil stabilization for base, 4" deep, includes scarifying and compaction	20,250	SY	37,787.92	47,415.58	47,415.58	61,417.30	61,417.30
(Note: CSI Task 023405002020 without lime stabilization Crew modified as B74C)							
			21.53	*22.48*	*22.48*	*29.12*	*29.12*
4" Bedding	**2,250**	**CY**	**48,439.16**	**50,580.69**	**50,580.69**	**65,517.06**	**65,517.06**
			18.00	*18.00*	*18.00*	*23.32*	*23.32*
USR Bedding material	2,250	CY	40,500.00	40,500.00	40,500.00	52,459.56	52,459.56
			32.19	*37.87*	*37.87*	*49.05*	*49.05*
GEN L40Z4390 LOADER, FRONT END, WHEEL, ARTICULATED, 1.75 CY (1.3 M3) BUCKET, 4X4	40	HR	1,287.58	1,514.80	1,514.80	1,962.12	1,962.12
			31.77	*42.88*	*42.88*	*55.55*	*55.55*
RSM B-EQOPRCRN Equip. Operators	80	HR	2,541.60	3,430.69	3,430.69	4,443.76	4,443.76
			19.91	*27.17*	*27.17*	*35.20*	*35.20*
RSM B-SKILLWKR Skilled Workers	80	HR	1,592.80	2,173.81	2,173.81	2,815.74	2,815.74
			62.93	*74.03*	*74.03*	*95.90*	*95.90*
GEN R45Z5690 ROLLER, VIBRATORY, SELF-PROPELLED, DOUBLE DRUM, SMOOTH, 12 TON (10.9 MT), 67" (1.7 M) WIDE, ASPHALT COMPACTOR	40	HR	2,517.18	2,961.39	2,961.39	3,835.88	3,835.88
			1.29	*1.43*	*1.43*	*1.86*	*1.86*
12 Filter Fabric, Levee and Dikes, and Access Ramps	**20,880**	**SY**	**26,957.22**	**29,953.70**	**29,953.70**	**38,798.97**	**38,798.97**
(Note: Former quantity = 16,350 SY. New quantity = 20,880 SY (08/15/07) Productivity = 300 sy/hr Hours needed = 20,880 / 300 = 70 hours.)							
			1.29	*1.43*	*1.43*	*1.86*	*1.86*
CIV 023403001600 Geotextile Filter Fabric, non-woven polypropylene, 60 mils thick	20,880	SY	26,957.22	29,953.70	29,953.70	38,798.97	38,798.97

Currency in US dollars

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
			41.32	*43.06*	*43.06*	*55.78*	*55.78*
13 3" ABC, O&M Roads and Turn-Arounds / Landing Area	**2,900**	**TON**	**119,826.07**	**124,882.36**	**124,882.36**	**161,759.85**	**161,759.85**
(Note: Former quantity = 2,500 tons. New quantity = 2,900 tons (08/15/07) Designer: "Two locations (one on top of the levee and other at toe of levee)")							
			35.00	*35.00*	*35.00*	*45.34*	*45.34*
01 Rock Price and Transportation	**2,900**	**TON**	**101,500.00**	**101,500.00**	**101,500.00**	**131,472.73**	**131,472.73**
			35.00	*35.00*	*35.00*	*45.34*	*45.34*
USR 01 Material Price and Transportation Cost	2,900	TON	101,500.00	101,500.00	101,500.00	131,472.73	131,472.73
			6.32	*8.06*	*8.06*	*10.44*	*10.44*
02 Placement	**2,900**	**TON**	**18,326.07**	**23,382.36**	**23,382.36**	**30,287.12**	**30,287.12**
(Note: Productivity = 200 ton/hr Hours needed = 2,100 / 200 = 11 hours (let's allow 24 hours at each location, totaling to 48 hours))							
			49.99	*58.81*	*58.81*	*76.18*	*76.18*
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	60	HR	2,999.53	3,528.86	3,528.86	4,570.92	4,570.92
			27.53	*32.39*	*32.39*	*41.95*	*41.95*
EP R30BO006 ROLLER, STATIC, SELF-PROPELLED, SMOOTH DRUM, DOUBLE DRUM, 10 TON, 50" WIDE ASPHALT COMPACTOR	60	HR	1,651.69	1,943.17	1,943.17	2,516.98	2,516.98
			4.38	*5.15*	*5.15*	*6.67*	*6.67*
MAP T40RS002 TRUCK OPTIONS, WATER TANK, 3,000 GAL (ADD 40,000 GVW TRUCK)	60	HR	262.67	309.03	309.03	400.28	400.28
			39.22	*46.15*	*46.15*	*59.77*	*59.77*
GEN T50Z7580 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	60	HR	2,353.47	2,768.79	2,768.79	3,586.41	3,586.41
			0.00	*0.00*	*0.00*	*0.00*	*0.00*
MAP T50XX002 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X2	60	HR	0.00	0.00	0.00	0.00	0.00
			30.74	*41.44*	*41.44*	*53.67*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (2 graders)	120	HR	3,688.80	4,972.47	4,972.47	6,440.83	6,440.83
			30.74	*41.44*	*41.44*	*53.67*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (1 roller)	60	HR	1,844.40	2,486.24	2,486.24	3,220.42	3,220.42
			18.36	*25.00*	*25.00*	*32.38*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	60	HR	1,101.60	1,499.77	1,499.77	1,942.65	1,942.65
			32.74	*44.25*	*44.25*	*57.31*	*57.31*
MIL X-EQOPRMED Outside Equip. Operators, Medium	60	HR	1,964.40	2,654.74	2,654.74	3,438.68	3,438.68
			39.30	*51.96*	*51.96*	*67.31*	*67.31*
MIL B-RODMAN Rodmen, (grade checker)	60	HR	2,358.00	3,117.80	3,117.80	4,038.48	4,038.48
			0.05	*0.05*	*0.05*	*0.06*	*0.06*
USR Water Cost	2,030	GAL	101.50	101.50	101.50	131.47	131.47

Currency in US dollars

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
			11.36	*12.70*	*12.70*	*16.45*	*16.45*
14 Four-Wire R/W Fence	**5,350**	**LF**	**60,781.66**	**67,951.36**	**67,951.36**	**88,017.25**	**88,017.25**
(Note: 4' H, 10' oc, Production = 80 lf/hr Hours needed = 5350 / 80 = 67 hours)							
			11.36	*12.70*	*12.70*	*16.45*	*16.45*
MIL 028201306540 Chain link fence, industrial, galvanized, 9 ga. mesh, 1-5/8" top rail, 4' high, posts in concrete, excludes excavation	5,350	LF	60,781.66	67,951.36	67,951.36	88,017.25	88,017.25
			860.00	*980.45*	*980.45*	*1,269.97*	*1,269.97*
15 14' Wide Double Swing Gate	**4**	**EA**	**3,440.00**	**3,921.79**	**3,921.79**	**5,079.88**	**5,079.88**
(Note: Quantity is changed from 3 EA to 4 EA on 06/28/07. Quantity is changed from 4 EA to 3 EA on 08/15/07.)							
			860.00	*980.45*	*980.45*	*1,269.97*	*1,269.97*
MIL 028201507125 Gates, swing, chain link, without barbed wire, double, galvanized, 4' high, 12' wide, excludes excavation	4	EA	3,440.00	3,921.79	3,921.79	5,079.88	5,079.88
			28.56	*29.72*	*29.72*	*38.49*	*38.49*
16 27" Riprap Slope Protection, Dikes	**560**	**TON**	**15,995.03**	**16,641.30**	**16,641.30**	**21,555.44**	**21,555.44**
(Note: Riprap source: approx. 2 miles away)							
			24.00	*24.00*	*24.00*	*31.09*	*31.09*
01 Stone Price and Transportation	**560**	**TON**	**13,440.00**	**13,440.00**	**13,440.00**	**17,408.80**	**17,408.80**
			24.00	*24.00*	*24.00*	*31.09*	*31.09*
USR 01 Stone Price and Transportation	560	TON	13,440.00	13,440.00	13,440.00	17,408.80	17,408.80
			4.56	*5.72*	*5.72*	*7.40*	*7.40*
02 Stone Placement	**560**	**TON**	**2,555.03**	**3,201.30**	**3,201.30**	**4,146.64**	**4,146.64**
(Note: Productivity = 100 ton/hr Needed hour = 8)							
			91.68	*107.86*	*107.86*	*139.72*	*139.72*
MAP H25CA027 HYDRAULIC EXCAVATOR, CRAWLER, 75,700 LBS, 2.09 CY BUCKET, 21.58' MAX DIGGING DEPTH	8	HR	733.47	862.91	862.91	1,117.72	1,117.72
			79.22	*93.21*	*93.21*	*120.73*	*120.73*
EP L40CA014 LOADER, WHEEL, INTEGRATED TOOL CARRIER, 4.25 CY LOADER; 13,670 LB @ 12.42' HIGH, FORK LIFT, OR 5,040 LB @ 22.67' HIGH, MATERIAL HANDLING ARM	8	HR	633.80	745.65	745.65	965.83	965.83
			0.00	*0.00*	*0.00*	*0.00*	*0.00*
MAP T50XX002 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X2	8	HR	0.00	0.00	0.00	0.00	0.00
			30.74	*41.44*	*41.44*	*53.67*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium	16	HR	491.84	663.00	663.00	858.78	858.78
			21.30	*28.93*	*28.93*	*37.47*	*37.47*
MIL X-TRKDVRLT Outside Truck Drivers, Light	8	HR	170.40	231.41	231.41	299.75	299.75
			39.30	*51.96*	*51.96*	*67.31*	*67.31*
MIL B-RODMAN Rodmen	8	HR	314.40	415.71	415.71	538.46	538.46

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
			26.39	*35.33*	*35.33*	*45.76*	*45.76*
MIL X-EQOPROIL Outside Equip. Oilers	8	HR	211.12	282.63	282.63	366.09	366.09
			5.32	*6.41*	*6.41*	*8.30*	*8.30*
17 Excavation and Spreading Excavated Materials for Gabion Mattresses, Levees and Dikes	**7,980**	**CY**	**42,462.67**	**51,140.11**	**51,140.11**	**66,241.67**	**66,241.67**
			5.32	*6.41*	*6.41*	*8.30*	*8.30*
01 Excavation and spreading	**7,980**	**CY**	**42,462.67**	**51,140.11**	**51,140.11**	**66,241.67**	**66,241.67**
(Note: Productivity = 300 cy/hr Hours needed = 27 hours)							
			290.73	*342.03*	*342.03*	*443.03*	*443.03*
MAP S20CA005 SCRAPER, TANDEM POWERED, STANDARD LOADING, 44 CY, 52 TON, 4X4, D-11 ASSISTED LOADING	108	HR	31,398.59	36,939.52	36,939.52	47,847.68	47,847.68
(Note: 4 pieces of equipment x 27 hours = 108 hours)							
			96.36	*113.36*	*113.36*	*146.84*	*146.84*
GEN T60Z7910 TRUCK, WATER, OFF-HIGHWAY, 5,000 GAL (18,927 L), W/175 HP (130 KW) TRACTOR	27	HR	2,601.72	3,060.85	3,060.85	3,964.71	3,964.71
(Note: This cost item includes water truck and driver costs.)							
			0.00	*0.00*	*0.00*	*0.00*	*0.00*
MAP T50XX005 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X4	27	HR	0.00	0.00	0.00	0.00	0.00
			32.74	*44.25*	*44.25*	*57.31*	*57.31*
MIL X-EQOPRMED Outside Equip. Operators, Medium (1 for scraper, 1 for dozer)	54	HR	1,767.96	2,389.26	2,389.26	3,094.81	3,094.81
			18.36	*25.00*	*25.00*	*32.38*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	27	HR	495.72	674.90	674.90	874.19	874.19
			21.30	*28.93*	*28.93*	*37.47*	*37.47*
MIL X-TRKDVRLT Outside Truck Drivers, Light	27	HR	575.10	781.01	781.01	1,011.64	1,011.64
			29.66	*39.92*	*39.92*	*51.71*	*51.71*
MIL X-EQOPRLT Outside Equip. Operators, Light	135	HR	4,004.10	5,389.30	5,389.30	6,980.75	6,980.75
(Note: Let's allow 5 operators here. Then, 5 x 27 = 135 hours)							
			4.02	*4.73*	*4.73*	*6.13*	*6.13*
MAP T10CA007 TRACTOR ATTACHMENTS, BLADE, POWER ANGLE, HYDRAULIC, FOR D5, 2.53 CY (ADD D5 TRACTOR)	27	HR	108.53	127.69	127.69	165.39	165.39
			5.37	*6.31*	*6.31*	*8.18*	*8.18*
MAP T10CA008 TRACTOR ATTACHMENTS, POWER WINCH, FOR D5 (ADD D5 TRACTOR)	27	HR	144.89	170.46	170.46	220.79	220.79
			34.15	*40.18*	*40.18*	*52.04*	*52.04*
USR T15CS005 TRACTOR, CRAWLER (DOZER), 75 HP, POWERSHIFT, W/2.50 CY UNIVERSAL BLADE (ADD ATTACHMENTS)	40	HR	1,366.05	1,607.12	1,607.12	2,081.70	2,081.70

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
			83.80	*92.02*	*92.02*	*119.20*	*119.20*
18 12" Gabion Mattress Scour Apron, Levee and Dikes	**7,800**	**TON**	**653,656.47**	**717,792.87**	**717,792.87**	**929,755.57**	**929,755.57**
(Note: Former quantity = 6440 ton. New quantity = 7800 ton (08/15/07))							
			44.69	*49.08*	*49.08*	*63.57*	*63.57*
MIL 023704500600 Gabions, galvanized steel mesh mats or boxes, stone filled, 12" deep	14,625	SY	653,656.47	717,792.87	717,792.87	929,755.57	929,755.57
(Note: Assume the gabion is laid for 12" deep, and we use the conversion factor of 1.575 ton/ccy (for in-fill average riprap rock). Then, 7800 ton / 1.6 ton/cy / 12" = 14,625 sy. Per ITR Review comments, reduced crew productivity from 19.125 sy/hr to 15 sy/hr, and increased material cost from $21.07/sy to $30.00/sy.)							
			5.17	*6.21*	*6.21*	*8.04*	*8.04*
19 Interior Drainage Excavation, Collector Channel & RCB Culvert	**35,100**	**CY**	**181,354.10**	**217,818.37**	**217,818.37**	**282,139.67**	**282,139.67**
(Note: Quantity is changed from 14,600 cy to 25,000 cy. [06/28/07] (Productivity = 300 cy/hr) New quantity = 35,100 cy (08/17/07) Productivity: 35,100 / 300 = 117 hours.)							
			290.73	*342.03*	*342.03*	*443.03*	*443.03*
MAP S20CA005 SCRAPER, TANDEM POWERED, STANDARD LOADING, 44 CY, 52 TON, 4X4, D-11 ASSISTED LOADING	468	HR	136,060.56	160,071.25	160,071.25	207,339.95	207,339.95
(Note: 4 pieces of equipment x 117 hours = 468 hours)							
			0.00	*0.00*	*0.00*	*0.00*	*0.00*
MAP T10CA014 TRACTOR ATTACHMENTS, BLADE, POWER ANGLE, HYDRAULIC, FOR D7, 5.08 CY (ADD D7 TRACTOR)	117	HR	0.00	0.00	0.00	0.00	0.00
			70.06	*82.43*	*82.43*	*106.77*	*106.77*
MAP T15CA008 TRACTOR, CRAWLER (DOZER), 145 HP, POWERSHIFT, W/5.60 CY SEMI-U BLADE (ADD ATTACHMENTS)	117	HR	8,197.50	9,644.12	9,644.12	12,492.01	12,492.01
			96.36	*113.36*	*113.36*	*146.84*	*146.84*
GEN T60Z7910 TRUCK, WATER, OFF-HIGHWAY, 5,000 GAL (18,927 L), W/175 HP (130 KW) TRACTOR	117	HR	11,274.13	13,263.68	13,263.68	17,180.42	17,180.42
(Note: This cost item includes water truck and driver costs.)							
			0.00	*0.00*	*0.00*	*0.00*	*0.00*
MAP T50XX005 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X4	117	HR	0.00	0.00	0.00	0.00	0.00
			32.74	*44.25*	*44.25*	*57.31*	*57.31*
MIL X-EQOPRMED Outside Equip. Operators, Medium	117	HR	3,830.58	5,176.74	5,176.74	6,705.42	6,705.42
			18.36	*25.00*	*25.00*	*32.38*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	117	HR	2,148.12	2,924.55	2,924.55	3,788.17	3,788.17
			21.30	*28.93*	*28.93*	*37.47*	*37.47*
MIL X-TRKDVRLT Outside Truck Drivers, Light	117	HR	2,492.10	3,384.39	3,384.39	4,383.79	4,383.79
			29.66	*39.92*	*39.92*	*51.71*	*51.71*
MIL X-EQOPRLT Outside Equip. Operators, Light	585	HR	17,351.10	23,353.64	23,353.64	30,249.92	30,249.92
(Note: Let's allow 5 operators here. Then, 5 x 117 = 585 hours)							

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
			4.93	*6.09*	*6.09*	*7.88*	*7.88*
20 Interior Drainage Structural Compaction, Collector Channel, Detention Basin & RCB Culvert	**4,000**	**CY**	**19,701.10**	**24,349.39**	**24,349.39**	**31,539.71**	**31,539.71**
(Note: Quantity is changed from 1150 cy to 1500 cy [06/28/07] New quantity = 4,000 cy (08/15/07))							
			3.36	*4.18*	*4.18*	*5.41*	*5.41*
01 Load and Haul	**4,000**	**CY**	**13,430.79**	**16,711.33**	**16,711.33**	**21,646.15**	**21,646.15**
			65.55	*81.59*	*81.59*	*105.69*	*105.69*
RSM COEIB34B 1 trkdvrhv + 1 truck, dump, 16-23.5 CY	80	HR	5,244.36	6,527.33	6,527.33	8,454.84	8,454.84
(Note: Assume productivity = 150 cy/hr. Allow 3 dump trucks.)							
			56.46	*66.42*	*66.42*	*86.04*	*86.04*
GEN L40Z4397 LOADER, FRONT END, WHEEL, ARTICULATED, 3.25 CY (2.5 M3) BUCKET, 4X4	27	HR	1,505.55	1,771.23	1,771.23	2,294.28	2,294.28
			133.97	*157.62*	*157.62*	*204.16*	*204.16*
MAP T15CA016 TRACTOR, CRAWLER (DOZER), 310 HP, POWERSHIFT, W/15.3 CY SEMI-U BLADE (ADD ATTACHMENTS)	27	HR	3,572.62	4,203.08	4,203.08	5,444.24	5,444.24
			0.00	*0.00*	*0.00*	*0.00*	*0.00*
MAP T10CA017 TRACTOR ATTACHMENTS, BLADE, UNIVERSAL, HYDRAULIC, FOR D8, 15.30 CY (ADD D8 TRACTOR)	27	HR	0.00	0.00	0.00	0.00	0.00
			30.74	*41.44*	*41.44*	*53.67*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Loader)	27	HR	819.73	1,104.99	1,104.99	1,431.30	1,431.30
			30.74	*41.44*	*41.44*	*53.67*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Dozer)	27	HR	819.73	1,104.99	1,104.99	1,431.30	1,431.30
			18.36	*25.00*	*25.00*	*32.38*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	80	HR	1,468.80	1,999.69	1,999.69	2,590.20	2,590.20
			1.57	*1.91*	*1.91*	*2.47*	*2.47*
02 Place and Compact	**4,000**	**CY**	**6,270.31**	**7,638.06**	**7,638.06**	**9,893.56**	**9,893.56**
			0.88	*1.09*	*1.09*	*1.41*	*1.41*
MIL 023153105900 Compaction, of backfill, structural, 6" lifts, self propelled roller	4,000	ECY	3,501.26	4,356.43	4,356.43	5,642.87	5,642.87
			0.69	*0.82*	*0.82*	*1.06*	*1.06*
MIL 023153109000 Water for compaction, 3000 gallon truck, 3 mile haul	4,000	ECY	2,769.05	3,281.63	3,281.63	4,250.69	4,250.69
			276.32	*323.01*	*323.01*	*418.39*	*418.39*
21 Interior Drainage Concrete, Collector Channel & RCB Culvert	**2,500**	**CY**	**690,811.54**	**807,518.71**	**807,518.71**	**1,045,977.26**	**1,045,977.26**
(Note: Quantity was changed from 4050 cy to 4500 cy [06/28/07] New quantity = 2,500 cy (08/15/07))							
			129.66	*132.22*	*132.22*	*171.26*	*171.26*
01 Placement	**2,500**	**CY**	**324,146.94**	**330,538.38**	**330,538.38**	**428,145.66**	**428,145.66**
			286.21	*366.10*	*366.10*	*474.21*	*474.21*
RSM CLABC20 6 laborers + 1 concrete pump, 117 CY/hr	80	HR	22,896.94	29,288.38	29,288.38	37,937.18	37,937.18

Currency in US dollars

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
			120.50	*120.50*	*120.50*	*156.08*	*156.08*
MIL 033102200150 Structural concrete, ready mix, normal weight, 3000 psi, includes material only	2,500	CY	301,250.00	301,250.00	301,250.00	390,208.48	390,208.48
			17,058.21	*19,109.87*	*19,109.87*	*24,752.98*	*24,752.98*
02 Finishing and Curing	**1**	**EA**	**17,058.21**	**19,109.87**	**19,109.87**	**24,752.98**	**24,752.98**
			0.18	*0.24*	*0.24*	*0.32*	*0.32*
MIL 033503000010 Concrete finishing, floors, monolithic, screed finish	5,000	SF	900.44	1,220.31	1,220.31	1,580.66	1,580.66
(Note: Quantity assumed.)							
			0.78	*0.97*	*0.97*	*1.26*	*1.26*
MIL 033503500600 Concrete finishing, walls, float finish, 1/16" thick	5,000	SF	3,901.33	4,860.92	4,860.92	6,296.34	6,296.34
(Note: Quantity assumed.)							
			15.32	*16.29*	*16.29*	*21.09*	*21.09*
MIL 033902000100 Curing, burlap, 12 oz., 4 uses assumed	800	CSF	12,256.44	13,028.65	13,028.65	16,875.98	16,875.98
(Note: quantity assumed.)							
			3.60	*4.71*	*4.71*	*6.10*	*6.10*
03 Forming	**97,232**	**SFC**	**349,606.38**	**457,870.46**	**457,870.46**	**593,078.63**	**593,078.63**
(Note: The slope of the Collector Channel is 2H:1V, the height of the channel is 5', and the length of the channel is 4,120 LF (begins at Sta. 7+40 and ends at Sta. 48+60.8), the width of the sloping surface is calculated to be 11.8', (square root of sum of 5-squared and 10-squared). Then, the square-foot contact area is calculated to be: 11.8' x 4120' x 2 sides = 97,232 SFCA.)							
			3.60	*4.71*	*4.71*	*6.10*	*6.10*
MIL 031104554750 C.I.P. concrete forms, retaining wall, battered, job built plywood, to 8' high, 4 use, includes erecting, bracing, stripping and cleaning	97,232	SFC	349,606.38	457,870.46	457,870.46	593,078.63	593,078.63
			1,220.63	*1,259.50*	*1,259.50*	*1,631.43*	*1,631.43*
22 Interior Drainage Rebar, Collector Channel & RCB Culvert	**175**	**TON**	**213,610.10**	**220,412.23**	**220,412.23**	**285,499.49**	**285,499.49**
(Note: Assume the channel and wall quantities are 50-50. Quantity is changed from 250 tons to 300 tons [06/28/07] New quantity = 175 ton (08/15/07))							
			1,236.46	*1,280.43*	*1,280.43*	*1,658.54*	*1,658.54*
MIL 032106000600 Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60	88	TON	108,190.10	112,037.46	112,037.46	145,121.88	145,121.88
(Note: Original material cost is increased by 40%)							
			1,204.80	*1,238.57*	*1,238.57*	*1,604.32*	*1,604.32*
MIL 032106000700 Reinforcing steel, in place, walls, #3 to #7, A615, grade 60	88	TON	105,420.00	108,374.77	108,374.77	140,377.61	140,377.61
(Note: Original material cost is increased by 40%)							
			2,399.40	*2,500.71*	*2,500.71*	*3,239.16*	*3,239.16*
23 Interior Drainage Trash Rack, RCB Culvert	**5**	**EA**	**11,997.00**	**12,503.53**	**12,503.53**	**16,195.80**	**16,195.80**
(Note: Quotation: ACF Environmental Distributor Reed & Graham, Carl Springer (888) 381-0800 (11/09/2006). The material price is $1,500 per each, plus freight to Phoenix, AZ, $585.00. Crew: 2 masonary workers. Productivity = 2 hours per each.)							

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
			2,085.00	*2,085.00*	*2,085.00*	*2,700.70*	*2,700.70*
USR Trash Rack by ACF Environmental	5	EA	10,425.00	10,425.00	10,425.00	13,503.48	13,503.48
(Note: Shipping Cost (freight) is placed in "UserCost1")							
			39.30	*51.96*	*51.96*	*67.31*	*67.31*
MIL B-STRSTEEL Structural Steel Workers	40	HR	1,572.00	2,078.53	2,078.53	2,692.32	2,692.32
(Note: 2 workers x 4 hours per each x 5 ea = 40 hours)							
			5,068.11	*5,089.58*	*5,089.58*	*6,592.52*	*6,592.52*
24 Interior Drainage Headwalls, RCB Culvert	**2**	**EA**	**10,136.21**	**10,179.16**	**10,179.16**	**13,185.04**	**13,185.04**
			5,068.11	*5,089.58*	*5,089.58*	*6,592.52*	*6,592.52*
CIV 026101000530 Headwall, concrete, precast, 30 degree skewed wingwall, 18" diameter pipe	2	EA	10,136.21	10,179.16	10,179.16	13,185.04	13,185.04
			3,335.76	*3,687.24*	*3,687.24*	*4,776.07*	*4,776.07*
25 Interior Drainage Wingwalls, RCB Culvert	**4**	**EA**	**13,343.04**	**14,748.95**	**14,748.95**	**19,104.28**	**19,104.28**
			2,549.76	*2,647.97*	*2,647.97*	*3,429.91*	*3,429.91*
CIV 112851900100 Wingwall	4	EA	10,199.04	10,591.88	10,591.88	13,719.64	13,719.64
			39.30	*51.96*	*51.96*	*67.31*	*67.31*
MIL B-STRSTEEL Structural Steel Workers	80	HR	3,144.00	4,157.06	4,157.06	5,384.64	5,384.64
(Note: Allow 2 workers, and 80 hours.)							
			16,576.00	*20,798.94*	*20,798.94*	*26,940.82*	*26,940.82*
26 Survey Markers (Bench Marks/Monuments) Removal & Installation for Levee	**1**	**EA**	**16,576.00**	**20,798.94**	**20,798.94**	**26,940.82**	**26,940.82**
			40.85	*56.45*	*56.45*	*73.12*	*73.12*
FOP FC-SURYR Surveyors (Foreman)	80	HR	3,268.00	4,515.89	4,515.89	5,849.42	5,849.42
(Note: Assumed a Occupation Code of #99659 Survey Technician. Allow 80 hours. For hourly labor cost quotation, see Means Building Construction Cost Data, 2004, Crew A-7 (p.589))							
			32.05	*44.22*	*44.22*	*57.28*	*57.28*
FOP FC-FLDRT Instrument Technician	80	HR	2,564.00	3,537.75	3,537.75	4,582.44	4,582.44
(Note: Assumed a Occupation Code of #29063 Drafter III. Allow 80 hours. For hourly labor cost quotation, see Means Building Construction Cost Data, 2004 (p.589))							
			39.30	*51.96*	*51.96*	*67.31*	*67.31*
MIL B-RODMAN Rodman/Chainman	80	HR	3,144.00	4,157.06	4,157.06	5,384.64	5,384.64
USR Survey Instruments	1	LS	5,000.00	5,882.35	5,882.35	7,619.40	7,619.40
			26.00	*27.06*	*27.06*	*35.05*	*35.05*
USR Monuments	100	EA	2,600.00	2,705.88	2,705.88	3,504.92	3,504.92
(Note: For material and equipment cost quotation, see Means Building Construction Cost Data, 2004, 01107-700-0600. Quanitity assumed.)							
			20,260.80	*24,158.08*	*24,158.08*	*31,291.90*	*31,291.90*
27 As-Built Drawings	**1**	**EA**	**20,260.80**	**24,158.08**	**24,158.08**	**31,291.90**	**31,291.90**

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
			37.58	*51.85*	*51.85*	*67.17*	*67.17*
FOP FC-ENGCI Engineers, Civil	160	HR	6,012.80	8,296.78	8,296.78	10,746.80	10,746.80
(Note: Assumed a Occupation Code of #29086 Engineer Technician IV)							
			26.55	*36.63*	*36.63*	*47.45*	*47.45*
FOP FC-FLDRT Field Draftsmen	160	HR	4,248.00	5,861.30	5,861.30	7,592.12	7,592.12
(Note: Assumed a Occupation Code of #29063 Drafter III)							
			10,000.00	*10,000.00*	*10,000.00*	*12,952.98*	*12,952.98*
USR Miscellaneous Costs	1	EA	10,000.00	10,000.00	10,000.00	12,952.98	12,952.98
			14,599.76	*14,697.97*	*14,697.97*	*19,038.25*	*19,038.25*
0024 Interior Drainage Flap Gates, RCB Culvert	**5**	**EA**	**72,998.80**	**73,489.86**	**73,489.86**	**95,191.25**	**95,191.25**
			599.76	*697.97*	*697.97*	*904.08*	*904.08*
CIV 112851900100 Flap gates, (Waterman, F-10), 6" dia. Flatback, head wall mounting	5	EA	2,998.80	3,489.86	3,489.86	4,520.40	4,520.40
(Note: Material quoted was obtained from Contractors/Engineers Supplies, (602) 272-1369 (Kris).)							
			14,000.00	*14,000.00*	*14,000.00*	*18,134.17*	*18,134.17*
USR Flap Gates, 3'x5' per each	5	EA	70,000.00	70,000.00	70,000.00	90,670.85	90,670.85
(Note: Price quoted from Hydro Gate, (303) 288-7873, x245, (Susan Dye), www.hydrogate.com. On the fax: "Model 50, with cast iron flat back seat, cast iron cover, bronze seating faces, ductile iron links, bronze bushings and stainless steel fasteners. Stainless Steel Anchor bolts." The price quoted includes freight to job site.)							
			434.06	*531.61*	*531.61*	*688.59*	*688.59*
09A Soil Cement	**20**	**CY**	**8,681.23**	**10,632.18**	**10,632.18**	**13,771.83**	**13,771.83**
			1.60	*2.04*	*2.04*	*2.64*	*2.64*
HNC 023154260205 Load, bank measure, medium material, 3/4 C.Y. bucket, wheeled loader	20	BCY	32.05	40.80	40.80	52.85	52.85
			1.56	*1.86*	*1.86*	*2.41*	*2.41*
HNC 023154902300 Hauling, excavated or borrow material, loose cubic yards, 6 mile round trip @ 40 MPH (2.1 cycles/hour), 40 C.Y., off highway haulers, excludes loading	24	LCY	37.35	44.68	44.68	57.88	57.88
			358.83	*439.45*	*439.45*	*569.21*	*569.21*
HNC 023707001300 Erosion control, soil cement, 7% portland cement, in place	24	ECY	8,611.84	10,546.69	10,546.69	13,661.11	13,661.11
(Note: 94-lb bag of cement)							
			18,389.71	*19,148.62*	*19,148.62*	*24,803.17*	*24,803.17*
0030 Clear Site and Remove Obstructions, Diversion Channel	**2**	**ACR**	**36,779.41**	**38,297.25**	**38,297.25**	**49,606.34**	**49,606.34**
			3,103.79	*3,949.75*	*3,949.75*	*5,116.10*	*5,116.10*
MIL 022301000152 Clear and grub, cut and chip, medium trees, to 10" diameter	1	ACR	1,551.89	1,974.87	1,974.87	2,558.05	2,558.05
(Note: Assume 1/4 of the total acreage will need to be cleared and grubbed. Then, 2 acres x 1/4 = 0.5 acre.)							
			677.66	*834.91*	*834.91*	*1,081.46*	*1,081.46*
AF 022302001060 Selective clearing, dry clearing, medium size brush, average grub and trees, excludes removal offsite	1	ACR	338.83	417.46	417.46	540.73	540.73

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Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
			13.67	*17.57*	*17.57*	*22.75*	*22.75*
MIL 022302002000 Selective clearing, load spoils, by machine, includes 2 mile haul to dump	261	CY	3,568.69	4,584.92	4,584.92	5,938.84	5,938.84
(Note: Assume 1 truck-load for every 1,000 sf. Say 12 CY/1,000 SF = 0.012 cy/sf --> 43,560 sf x (0.5 acre) x 0.012 cy/sf = 261 cy)							
			24.00	*24.00*	*24.00*	*31.09*	*31.09*
USR Disposal Fee	1,305	CY	31,320.00	31,320.00	31,320.00	40,568.73	40,568.73
			10.12	*12.32*	*12.32*	*15.95*	*15.95*
0031 Excavation, Compacted Fill, and Spreading Excavated Materials, Diversion Channel	**10,250**	**CY**	**103,774.88**	**126,233.77**	**126,233.77**	**163,510.34**	**163,510.34**
			6.07	*7.32*	*7.32*	*9.48*	*9.48*
01 Excavation and Spreading Excavated Materials	**10,250**	**CY**	**62,249.93**	**74,989.33**	**74,989.33**	**97,133.51**	**97,133.51**
			6.07	*7.32*	*7.32*	*9.48*	*9.48*
01 Excavation and spreading	**10,250**	**CY**	**62,249.93**	**74,989.33**	**74,989.33**	**97,133.51**	**97,133.51**
(Note: Productivity = 300 cy/hr Hours needed = 10,265 cy / 300 cy/hr = 40 hours (allowed))							
			290.73	*342.03*	*342.03*	*443.03*	*443.03*
MAP S20CA005 SCRAPER, TANDEM POWERED, STANDARD LOADING, 44 CY, 52 TON, 4X4, D-11 ASSISTED LOADING	160	HR	46,516.43	54,725.21	54,725.21	70,885.45	70,885.45
(Note: 4 pieces of equipment x 40 hours = 160 hours)							
			96.36	*113.36*	*113.36*	*146.84*	*146.84*
GEN T60Z7910 TRUCK, WATER, OFF-HIGHWAY, 5,000 GAL (18,927 L), W/175 HP (130 KW) TRACTOR	40	HR	3,854.40	4,534.59	4,534.59	5,873.65	5,873.65
(Note: This cost item includes water truck and driver costs.)							
			0.00	*0.00*	*0.00*	*0.00*	*0.00*
MAP T50XX005 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X4	40	HR	0.00	0.00	0.00	0.00	0.00
			32.74	*44.25*	*44.25*	*57.31*	*57.31*
MIL X-EQOPRMED Outside Equip. Operators, Medium (1 for scraper, 1 for dozer)	80	HR	2,619.20	3,539.65	3,539.65	4,584.90	4,584.90
			18.36	*25.00*	*25.00*	*32.38*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	40	HR	734.40	999.85	999.85	1,295.10	1,295.10
			21.30	*28.93*	*28.93*	*37.47*	*37.47*
MIL X-TRKDVRLT Outside Truck Drivers, Light	40	HR	852.00	1,157.05	1,157.05	1,498.73	1,498.73
			29.66	*39.92*	*39.92*	*51.71*	*51.71*
MIL X-EQOPRLT Outside Equip. Operators, Light	200	HR	5,932.00	7,984.15	7,984.15	10,341.85	10,341.85
(Note: Let's allow 5 operators here. Then, 5 x 40 = 200 hours)							
			4.02	*4.73*	*4.73*	*6.13*	*6.13*
MAP T10CA007 TRACTOR ATTACHMENTS, BLADE, POWER ANGLE, HYDRAULIC, FOR D5, 2.53 CY (ADD D5 TRACTOR)	40	HR	160.79	189.17	189.17	245.03	245.03

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Description	Quantity	UOM	BareCost	DirectCost	CostToPrime	ContractCost	ProjectCost
MAP T10CA008 TRACTOR ATTACHMENTS, POWER WINCH, FOR D5 (ADD D5 TRACTOR)	40	HR	*5.37* 214.65	*6.31* 252.53	*6.31* 252.53	*8.18* 327.10	*8.18* 327.10
USR T15CS005 TRACTOR, CRAWLER (DOZER), 75 HP, POWERSHIFT, W/2.50 CY UNIVERSAL BLADE (ADD ATTACHMENTS)	40	HR	*34.15* 1,366.05	*40.18* 1,607.12	*40.18* 1,607.12	*52.04* 2,081.70	*52.04* 2,081.70
02 Compacted Fill	**10,250**	**CY**	*4.05* **41,524.95**	*5.00* **51,244.45**	*5.00* **51,244.45**	*6.48* **66,376.82**	*6.48* **66,376.82**
01 Load and Haul	**10,250**	**CY**	*2.48* **25,457.30**	*3.09* **31,671.92**	*3.09* **31,671.92**	*4.00* **41,024.57**	*4.00* **41,024.57**
RSM COEIB34B 1 trkdvrhv + 1 truck, dump, 16-23.5 CY	68	HR	*65.55* 4,479.56	*81.59* 5,575.43	*81.59* 5,575.43	*105.69* 7,221.84	*105.69* 7,221.84
(Note: Assume productivity = 150 cy/hr. and a truck fleet of 20. Then, 10,265/150 = 70 hours)							
GEN L40Z4397 LOADER, FRONT END, WHEEL, ARTICULATED, 3.25 CY (2.5 M3) BUCKET, 4X4	68	HR	*56.46* 3,857.97	*66.42* 4,538.79	*66.42* 4,538.79	*86.04* 5,879.08	*86.04* 5,879.08
MAP T15CA016 TRACTOR, CRAWLER (DOZER), 310 HP, POWERSHIFT, W/15.3 CY SEMI-U BLADE (ADD ATTACHMENTS)	68	HR	*133.97* 9,154.84	*157.62* 10,770.40	*157.62* 10,770.40	*204.16* 13,950.87	*204.16* 13,950.87
MIL X-EQOPRMED Outside Equip. Operators, Medium (Loader)	68	HR	*30.74* 2,100.57	*41.44* 2,831.55	*41.44* 2,831.55	*53.67* 3,667.70	*53.67* 3,667.70
MIL X-EQOPRMED Outside Equip. Operators, Medium (Dozer)	68	HR	*30.74* 2,100.57	*41.44* 2,831.55	*41.44* 2,831.55	*53.67* 3,667.70	*53.67* 3,667.70
MIL X-LABORER Outside Laborers, (Semi-Skilled)	205	HR	*18.36* 3,763.80	*25.00* 5,124.22	*25.00* 5,124.22	*32.38* 6,637.38	*32.38* 6,637.38
02 Place and Compact	**10,250**	**CY**	*1.57* **16,067.66**	*1.91* **19,572.53**	*1.91* **19,572.53**	*2.47* **25,352.25**	*2.47* **25,352.25**
MIL 023153105900 Compaction, of backfill, structural, 6" lifts, self propelled roller	10,250	ECY	*0.88* 8,971.98	*1.09* 11,163.35	*1.09* 11,163.35	*1.41* 14,459.86	*1.41* 14,459.86
MIL 023153109000 Water for compaction, 3000 gallon truck, 3 mile haul	10,250	ECY	*0.69* 7,095.68	*0.82* 8,409.18	*0.82* 8,409.18	*1.06* 10,892.39	*1.06* 10,892.39

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
Project Indirect Summary			**3,752,393.08**	**532,442.43**	**342,786.84**	**43,208.65**	**189,635.74**	**1,121,639.97**	**4,860,466.75**
			3,752,393.08						*4,860,466.75*
Bid Schedule	**1**	**EA**	**3,752,393.08**	**532,442.43**	**342,786.84**	**43,208.65**	**189,635.74**	**1,121,639.97**	**4,860,466.75**
			48,901.59						*63,342.12*
01 Diversion and Control of Water	**1**	**EA**	**48,901.59**	**6,938.85**	**4,467.23**	**563.10**	**2,471.35**	**14,695.87**	**63,342.12**
(Note: Assume that dewatering will be required for one month. Account for 1 pump tender and 1 laborer to locate or relocate the pump within the pumping zone) EQOPRLT (Foreman), LABORER, P60Z5405, Productivity = 0.014 mon/hr)									
			200.00						*259.06*
01 K-rails	**100**	**EA**	**20,000.00**	**2,837.88**	**1,827.03**	**230.30**	**1,010.75**	**5,905.96**	**25,905.96**
(Note: (32" (h) x 20' (L)) Assume 2000 lf for both sides of the drainage ditch. Therefore, we need a total of 100 K-rails.)									
			10.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*12.95*
USR 01 Precast Concrete Barricades	2,000	LF	20,000.00	2,837.88	1,827.03	230.30	1,010.75	5,905.96	25,905.96
			28,901.59						*37,436.17*
02 Pump Water	**1**	**EA**	**28,901.59**	**4,100.96**	**2,640.20**	**332.80**	**1,460.61**	**8,789.91**	**37,436.17**
(Note: Assume the pump will work 75% of the time for a whole month. Then, 30 days/mon x 24 hours/day x 0.75 = 540 hours. The pump tender and laborer will work 40% of the time. Then, 30 x 24 x 0.40 = 288 hours.)									
			42.73	*28.38*	*16.00*	*1.87*	*8.12*	*30.82*	*55.35*
MIL X-EQOPRLT Outside Equip. Operators, Light (Pump Tender)	288	HR	12,305.99	1,746.15	1,124.17	141.70	621.91	3,792.64	15,939.92
			25.00	*28.38*	*16.00*	*1.87*	*8.12*	*30.87*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	288	HR	7,198.90	1,021.48	657.63	82.90	363.81	2,222.45	9,324.72
			17.40	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*22.54*
GEN P60Z5405 PUMP, WATER, CENTRIFUGAL, DEWATERING, WHEEL, ENGINE DRIVE, 4" (102 MM) DIA, 570 GPM (2,158 LPM) @ 40' (12.2 M) HEAD (ADD HOSES)	540	HR	9,396.70	1,333.34	858.40	108.20	474.88	2,774.83	12,171.53
			6,620.62						*8,575.68*
02 Clear Site and Remove Obstructions, All Areas (Except Diversion Channel)	**10**	**ACR**	**66,206.24**	**9,394.27**	**6,048.04**	**762.36**	**3,345.88**	**19,826.32**	**85,756.80**
			3,949.75	*28.38*	*16.00*	*1.87*	*8.12*	*30.28*	*5,116.10*
MIL 022301000152 Clear and grub, cut and chip, medium trees, to 10" diameter	3	ACR	9,874.37	1,401.11	902.04	113.70	499.02	2,989.84	12,790.25
(Note: Assume 1/4 of the total acreage will need to be cleared and grubbed. Then, 10 acres x 1/4 = 2.5 acre.)									
			834.91	*28.38*	*16.00*	*1.87*	*8.12*	*29.98*	*1,081.46*
AF 022302001060 Selective clearing, dry clearing, medium size brush, average grub and trees, excludes removal offsite	3	ACR	2,087.28	296.17	190.68	24.03	105.49	625.81	2,703.65
			17.57	*28.38*	*16.00*	*1.87*	*8.12*	*30.37*	*22.75*

Currency in US dollars

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
MIL 022302002000 Selective clearing, load spoils, by machine, includes 2 mile haul to dump	1,305	CY	22,924.60	3,252.86	2,094.20	263.98	1,158.55	6,961.94	29,694.18
(Note: Assume 1 truck-load for every 1,000 sf. Say 12 CY/1,000 SF = 0.012 cy/sf --> 2.5 acres x 43,560 sf/acr x 0.012 cy/sf = 1305 cy)									
			24.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*31.09*
USR Disposal Fee	1,305	CY	31,320.00	4,444.12	2,861.13	360.65	1,582.83	9,248.73	40,568.73
			7.50						*9.71*
03 Removal, Stockpile, Salvage and Disposal of the Exist. 15" Stone/Riprap Protection, 6" Bedding Material and Filter Fabric, and Gabion Mattress, Levee Sta. 103+00.00 to Sta. 152+00.00 and RCB Culvert	**7,425**	**CY**	**55,687.50**	**7,901.73**	**5,087.14**	**641.24**	**2,814.29**	**16,444.40**	**72,131.90**
(Note: Former quantity = 5600 cy. New quantity = 7425 cy (08/15/07) Production: 10 cy/hr per truck Hours needed = 742.5 hours Assume a truck fleet of 20 @ $75/hr (for truck+driver). Then, 742.5 hours x $75.00 = $55,688)									
			75.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*97.15*
USR Trucking Cost	743	HR	55,687.50	7,901.73	5,087.14	641.24	2,814.29	16,444.40	72,131.90
			536.10						*694.41*
04 Reconstruction of Existing Concrete/Earthen Irrigation Canals (CIC/EIC)	**40**	**HR**	**21,444.04**	**3,042.78**	**1,958.95**	**246.93**	**1,083.72**	**6,449.47**	**27,776.42**
(Note: Allow 40 hours for this crew to do reconstruction and relocation of CIC and EIC. According to the designer, there will be a max of 10 cy of concrete needed.)									
			107.86	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*139.72*
MAP H25CA027 HYDRAULIC EXCAVATOR, CRAWLER, 75,700 LBS, 2.09 CY BUCKET, 21.58' MAX DIGGING DEPTH	40	HR	4,314.54	612.21	394.14	49.68	218.05	1,274.07	5,588.61
			22.06	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*28.57*
GEN L50Z4640 LOADER / BACKHOE, WHEEL, 0.80 CY (0.6M3) FRONT END BUCKET, 9.8' (3.0M) DEPTH OF HOE, 24" (0.61M) DIPPER, 4X4	40	HR	882.41	125.21	80.61	10.16	44.59	260.57	1,142.99
			58.81	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*76.18*
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	40	HR	2,352.57	333.82	214.91	27.09	118.89	694.71	3,047.28
			32.39	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*41.95*
EP R30BO006 ROLLER, STATIC, SELF-PROPELLED, SMOOTH DRUM, DOUBLE DRUM, 10 TON, 50" WIDE ASPHALT COMPACTOR	40	HR	1,295.45	183.82	118.34	14.92	65.47	382.54	1,677.99
			72.19	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*93.51*
GEN T60Z7910 TRUCK, WATER, OFF-HIGHWAY, 5,000 GAL (18,927 L), W/175 HP (130 KW) TRACTOR	20	HR	1,443.77	204.86	131.89	16.62	72.96	426.34	1,870.11
(Note: allow half the time for the water truck.)									
			41.44	*28.38*	*16.00*	*1.87*	*8.12*	*30.81*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (3 men)	120	HR	4,972.47	705.56	454.24	57.26	251.30	1,531.89	6,440.83

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
			44.25	*28.38*	*16.00*	*1.87*	*8.12*	*30.83*	*57.31*
MIL X-EQOPRMED Outside Equip. Operators, Medium	40	HR	1,769.83	251.13	161.68	20.38	89.44	545.68	2,292.45
			35.33	*28.38*	*16.00*	*1.87*	*8.12*	*30.74*	*45.76*
MIL X-EQOPROIL Outside Equip. Oilers	40	HR	1,413.16	200.52	129.09	16.27	71.42	434.39	1,830.47
			25.00	*28.38*	*16.00*	*1.87*	*8.12*	*30.87*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled) (checker/grader)	40	HR	999.85	141.87	91.34	11.51	50.53	308.67	1,295.10
			200.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*259.06*
MIL 033102200150 Structural concrete, ready mix, normal weight, 3000 psi, includes material only	10	CY	2,000.00	283.79	182.70	23.03	101.07	590.60	2,590.60
			409.95						*531.01*
05 Seal Existing 18" CMP's and RCP's, with Controlled Low Strength Material (CLSM), Levee	**35**	**CY**	**14,348.39**	**2,035.95**	**1,310.75**	**165.22**	**725.13**	**4,377.97**	**18,585.44**
(Note: Productivity = 1cy/hr Hours needed = 20 hours. Allow 3 laborers.)									
			110.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*142.48*
USR Control Slow Strength Material	35	CY	3,850.00	546.29	351.70	44.33	194.57	1,136.90	4,986.90
			25.00	*28.38*	*16.00*	*1.87*	*8.12*	*30.87*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	420	HR	10,498.39	1,489.66	959.04	120.89	530.56	3,241.08	13,598.54
			18.33						*23.75*
06 Stripping and Disposal of 6" Topsoil, Levees and Dikes and Dention Basin	**4,920**	**CY**	**90,194.27**	**12,798.03**	**8,239.38**	**1,038.58**	**4,558.17**	**26,815.30**	**116,828.44**
(Note: Former quantity = 2,500 cy. New quantity = 4,920 cy (08/17/07) Assume disposal site is 10-mile radius, per designer.)									
			41.44	*28.38*	*16.00*	*1.87*	*8.12*	*30.81*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (1 for dozer, 1 for loader)	197	HR	8,154.85	1,157.13	744.96	93.90	412.12	2,512.30	10,562.97
			25.00	*28.38*	*16.00*	*1.87*	*8.12*	*30.87*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	98	HR	2,459.62	349.01	224.69	28.32	124.30	759.34	3,185.94
			135.95	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*176.10*
GEN T15Z6520 TRACTOR, CRAWLER (DOZER), 181-250 HP (135-186 KW), POWERSHIFT, LGP, W/UNIVERSAL BLADE	98	HR	13,377.64	1,898.21	1,222.07	154.04	676.07	3,950.39	17,328.03
			94.01	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*121.77*
GEN L35Z4260 LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	98	HR	9,250.21	1,312.55	845.02	106.52	467.48	2,731.57	11,981.77
			46.15	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*59.77*
GEN T50Z7580 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	98	HR	4,540.81	644.31	414.81	52.29	229.48	1,340.89	5,881.71
			32.63	*28.38*	*16.00*	*1.87*	*8.12*	*30.90*	*42.27*
MIL X-TRKDVRHV Outside Truck Drivers, Heavy	98	HR	3,211.13	455.64	293.34	36.98	162.28	992.16	4,159.37

Currency in US dollars

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
			10.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*12.95*
USR Disposal Fee	4,920	CY	49,200.00	6,981.19	4,494.50	566.54	2,486.43	14,528.65	63,728.65
			11.73						*15.20*
07 Compacted Fill, Levee, Detention Basin and Dikes	**42,540**	**CY**	**499,105.81**	**70,820.17**	**45,594.08**	**5,747.18**	**25,223.45**	**148,398.92**	**646,490.69**
(Note: Former quantity = 29,560 cy. New quantity = 42,540 cy.)									
			9.82						*12.72*
01 Load and Haul	**42,540**	**CY**	**417,875.05**	**59,294.00**	**38,173.52**	**4,811.81**	**21,118.27**	**123,983.36**	**541,272.65**
			66.42	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*86.04*
GEN L40Z4397 LOADER, FRONT END, WHEEL, ARTICULATED, 3.25 CY (2.5 M3) BUCKET, 4X4	284	HR	18,837.08	2,672.87	1,720.80	216.91	951.97	5,562.55	24,399.63
			157.62	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*204.16*
MAP T15CA016 TRACTOR, CRAWLER (DOZER), 310 HP, POWERSHIFT, W/15.3 CY SEMI-U BLADE (ADD ATTACHMENTS)	284	HR	44,699.77	6,342.63	4,083.39	514.72	2,259.00	13,199.75	57,899.52
			41.44	*28.38*	*16.00*	*1.87*	*8.12*	*30.81*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Loader)	284	HR	11,751.61	1,667.48	1,073.53	135.32	593.89	3,620.37	15,221.84
			41.44	*28.38*	*16.00*	*1.87*	*8.12*	*30.81*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Dozer)	284	HR	11,751.61	1,667.48	1,073.53	135.32	593.89	3,620.37	15,221.84
			25.00	*28.38*	*16.00*	*1.87*	*8.12*	*30.87*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	851	HR	21,266.74	3,017.63	1,942.75	244.89	1,074.76	6,565.49	27,546.77
			137.65	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*178.29*
USR 1 trkdriver + 1 truck, 16 - 23.5 cy per load	2,249	HR	309,568.24	43,925.91	28,279.53	3,564.67	15,644.74	91,414.84	400,983.07
(Note: Reference for Unit Labor Cost, see Excel Spreadsheet file: "Hauling Cost for TresRios Ph 1B.xls" [08/08/07])									
			1.91						*2.47*
02 Place and Compact	**42,540**	**CY**	**81,230.76**	**11,526.17**	**7,420.55**	**935.37**	**4,105.18**	**24,415.56**	**105,218.03**
			1.09	*28.38*	*16.00*	*1.87*	*8.12*	*30.07*	*1.41*
MIL 023153105900 Compaction, of backfill, structural, 6" lifts, self propelled roller	42,540	ECY	46,330.62	6,574.04	4,232.37	533.50	2,341.42	13,933.74	60,011.95
			0.82	*28.38*	*16.00*	*1.87*	*8.12*	*30.03*	*1.06*
MIL 023153109000 Water for compaction, 3000 gallon truck, 3 mile haul	42,540	ECY	34,900.15	4,952.12	3,188.18	401.87	1,763.76	10,481.82	45,206.08
			39.80						*51.55*
08 4" Rock Mulch Protection, Levee, Access Ramp and Detention Basin	**2,120**	**TON**	**84,375.60**	**11,972.40**	**7,707.84**	**971.58**	**4,264.11**	**24,933.73**	**109,291.53**

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
(Note: Former quantity = 1,500 tons (06/28/07). New quantity = 2,120 tons. (08/17/07) Item Description is changed to "4-inch" instead of "2-inch". Bid Abstract Info from Tres Rios Ph 1A (07/14/2005): Quantity required: 1,223 CY (1) GE = $58.00 (2) TPA-CKY = $65.00 (3) Macro-Z = $105.00 (4) Hal Hays = $75.00 (5) Miramar = $78.50 (6) MRM = $146.00 Average w/o GE = $93.90. Average w/ GE = $87.92)									
			32.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*41.45*
USR Rock cost	2,120	TON	67,840.00	9,626.10	6,197.29	781.17	3,428.45	20,033.01	87,873.01
			1.12	*28.38*	*16.00*	*1.87*	*8.12*	*30.58*	*1.45*
USR 029105001200JD 4" Rock placement (1.4 ton/cy)	1,514	CY	1,695.60	240.60	154.90	19.52	85.69	518.50	2,196.30
(Note: 1,500 ton / 1.4 ton/cy = 1,071 cy)									
			7.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*9.07*
USR Trucking Cost	2,120	TON	14,840.00	2,105.71	1,355.66	170.88	749.97	4,382.22	19,222.22
(Note: Quoted from Pioneer Sand Co., (480) 833-0441 (Ken))									
			129.67						*167.96*
09 Grout and Asphalt Protection, New Levee, Landing Area, RCB Culvert and Detention Basin	**300**	**CY**	**38,900.99**	**5,519.82**	**3,553.66**	**447.94**	**1,965.95**	**11,517.67**	**50,388.36**
(Note: Per designer, the grout protection is for the riprap at RCB Culvert, and the asphalt is used for the road surface. Productivity: 20 cy/hr Hours needed = 15 hours. (let's give them 16 hours))									
			39.92	*28.38*	*16.00*	*1.87*	*8.12*	*30.79*	*51.71*
MIL X-EQOPRLT Outside Equip. Operators, Light	16	HR	638.73	90.63	58.35	7.35	32.28	196.68	827.35
			27.80	*28.38*	*16.00*	*1.87*	*8.12*	*30.91*	*36.02*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	16	HR	444.87	63.12	40.64	5.12	22.48	137.49	576.24
			25.00	*28.38*	*16.00*	*1.87*	*8.12*	*30.87*	*32.38*
MIL B-LABORER Laborers (3)	48	HR	1,199.82	170.25	109.61	13.82	60.64	370.41	1,554.12
			38.60	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*50.00*
EP C55MO003 CONCRETE PUMP, 50 CY/HR, TRAILER MTD	16	HR	617.56	87.63	56.42	7.11	31.21	182.37	799.93
			120.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*155.44*
MIL 040607500300 Sand (ready-mix), screened and washed, includes 30 mile haul	300	CY	36,000.00	5,108.19	3,288.66	414.54	1,819.34	10,630.72	46,630.72
			50.75						*65.74*
10 15" & 27" Stone Protection, New Levee, Landing Area, RCB Culvert and Detention Basin	**2,400**	**TON**	**121,808.50**	**17,283.91**	**11,127.39**	**1,402.62**	**6,155.87**	**35,981.88**	**157,778.29**
(Note: Quantity is changed from 45 ton to 50 tons [06/28/07] New quantity = 2400 tons. (08/17/07))									
			50.00						*64.76*
01 Stone Price and Transportation	**2,400**	**TON**	**120,000.00**	**17,027.29**	**10,962.18**	**1,381.80**	**6,064.47**	**35,435.74**	**155,435.74**
			50.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*64.76*
USR 01 Stone Price and Transporation	2,400	TON	120,000.00	17,027.29	10,962.18	1,381.80	6,064.47	35,435.74	155,435.74
			0.75						*0.98*
02 Stone Placement	**2,400**	**TON**	**1,808.50**	**256.62**	**165.21**	**20.82**	**91.40**	**546.14**	**2,342.55**

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
(Note: Productivity = 120 ton/hr Needed hours = 2 (let's allow 4 hours))									
			107.86	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*139.72*
MAP H25CA027 HYDRAULIC EXCAVATOR, CRAWLER, 75,700 LBS, 2.09 CY BUCKET, 21.58' MAX DIGGING DEPTH	4	HR	431.45	61.22	39.41	4.97	21.80	127.41	558.86
			93.21	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*120.73*
EP L40CA014 LOADER, WHEEL, INTEGRATED TOOL CARRIER, 4.25 CY LOADER; 13,670 LB @ 12.42' HIGH, FORK LIFT, OR 5,040 LB @ 22.67' HIGH, MATERIAL HANDLING ARM	4	HR	372.82	52.90	34.06	4.29	18.84	110.09	482.92
			0.00	*28.38*	*16.00*	*1.87*	*8.12*	*0.00*	*0.00*
MAP T50XX002 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X2	4	HR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			41.44	*28.38*	*16.00*	*1.87*	*8.12*	*30.81*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium	8	HR	331.50	47.04	30.28	3.82	16.75	102.13	429.39
			28.93	*28.38*	*16.00*	*1.87*	*8.12*	*30.86*	*37.47*
MIL X-TRKDVRLT Outside Truck Drivers, Light	4	HR	115.71	16.42	10.57	1.33	5.85	35.70	149.87
			51.96	*28.38*	*16.00*	*1.87*	*8.12*	*30.64*	*67.31*
MIL B-RODMAN Rodmen	8	HR	415.71	58.99	37.98	4.79	21.01	127.37	538.46
			35.33	*28.38*	*16.00*	*1.87*	*8.12*	*30.74*	*45.76*
MIL X-EQOPROIL Outside Equip. Oilers	4	HR	141.32	20.05	12.91	1.63	7.14	43.44	183.05
			43.55						*56.42*
11 Bedding Materials, Levee and Dikes (Assume 4" Thick)	**2,250**	**CY**	**97,996.27**	**13,905.09**	**8,952.11**	**1,128.42**	**4,952.46**	**29,307.52**	**126,934.36**
(Note: Designer: "Bedding Materials are natural soils (4" thick). The purpose of using 4" bedding layer is to protect geotextile fabric from tearing apart caused by placing 15" riprap." Former quantity = 2,250 cy. New quantity = 3,220 cy (08/15/07))									
			4.84						*6.27*
Base Preparation	**20,250**	**SY**	**97,996.27**	**13,905.09**	**8,952.11**	**1,128.42**	**4,952.46**	**29,307.52**	**126,934.36**
(Note: Base preparation assumed to be performed with grader with toothed blade, compacted, and covered)									
			2.34						*3.03*
03 Scarify & Compact	**20,250**	**SY**	**47,415.58**	**6,727.99**	**4,331.49**	**545.99**	**2,396.25**	**14,297.10**	**61,417.30**
			2.34	*28.38*	*16.00*	*1.87*	*8.12*	*30.15*	*3.03*
USR 02340500Channel Soil stabilization for base, 4" deep, includes scarifying and compaction	20,250	SY	47,415.58	6,727.99	4,331.49	545.99	2,396.25	14,297.10	61,417.30
(Note: CSI Task 023405002020 without lime stabilization Crew modified as B74C)									
			22.48						*29.12*
4" Bedding	**2,250**	**CY**	**50,580.69**	**7,177.10**	**4,620.62**	**582.43**	**2,556.21**	**15,010.42**	**65,517.06**

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
			18.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*23.32*
USR Bedding material	2,250	CY	40,500.00	5,746.71	3,699.74	466.36	2,046.76	11,959.56	52,459.56
			37.87	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*49.05*
GEN L40Z4390 LOADER, FRONT END, WHEEL, ARTICULATED, 1.75 CY (1.3 M3) BUCKET, 4X4	40	HR	1,514.80	214.94	138.38	17.44	76.55	447.32	1,962.12
			42.88	*28.38*	*16.00*	*1.87*	*8.12*	*30.82*	*55.55*
RSM B-EQOPRCRN Equip. Operators	80	HR	3,430.69	486.79	313.40	39.50	173.38	1,057.37	4,443.76
			27.17	*28.38*	*16.00*	*1.87*	*8.12*	*30.90*	*35.20*
RSM B-SKILLWKR Skilled Workers	80	HR	2,173.81	308.45	198.58	25.03	109.86	671.68	2,815.74
			74.03	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*95.90*
GEN R45Z5690 ROLLER, VIBRATORY, SELF-PROPELLED, DOUBLE DRUM, SMOOTH, 12 TON (10.9 MT), 67" (1.7 M) WIDE, ASPHALT COMPACTOR	40	HR	2,961.39	420.20	270.53	34.10	149.66	874.49	3,835.88
			1.43						*1.86*
12 Filter Fabric, Levee and Dikes, and Access Ramps	**20,880**	**SY**	**29,953.70**	**4,250.25**	**2,736.32**	**344.92**	**1,513.78**	**8,962.78**	**38,798.97**
(Note: Former quantity = 16,350 SY. New quantity = 20,880 SY (08/15/07) Productivity = 300 sy/hr Hours needed = 20,880 / 300 = 70 hours.)									
			1.43	*28.38*	*16.00*	*1.87*	*8.12*	*29.92*	*1.86*
CIV 023403001600 Geotextile Filter Fabric, non-woven polypropylene, 60 mils thick	20,880	SY	29,953.70	4,250.25	2,736.32	344.92	1,513.78	8,962.78	38,798.97
			43.06						*55.78*
13 3" ABC, O&M Roads and Turn-Arounds / Landing Area	**2,900**	**TON**	**124,882.36**	**17,720.07**	**11,408.19**	**1,438.02**	**6,311.21**	**37,062.10**	**161,759.85**
(Note: Former quantity = 2,500 tons. New quantity = 2,900 tons (08/15/07) Designer: "Two locations (one on top of the levee and other at toe of levee)")									
			35.00						*45.34*
01 Rock Price and Transportation	**2,900**	**TON**	**101,500.00**	**14,402.25**	**9,272.18**	**1,168.77**	**5,129.53**	**29,972.73**	**131,472.73**
			35.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*45.34*
USR 01 Material Price and Transportation Cost	2,900	TON	101,500.00	14,402.25	9,272.18	1,168.77	5,129.53	29,972.73	131,472.73
			8.06						*10.44*
02 Placement	**2,900**	**TON**	**23,382.36**	**3,317.82**	**2,136.01**	**269.25**	**1,181.68**	**7,089.36**	**30,287.12**
(Note: Productivity = 200 ton/hr Hours needed = 2,100 / 200 = 11 hours (let's allow 24 hours at each location, totaling to 48 hours))									
			58.81	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*76.18*
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	60	HR	3,528.86	500.72	322.37	40.63	178.34	1,042.06	4,570.92
			32.39	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*41.95*
EP R30BO006 ROLLER, STATIC, SELF-PROPELLED, SMOOTH DRUM, DOUBLE DRUM, 10 TON, 50" WIDE ASPHALT COMPACTOR	60	HR	1,943.17	275.72	177.51	22.38	98.20	573.81	2,516.98

Currency in US dollars

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
			5.15	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*6.67*
MAP T40RS002 TRUCK OPTIONS, WATER TANK, 3,000 GAL (ADD 40,000 GVW TRUCK)	60	HR	309.03	43.85	28.23	3.56	15.62	91.25	400.28
			46.15	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*59.77*
GEN T50Z7580 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	60	HR	2,768.79	392.87	252.93	31.88	139.93	817.62	3,586.41
			0.00	*28.38*	*16.00*	*1.87*	*8.12*	*0.00*	*0.00*
MAP T50XX002 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X2	60	HR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			41.44	*28.38*	*16.00*	*1.87*	*8.12*	*30.81*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (2 graders)	120	HR	4,972.47	705.56	454.24	57.26	251.30	1,531.89	6,440.83
			41.44	*28.38*	*16.00*	*1.87*	*8.12*	*30.81*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (1 roller)	60	HR	2,486.24	352.78	227.12	28.63	125.65	765.94	3,220.42
			25.00	*28.38*	*16.00*	*1.87*	*8.12*	*30.87*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	60	HR	1,499.77	212.81	137.01	17.27	75.79	463.01	1,942.65
			44.25	*28.38*	*16.00*	*1.87*	*8.12*	*30.83*	*57.31*
MIL X-EQOPRMED Outside Equip. Operators, Medium	60	HR	2,654.74	376.69	242.51	30.57	134.16	818.53	3,438.68
			51.96	*28.38*	*16.00*	*1.87*	*8.12*	*30.64*	*67.31*
MIL B-RODMAN Rodmen, (grade checker)	60	HR	3,117.80	442.40	284.82	35.90	157.57	955.27	4,038.48
			0.05	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*0.06*
USR Water Cost	2,030	GAL	101.50	14.40	9.27	1.17	5.13	29.97	131.47
			12.70						*16.45*
14 Four-Wire R/W Fence	**5,350**	**LF**	**67,951.36**	**9,641.90**	**6,207.46**	**782.46**	**3,434.08**	**20,344.70**	**88,017.25**
(Note: 4' H, 10' oc, Production = 80 lf/hr Hours needed = 5350 / 80 = 67 hours)									
			12.70	*28.38*	*16.00*	*1.87*	*8.12*	*29.94*	*16.45*
MIL 028201306540 Chain link fence, industrial, galvanized, 9 ga. mesh, 1-5/8" top rail, 4' high, posts in concrete, excludes excavation	5,350	LF	67,951.36	9,641.90	6,207.46	782.46	3,434.08	20,344.70	88,017.25
			980.45						*1,269.97*
15 14' Wide Double Swing Gate	**4**	**EA**	**3,921.79**	**556.48**	**358.26**	**45.16**	**198.20**	**1,177.10**	**5,079.88**
(Note: Quantity is changed from 3 EA to 4 EA on 06/28/07. Quantity is changed from 4 EA to 3 EA on 08/15/07.)									
			980.45	*28.38*	*16.00*	*1.87*	*8.12*	*30.01*	*1,269.97*
MIL 028201507125 Gates, swing, chain link, without barbed wire, double, galvanized, 4' high, 12' wide, excludes excavation	4	EA	3,921.79	556.48	358.26	45.16	198.20	1,177.10	5,079.88
			29.72						*38.49*
16 27" Riprap Slope Protection, Dikes	**560**	**TON**	**16,641.30**	**2,361.30**	**1,520.21**	**191.62**	**841.01**	**4,933.71**	**21,555.44**

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
(Note: Riprap source: approx. 2 miles away)									
			24.00						*31.09*
01 Stone Price and Transportation	**560**	**TON**	**13,440.00**	**1,907.06**	**1,227.76**	**154.76**	**679.22**	**3,968.80**	**17,408.80**
			24.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*31.09*
USR 01 Stone Price and Transportation	560	TON	13,440.00	1,907.06	1,227.76	154.76	679.22	3,968.80	17,408.80
			5.72						*7.40*
02 Stone Placement	**560**	**TON**	**3,201.30**	**454.25**	**292.44**	**36.86**	**161.78**	**964.91**	**4,146.64**
(Note: Productivity = 100 ton/hr Needed hour = 8)									
			107.86	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*139.72*
MAP H25CA027 HYDRAULIC EXCAVATOR, CRAWLER, 75,700 LBS, 2.09 CY BUCKET, 21.58' MAX DIGGING DEPTH	8	HR	862.91	122.44	78.83	9.94	43.61	254.81	1,117.72
			93.21	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*120.73*
EP L40CA014 LOADER, WHEEL, INTEGRATED TOOL CARRIER, 4.25 CY LOADER; 13,670 LB @ 12.42' HIGH, FORK LIFT, OR 5,040 LB @ 22.67' HIGH, MATERIAL HANDLING ARM	8	HR	745.65	105.80	68.12	8.59	37.68	220.19	965.83
			0.00	*28.38*	*16.00*	*1.87*	*8.12*	*0.00*	*0.00*
MAP T50XX002 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X2	8	HR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			41.44	*28.38*	*16.00*	*1.87*	*8.12*	*30.81*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium	16	HR	663.00	94.08	60.57	7.63	33.51	204.25	858.78
			28.93	*28.38*	*16.00*	*1.87*	*8.12*	*30.86*	*37.47*
MIL X-TRKDVRLT Outside Truck Drivers, Light	8	HR	231.41	32.84	21.14	2.66	11.69	71.41	299.75
			51.96	*28.38*	*16.00*	*1.87*	*8.12*	*30.64*	*67.31*
MIL B-RODMAN Rodmen	8	HR	415.71	58.99	37.98	4.79	21.01	127.37	538.46
			35.33	*28.38*	*16.00*	*1.87*	*8.12*	*30.74*	*45.76*
MIL X-EQOPROIL Outside Equip. Oilers	8	HR	282.63	40.10	25.82	3.25	14.28	86.88	366.09
			6.41						*8.30*
17 Excavation and Spreading Excavated Materials for Gabion Mattresses, Levees and Dikes	**7,980**	**CY**	**51,140.11**	**7,256.48**	**4,671.73**	**588.88**	**2,584.48**	**15,220.17**	**66,241.67**
			6.41						*8.30*
01 Excavation and spreading	**7,980**	**CY**	**51,140.11**	**7,256.48**	**4,671.73**	**588.88**	**2,584.48**	**15,220.17**	**66,241.67**
(Note: Productivity = 300 cy/hr Hours needed = 27 hours)									
			342.03	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*443.03*
MAP S20CA005 SCRAPER, TANDEM POWERED, STANDARD LOADING, 44 CY, 52 TON, 4X4, D-11 ASSISTED LOADING	108	HR	36,939.52	5,241.50	3,374.48	425.36	1,866.82	10,908.16	47,847.68

Currency in US dollars

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
(Note: 4 pieces of equipment x 27 hours = 108 hours)									
			113.36	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*146.84*
GEN T60Z7910 TRUCK, WATER, OFF-HIGHWAY, 5,000 GAL (18,927 L), W/175 HP (130 KW) TRACTOR	27	HR	3,060.85	434.32	279.61	35.25	154.69	903.86	3,964.71
(Note: This cost item includes water truck and driver costs.)									
			0.00	*28.38*	*16.00*	*1.87*	*8.12*	*0.00*	*0.00*
MAP T50XX005 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X4	27	HR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			44.25	*28.38*	*16.00*	*1.87*	*8.12*	*30.83*	*57.31*
MIL X-EQOPRMED Outside Equip. Operators, Medium (1 for scraper, 1 for dozer)	54	HR	2,389.26	339.02	218.26	27.51	120.75	736.67	3,094.81
			25.00	*28.38*	*16.00*	*1.87*	*8.12*	*30.87*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	27	HR	674.90	95.76	61.65	7.77	34.11	208.35	874.19
			28.93	*28.38*	*16.00*	*1.87*	*8.12*	*30.86*	*37.47*
MIL X-TRKDVRLT Outside Truck Drivers, Light	27	HR	781.01	110.82	71.35	8.99	39.47	241.01	1,011.64
			39.92	*28.38*	*16.00*	*1.87*	*8.12*	*30.79*	*51.71*
MIL X-EQOPRLT Outside Equip. Operators, Light	135	HR	5,389.30	764.71	492.32	62.06	272.36	1,659.49	6,980.75
(Note: Let's allow 5 operators here. Then, 5 x 27 = 135 hours)									
			4.73	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*6.13*
MAP T10CA007 TRACTOR ATTACHMENTS, BLADE, POWER ANGLE, HYDRAULIC, FOR D5, 2.53 CY (ADD D5 TRACTOR)	27	HR	127.69	18.12	11.66	1.47	6.45	37.71	165.39
			6.31	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*8.18*
MAP T10CA008 TRACTOR ATTACHMENTS, POWER WINCH, FOR D5 (ADD D5 TRACTOR)	27	HR	170.46	24.19	15.57	1.96	8.61	50.34	220.79
			40.18	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*52.04*
USR T15CS005 TRACTOR, CRAWLER (DOZER), 75 HP, POWERSHIFT, W/2.50 CY UNIVERSAL BLADE (ADD ATTACHMENTS)	40	HR	1,607.12	228.04	146.81	18.51	81.22	474.58	2,081.70
			92.02						*119.20*
18 12" Gabion Mattress Scour Apron, Levee and Dikes	**7,800**	**TON**	**717,792.87**	**101,850.57**	**65,571.48**	**8,265.36**	**36,275.30**	**214,566.07**	**929,755.57**
(Note: Former quantity = 6440 ton. New quantity = 7800 ton (08/15/07))									
			49.08	*28.38*	*16.00*	*1.87*	*8.12*	*29.89*	*63.57*
MIL 023704500600 Gabions, galvanized steel mesh mats or boxes, stone filled, 12" deep	14,625	SY	717,792.87	101,850.57	65,571.48	8,265.36	36,275.30	214,566.07	929,755.57

(Note: Assume the gabion is laid for 12" deep, and we use the conversion factor of 1.575 ton/ccy (for in-fill average riprap rock). Then, 7800 ton / 1.6 ton/cy / 12" = 14,625 sy. Per ITR Review comments, reduced crew productivity from 19.125 sy/hr to 15 sy/hr, and increased material cost from $21.07/sy to $30.00/sy.)

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
			6.21						*8.04*
19 Interior Drainage Excavation, Collector Channel & RCB Culvert	**35,100**	**CY**	**217,818.37**	**30,907.14**	**19,898.04**	**2,508.17**	**11,007.95**	**64,767.80**	**282,139.67**
(Note: Quantity is changed from 14,600 cy to 25,000 cy. [06/28/07] (Productivity = 300 cy/hr) New quantity = 35,100 cy (08/17/07) Productivity: 35,100 / 300 = 117 hours.)									
			342.03	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*443.03*
MAP S20CA005 SCRAPER, TANDEM POWERED, STANDARD LOADING, 44 CY, 52 TON, 4X4, D-11 ASSISTED LOADING	468	HR	160,071.25	22,713.17	14,622.75	1,843.21	8,089.57	47,268.70	207,339.95
(Note: 4 pieces of equipment x 117 hours = 468 hours)									
			0.00	*28.38*	*16.00*	*1.87*	*8.12*	*0.00*	*0.00*
MAP T10CA014 TRACTOR ATTACHMENTS, BLADE, POWER ANGLE, HYDRAULIC, FOR D7, 5.08 CY (ADD D7 TRACTOR)	117	HR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			82.43	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*106.77*
MAP T15CA008 TRACTOR, CRAWLER (DOZER), 145 HP, POWERSHIFT, W/5.60 CY SEMI-U BLADE (ADD ATTACHMENTS)	117	HR	9,644.12	1,368.44	881.01	111.05	487.39	2,847.89	12,492.01
			113.36	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*146.84*
GEN T60Z7910 TRUCK, WATER, OFF-HIGHWAY, 5,000 GAL (18,927 L), W/175 HP (130 KW) TRACTOR	117	HR	13,263.68	1,882.04	1,211.66	152.73	670.31	3,916.74	17,180.42
(Note: This cost item includes water truck and driver costs.)									
			0.00	*28.38*	*16.00*	*1.87*	*8.12*	*0.00*	*0.00*
MAP T50XX005 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X4	117	HR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			44.25	*28.38*	*16.00*	*1.87*	*8.12*	*30.83*	*57.31*
MIL X-EQOPRMED Outside Equip. Operators, Medium	117	HR	5,176.74	734.55	472.90	59.61	261.62	1,596.13	6,705.42
			25.00	*28.38*	*16.00*	*1.87*	*8.12*	*30.87*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	117	HR	2,924.55	414.98	267.16	33.68	147.80	902.87	3,788.17
			28.93	*28.38*	*16.00*	*1.87*	*8.12*	*30.86*	*37.47*
MIL X-TRKDVRLT Outside Truck Drivers, Light	117	HR	3,384.39	480.22	309.17	38.97	171.04	1,044.36	4,383.79
			39.92	*28.38*	*16.00*	*1.87*	*8.12*	*30.79*	*51.71*
MIL X-EQOPRLT Outside Equip. Operators, Light	585	HR	23,353.64	3,313.74	2,133.39	268.92	1,180.23	7,191.12	30,249.92
(Note: Let's allow 5 operators here. Then, 5 x 117 = 585 hours)									
			6.09						*7.88*
20 Interior Drainage Structural Compaction, Collector Channel, Detention Basin & RCB Culvert	**4,000**	**CY**	**24,349.39**	**3,455.03**	**2,224.35**	**280.38**	**1,230.55**	**7,321.38**	**31,539.71**
(Note: Quantity is changed from 1150 cy to 1500 cy [06/28/07] New quantity = 4,000 cy (08/15/07))									

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
			4.18						*5.41*
01 Load and Haul	**4,000**	**CY**	**16,711.33**	**2,371.24**	**1,526.61**	**192.43**	**844.55**	**5,025.61**	**21,646.15**
			81.59	*28.38*	*16.00*	*1.87*	*8.12*	*30.08*	*105.69*
RSM COEIB34B 1 trkdvrhv + 1 truck, dump, 16-23.5 CY	80	HR	6,527.33	926.19	596.28	75.16	329.87	1,963.21	8,454.84
(Note: Assume productivity = 150 cy/hr. Allow 3 dump trucks.)									
			66.42	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*86.04*
GEN L40Z4397 LOADER, FRONT END, WHEEL, ARTICULATED, 3.25 CY (2.5 M3) BUCKET, 4X4	27	HR	1,771.23	251.33	161.80	20.40	89.51	523.04	2,294.28
			157.62	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*204.16*
MAP T15CA016 TRACTOR, CRAWLER (DOZER), 310 HP, POWERSHIFT, W/15.3 CY SEMI-U BLADE (ADD ATTACHMENTS)	27	HR	4,203.08	596.39	383.96	48.40	212.41	1,241.16	5,444.24
			0.00	*28.38*	*16.00*	*1.87*	*8.12*	*0.00*	*0.00*
MAP T10CA017 TRACTOR ATTACHMENTS, BLADE, UNIVERSAL, HYDRAULIC, FOR D8, 15.30 CY (ADD D8 TRACTOR)	27	HR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			41.44	*28.38*	*16.00*	*1.87*	*8.12*	*30.81*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Loader)	27	HR	1,104.99	156.79	100.94	12.72	55.84	340.42	1,431.30
			41.44	*28.38*	*16.00*	*1.87*	*8.12*	*30.81*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Dozer)	27	HR	1,104.99	156.79	100.94	12.72	55.84	340.42	1,431.30
			25.00	*28.38*	*16.00*	*1.87*	*8.12*	*30.87*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	80	HR	1,999.69	283.74	182.68	23.03	101.06	617.35	2,590.20
			1.91						*2.47*
02 Place and Compact	**4,000**	**CY**	**7,638.06**	**1,083.80**	**697.75**	**87.95**	**386.01**	**2,295.77**	**9,893.56**
			1.09	*28.38*	*16.00*	*1.87*	*8.12*	*30.07*	*1.41*
MIL 023153105900 Compaction, of backfill, structural, 6" lifts, self propelled roller	4,000	ECY	4,356.43	618.15	397.97	50.16	220.16	1,310.18	5,642.87
			0.82	*28.38*	*16.00*	*1.87*	*8.12*	*30.03*	*1.06*
MIL 023153109000 Water for compaction, 3000 gallon truck, 3 mile haul	4,000	ECY	3,281.63	465.64	299.78	37.79	165.84	985.60	4,250.69
			323.01						*418.39*
21 Interior Drainage Concrete, Collector Channel & RCB Culvert	**2,500**	**CY**	**807,518.71**	**114,582.14**	**73,768.07**	**9,298.55**	**40,809.80**	**244,379.52**	**1,045,977.26**
(Note: Quantity was changed from 4050 cy to 4500 cy [06/28/07] New quantity = 2,500 cy (08/15/07))									
			132.22						*171.26*
01 Placement	**2,500**	**CY**	**330,538.38**	**46,901.45**	**30,195.19**	**3,806.14**	**16,704.51**	**97,840.33**	**428,145.66**

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
			366.10	*28.38*	*16.00*	*1.87*	*8.12*	*30.33*	*474.21*
RSM CLABC20 6 laborers + 1 concrete pump, 117 CY/hr	80	HR	29,288.38	4,155.85	2,675.54	337.25	1,480.16	8,881.85	37,937.18
			120.50	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*156.08*
MIL 033102200150 Structural concrete, ready mix, normal weight, 3000 psi, includes material only	2,500	CY	301,250.00	42,745.60	27,519.65	3,468.88	15,224.36	88,958.48	390,208.48
			19,109.87						*24,752.98*
02 Finishing and Curing	**1**	**EA**	**19,109.87**	**2,711.58**	**1,745.72**	**220.05**	**965.76**	**5,745.94**	**24,752.98**
			0.24	*28.38*	*16.00*	*1.87*	*8.12*	*30.84*	*0.32*
MIL 033503000010 Concrete finishing, floors, monolithic, screed finish	5,000	SF	1,220.31	173.15	111.48	14.05	61.67	376.30	1,580.66
(Note: Quantity assumed.)									
			0.97	*28.38*	*16.00*	*1.87*	*8.12*	*30.51*	*1.26*
MIL 033503500600 Concrete finishing, walls, float finish, 1/16" thick	5,000	SF	4,860.92	689.74	444.05	55.97	245.66	1,483.26	6,296.34
(Note: Quantity assumed.)									
			16.29	*28.38*	*16.00*	*1.87*	*8.12*	*29.83*	*21.09*
MIL 033902000100 Curing, burlap, 12 oz., 4 uses assumed	800	CSF	13,028.65	1,848.69	1,190.19	150.02	658.43	3,886.37	16,875.98
(Note: quantity assumed.)									
			4.71						*6.10*
03 Forming	**97,232**	**SFC**	**457,870.46**	**64,969.12**	**41,827.17**	**5,272.36**	**23,139.53**	**140,793.24**	**593,078.63**
(Note: The slope of the Collector Channel is 2H:1V, the height of the channel is 5', and the length of the channel is 4,120 LF (begins at Sta. 7+40 and ends at Sta. 48+60.8), the width of the sloping surface is calculated to be 11.8', (square root of sum of 5-squared and 10-squared). Then, the square-foot contact area is calculated to be: 11.8' x 4120' x 2 sides = 97,232 SFCA.)									
			4.71	*28.38*	*16.00*	*1.87*	*8.12*	*30.75*	*6.10*
MIL 031104554750 C.I.P. concrete forms, retaining wall, battered, job built plywood, to 8' high, 4 use, includes erecting, bracing, stripping and cleaning	97,232	SFC	457,870.46	64,969.12	41,827.17	5,272.36	23,139.53	140,793.24	593,078.63
			1,259.50						*1,631.43*
22 Interior Drainage Rebar, Collector Channel & RCB Culvert	**175**	**TON**	**220,412.23**	**31,275.19**	**20,134.99**	**2,538.04**	**11,139.03**	**65,396.91**	**285,499.49**
(Note: Assume the channel and wall quantities are 50-50. Quantity is changed from 250 tons to 300 tons [06/28/07] New quantity = 175 ton (08/15/07))									
			1,280.43	*28.38*	*16.00*	*1.87*	*8.12*	*29.69*	*1,658.54*
MIL 032106000600 Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60	88	TON	112,037.46	15,897.45	10,234.79	1,290.11	5,662.07	33,259.57	145,121.88
(Note: Original material cost is increased by 40%)									
			1,238.57	*28.38*	*16.00*	*1.87*	*8.12*	*29.65*	*1,604.32*

Currency in US dollars

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
MIL 032106000700 Reinforcing steel, in place, walls, #3 to #7, A615, grade 60	88	TON	108,374.77	15,377.74	9,900.20	1,247.93	5,476.97	32,137.35	140,377.61
(Note: Original material cost is increased by 40%)									
			2,500.71						*3,239.16*
23 Interior Drainage Trash Rack, RCB Culvert	**5**	**EA**	**12,503.53**	**1,774.18**	**1,142.22**	**143.98**	**631.89**	**3,715.33**	**16,195.80**
(Note: Quotation: ACF Environmental Distributor Reed & Graham, Carl Springer (888) 381-0800 (11/09/2006). The material price is $1,500 per each, plus freight to Phoenix, AZ, $585.00. Crew: 2 masonary workers. Productivity = 2 hours per each.)									
			2,085.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*2,700.70*
USR Trash Rack by ACF Environmental	5	EA	10,425.00	1,479.25	952.34	120.04	526.85	3,078.48	13,503.48
(Note: Shipping Cost (freight) is placed in "UserCost1")									
			51.96	*28.38*	*16.00*	*1.87*	*8.12*	*30.64*	*67.31*
MIL B-STRSTEEL Structural Steel Workers	40	HR	2,078.53	294.93	189.88	23.93	105.04	636.84	2,692.32
(Note: 2 workers x 4 hours per each x 5 ea = 40 hours)									
			5,089.58						*6,592.52*
24 Interior Drainage Headwalls, RCB Culvert	**2**	**EA**	**10,179.16**	**1,444.36**	**929.88**	**117.21**	**514.43**	**3,007.76**	**13,185.04**
			5,089.58	*28.38*	*16.00*	*1.87*	*8.12*	*29.55*	*6,592.52*
CIV 026101000530 Headwall, concrete, precast, 30 degree skewed wingwall, 18" diameter pipe	2	EA	10,179.16	1,444.36	929.88	117.21	514.43	3,007.76	13,185.04
			3,687.24						*4,776.07*
25 Interior Drainage Wingwalls, RCB Culvert	**4**	**EA**	**14,748.95**	**2,092.79**	**1,347.34**	**169.83**	**745.37**	**4,416.14**	**19,104.28**
			2,647.97	*28.38*	*16.00*	*1.87*	*8.12*	*29.67*	*3,429.91*
CIV 112851900100 Wingwall	4	EA	10,591.88	1,502.93	967.58	121.97	535.29	3,142.45	13,719.64
			51.96	*28.38*	*16.00*	*1.87*	*8.12*	*30.64*	*67.31*
MIL B-STRSTEEL Structural Steel Workers	80	HR	4,157.06	589.86	379.75	47.87	210.09	1,273.69	5,384.64
(Note: Allow 2 workers, and 80 hours.)									
			20,798.94						*26,940.82*
26 Survey Markers (Bench Marks/Monuments) Removal & Installation for Levee	**1**	**EA**	**20,798.94**	**2,951.25**	**1,900.01**	**239.50**	**1,051.12**	**6,261.24**	**26,940.82**
			56.45	*28.38*	*16.00*	*1.87*	*8.12*	*30.19*	*73.12*
FOP FC-SURYR Surveyors (Foreman)	80	HR	4,515.89	640.78	412.53	52.00	228.22	1,363.39	5,849.42
(Note: Assumed a Occupation Code of #99659 Survey Technician. Allow 80 hours. For hourly labor cost quotation, see Means Building Construction Cost Data, 2004, Crew A-7 (p.589))									
			44.22	*28.38*	*16.00*	*1.87*	*8.12*	*30.76*	*57.28*
FOP FC-FLDRT Instrument Technician	80	HR	3,537.75	501.99	323.18	40.74	178.79	1,088.08	4,582.44
(Note: Assumed a Occupation Code of #29063 Drafter III. Allow 80 hours. For hourly labor cost quotation, see Means Building Construction Cost Data, 2004 (p.589))									

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
			51.96	*28.38*	*16.00*	*1.87*	*8.12*	*30.64*	*67.31*
MIL B-RODMAN Rodman/Chainman	80	HR	4,157.06	589.86	379.75	47.87	210.09	1,273.69	5,384.64
USR Survey Instruments	1	LS	5,882.35	834.67	537.36	67.74	297.28	1,737.05	7,619.40
			27.06	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*35.05*
USR Monuments	100	EA	2,705.88	383.95	247.19	31.16	136.75	799.04	3,504.92
(Note: For material and equipment cost quotation, see Means Building Construction Cost Data, 2004, 01107-700-0600. Quanitity assumed.)									
			24,158.08						*31,291.90*
27 As-Built Drawings	**1**	**EA**	**24,158.08**	**3,427.89**	**2,206.88**	**278.18**	**1,220.88**	**7,344.50**	**31,291.90**
			51.85	*28.38*	*16.00*	*1.87*	*8.12*	*31.02*	*67.17*
FOP FC-ENGCI Engineers, Civil	160	HR	8,296.78	1,177.26	757.92	95.54	419.30	2,573.92	10,746.80
(Note: Assumed a Occupation Code of #29086 Engineer Technician IV)									
			36.63	*28.38*	*16.00*	*1.87*	*8.12*	*31.01*	*47.45*
FOP FC-FLDRT Field Draftsmen	160	HR	5,861.30	831.68	535.44	67.49	296.21	1,817.60	7,592.12
(Note: Assumed a Occupation Code of #29063 Drafter III)									
			10,000.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*12,952.98*
USR Miscellaneous Costs	1	EA	10,000.00	1,418.94	913.52	115.15	505.37	2,952.98	12,952.98
			14,697.97						*19,038.25*
0024 Interior Drainage Flap Gates, RCB Culvert	**5**	**EA**	**73,489.86**	**10,427.78**	**6,713.41**	**846.23**	**3,713.98**	**21,719.76**	**95,191.25**
			697.97	*28.38*	*16.00*	*1.87*	*8.12*	*30.06*	*904.08*
CIV 112851900100 Flap gates, (Waterman, F-10), 6" dia. Flatback, head wall mounting	5	EA	3,489.86	495.19	318.80	40.19	176.37	1,048.91	4,520.40
(Note: Material quoted was obtained from Contractors/Engineers Supplies, (602) 272-1369 (Kris).)									
			14,000.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*18,134.17*
USR Flap Gates, 3'x5' per each	5	EA	70,000.00	9,932.59	6,394.61	806.05	3,537.61	20,670.85	90,670.85
(Note: Price quoted from Hydro Gate, (303) 288-7873, x245, (Susan Dye), www.hydrogate.com. On the fax: "Model 50, with cast iron flat back seat, cast iron cover, bronze seating faces, ductile iron links, bronze bushings and stainless steel fasteners. Stainless Steel Anchor bolts." The price quoted includes freight to job site.)									
			531.61						*688.59*
09A Soil Cement	**20**	**CY**	**10,632.18**	**1,508.64**	**971.27**	**122.43**	**537.32**	**3,202.60**	**13,771.83**
			2.04	*28.38*	*16.00*	*1.87*	*8.12*	*30.29*	*2.64*
HNC 023154260205 Load, bank measure, medium material, 3/4 C.Y. bucket, wheeled loader	20	BCY	40.80	5.79	3.73	0.47	2.06	12.36	52.85
			1.86	*28.38*	*16.00*	*1.87*	*8.12*	*29.70*	*2.41*
HNC 023154902300 Hauling, excavated or borrow material, loose cubic yards, 6 mile round trip @ 40 MPH (2.1 cycles/hour), 40 C.Y., off highway haulers, excludes loading	24	LCY	44.68	6.34	4.08	0.51	2.26	13.27	57.88

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
			439.45	*28.38*	*16.00*	*1.87*	*8.12*	*30.12*	*569.21*
HNC 023707001300 Erosion control, soil cement, 7% portland cement, in place	24	ECY	10,546.69	1,496.51	963.46	121.44	533.00	3,176.97	13,661.11
(Note: 94-lb bag of cement)									
			19,148.62						*24,803.17*
0030 Clear Site and Remove Obstructions, Diversion Channel	**2**	**ACR**	**38,297.25**	**5,434.15**	**3,498.51**	**440.99**	**1,935.44**	**11,364.25**	**49,606.34**
			3,949.75	*28.38*	*16.00*	*1.87*	*8.12*	*30.28*	*5,116.10*
MIL 022301000152 Clear and grub, cut and chip, medium trees, to 10" diameter	1	ACR	1,974.87	280.22	180.41	22.74	99.80	597.97	2,558.05
(Note: Assume 1/4 of the total acreage will need to be cleared and grubbed. Then, 2 acres x 1/4 = 0.5 acre.)									
			834.91	*28.38*	*16.00*	*1.87*	*8.12*	*29.98*	*1,081.46*
AF 022302001060 Selective clearing, dry clearing, medium size brush, average grub and trees, excludes removal offsite	1	ACR	417.46	59.23	38.14	4.81	21.10	125.16	540.73
			17.57	*28.38*	*16.00*	*1.87*	*8.12*	*30.37*	*22.75*
MIL 022302002000 Selective clearing, load spoils, by machine, includes 2 mile haul to dump	261	CY	4,584.92	650.57	418.84	52.80	231.71	1,392.39	5,938.84
(Note: Assume 1 truck-load for every 1,000 sf. Say 12 CY/1,000 SF = 0.012 cy/sf --> 43,560 sf x (0.5 acre) x 0.012 cy/sf = 261 cy)									
			24.00	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*31.09*
USR Disposal Fee	1,305	CY	31,320.00	4,444.12	2,861.13	360.65	1,582.83	9,248.73	40,568.73
			12.32						*15.95*
0031 Excavation, Compacted Fill, and Spreading Excavated Materials, Diversion Channel	**10,250**	**CY**	**126,233.77**	**17,911.83**	**11,531.65**	**1,453.58**	**6,379.51**	**37,727.11**	**163,510.34**
			7.32						*9.48*
01 Excavation and Spreading Excavated Materials	**10,250**	**CY**	**74,989.33**	**10,640.54**	**6,850.39**	**863.50**	**3,789.76**	**22,319.90**	**97,133.51**
			7.32						*9.48*
01 Excavation and spreading	**10,250**	**CY**	**74,989.33**	**10,640.54**	**6,850.39**	**863.50**	**3,789.76**	**22,319.90**	**97,133.51**
(Note: Productivity = 300 cy/hr Hours needed = 10,265 cy / 300 cy/hr = 40 hours (allowed))									
			342.03	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*443.03*
MAP S20CA005 SCRAPER, TANDEM POWERED, STANDARD LOADING, 44 CY, 52 TON, 4X4, D-11 ASSISTED LOADING	160	HR	54,725.21	7,765.18	4,999.23	630.16	2,765.66	16,160.24	70,885.45
(Note: 4 pieces of equipment x 40 hours = 160 hours)									
			113.36	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*146.84*
GEN T60Z7910 TRUCK, WATER, OFF-HIGHWAY, 5,000 GAL (18,927 L), W/175 HP (130 KW) TRACTOR	40	HR	4,534.59	643.43	414.24	52.22	229.17	1,339.06	5,873.65
(Note: This cost item includes water truck and driver costs.)									

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
			0.00	*28.38*	*16.00*	*1.87*	*8.12*	*0.00*	*0.00*
MAP T50XX005 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X4	40	HR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			44.25	*28.38*	*16.00*	*1.87*	*8.12*	*30.83*	*57.31*
MIL X-EQOPRMED Outside Equip. Operators, Medium (1 for scraper, 1 for dozer)	80	HR	3,539.65	502.26	323.35	40.76	178.88	1,091.37	4,584.90
			25.00	*28.38*	*16.00*	*1.87*	*8.12*	*30.87*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	40	HR	999.85	141.87	91.34	11.51	50.53	308.67	1,295.10
			28.93	*28.38*	*16.00*	*1.87*	*8.12*	*30.86*	*37.47*
MIL X-TRKDVRLT Outside Truck Drivers, Light	40	HR	1,157.05	164.18	105.70	13.32	58.47	357.05	1,498.73
			39.92	*28.38*	*16.00*	*1.87*	*8.12*	*30.79*	*51.71*
MIL X-EQOPRLT Outside Equip. Operators, Light	200	HR	7,984.15	1,132.90	729.36	91.94	403.50	2,458.50	10,341.85
(Note: Let's allow 5 operators here. Then, 5 x 40 = 200 hours)									
			4.73	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*6.13*
MAP T10CA007 TRACTOR ATTACHMENTS, BLADE, POWER ANGLE, HYDRAULIC, FOR D5, 2.53 CY (ADD D5 TRACTOR)	40	HR	189.17	26.84	17.28	2.18	9.56	55.86	245.03
			6.31	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*8.18*
MAP T10CA008 TRACTOR ATTACHMENTS, POWER WINCH, FOR D5 (ADD D5 TRACTOR)	40	HR	252.53	35.83	23.07	2.91	12.76	74.57	327.10
			40.18	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*52.04*
USR T15CS005 TRACTOR, CRAWLER (DOZER), 75 HP, POWERSHIFT, W/2.50 CY UNIVERSAL BLADE (ADD ATTACHMENTS)	40	HR	1,607.12	228.04	146.81	18.51	81.22	474.58	2,081.70
			5.00						*6.48*
02 Compacted Fill	**10,250**	**CY**	**51,244.45**	**7,271.28**	**4,681.26**	**590.08**	**2,589.76**	**15,407.21**	**66,376.82**
			3.09						*4.00*
01 Load and Haul	**10,250**	**CY**	**31,671.92**	**4,494.06**	**2,893.28**	**364.70**	**1,600.61**	**9,524.29**	**41,024.57**
			81.59	*28.38*	*16.00*	*1.87*	*8.12*	*30.08*	*105.69*
RSM COEIB34B 1 trkdvrhv + 1 truck, dump, 16-23.5 CY	68	HR	5,575.43	791.12	509.32	64.20	281.77	1,676.91	7,221.84
(Note: Assume productivity = 150 cy/hr. and a truck fleet of 20. Then, 10,265/150 = 70 hours)									
			66.42	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*86.04*
GEN L40Z4397 LOADER, FRONT END, WHEEL, ARTICULATED, 3.25 CY (2.5 M3) BUCKET, 4X4	68	HR	4,538.79	644.03	414.63	52.26	229.38	1,340.29	5,879.08
			157.62	*28.38*	*16.00*	*1.87*	*8.12*	*29.53*	*204.16*
MAP T15CA016 TRACTOR, CRAWLER (DOZER), 310 HP, POWERSHIFT, W/15.3 CY SEMI-U BLADE (ADD ATTACHMENTS)	68	HR	10,770.40	1,528.26	983.89	124.02	544.31	3,180.47	13,950.87

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	DirectCost	JOOH	HOOH	Bond	Excise	ContractMarkup	ContractCost
			41.44	*28.38*	*16.00*	*1.87*	*8.12*	*30.81*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Loader)	68	HR	2,831.55	401.78	258.67	32.61	143.10	872.33	3,667.70
			41.44	*28.38*	*16.00*	*1.87*	*8.12*	*30.81*	*53.67*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Dozer)	68	HR	2,831.55	401.78	258.67	32.61	143.10	872.33	3,667.70
			25.00	*28.38*	*16.00*	*1.87*	*8.12*	*30.87*	*32.38*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	205	HR	5,124.22	727.10	468.10	59.01	258.96	1,581.95	6,637.38
			1.91						*2.47*
02 Place and Compact	**10,250**	**CY**	**19,572.53**	**2,777.23**	**1,787.98**	**225.38**	**989.14**	**5,882.92**	**25,352.25**
			1.09	*28.38*	*16.00*	*1.87*	*8.12*	*30.07*	*1.41*
MIL 023153105900 Compaction, of backfill, structural, 6" lifts, self propelled roller	10,250	ECY	11,163.35	1,584.01	1,019.79	128.55	564.17	3,357.33	14,459.86
			0.82	*28.38*	*16.00*	*1.87*	*8.12*	*30.03*	*1.06*
MIL 023153109000 Water for compaction, 3000 gallon truck, 3 mile haul	10,250	ECY	8,409.18	1,193.21	768.19	96.83	424.98	2,525.59	10,892.39

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
Project Direct Summary			**1,022,534.13**	**552,051.18**	**1,450,541.28**	**313,032.50**	**3,338,159.09**	**3,752,393.08**
			1,022,534.13	*552,051.18*	*1,450,541.28*		*3,338,159.09*	*3,752,393.08*
Bid Schedule	**1**	**EA**	**1,022,534.13**	**552,051.18**	**1,450,541.28**	**313,032.50**	**3,338,159.09**	**3,752,393.08**
			14,405.76	*7,987.20*	*20,000.00*		*42,392.96*	*48,901.59*
01 Diversion and Control of Water	**1**	**EA**	**14,405.76**	**7,987.20**	**20,000.00**	**0.00**	**42,392.96**	**48,901.59**
(Note: Assume that dewatering will be required for one month. Account for 1 pump tender and 1 laborer to locate or relocate the pump within the pumping zone) EQOPRLT (Foreman), LABORER, P60Z5405, Productivity = 0.014 mon/hr)								
			0.00	*0.00*	*200.00*		*200.00*	*200.00*
01 K-rails	**100**	**EA**	**0.00**	**0.00**	**20,000.00**	**0.00**	**20,000.00**	**20,000.00**
(Note: (32" (h) x 20' (L)) Assume 2000 lf for both sides of the drainage ditch. Therefore, we need a total of 100 K-rails.)								
			0.00	*0.00*	*10.00*	*0.00*	*10.00*	*10.00*
USR 01 Precast Concrete Barricades	2,000	LF	0.00	0.00	20,000.00	0.00	20,000.00	20,000.00
			14,405.76	*7,987.20*	*0.00*		*22,392.96*	*28,901.59*
02 Pump Water	**1**	**EA**	**14,405.76**	**7,987.20**	**0.00**	**0.00**	**22,392.96**	**28,901.59**
(Note: Assume the pump will work 75% of the time for a whole month. Then, 30 days/mon x 24 hours/day x 0.75 = 540 hours. The pump tender and laborer will work 40% of the time. Then, 30 x 24 x 0.40 = 288 hours.)								
			31.66	*0.00*	*0.00*	*0.00*	*31.66*	*42.73*
MIL X-EQOPRLT Outside Equip. Operators, Light (Pump Tender)	288	HR	9,118.08	0.00	0.00	0.00	9,118.08	12,305.99
			18.36	*0.00*	*0.00*	*0.00*	*18.36*	*25.00*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	288	HR	5,287.68	0.00	0.00	0.00	5,287.68	7,198.90
			0.00	*14.79*	*0.00*	*0.00*	*14.79*	*17.40*
GEN P60Z5405 PUMP, WATER, CENTRIFUGAL, DEWATERING, WHEEL, ENGINE DRIVE, 4" (102 MM) DIA, 570 GPM (2,158 LPM) @ 40' (12.2 M) HEAD (ADD HOSES)	540	HR	0.00	7,987.20	0.00	0.00	7,987.20	9,396.70
			1,536.17	*1,193.53*	*0.00*		*5,861.71*	*6,620.62*
02 Clear Site and Remove Obstructions, All Areas (Except Diversion Channel)	**10**	**ACR**	**15,361.73**	**11,935.32**	**0.00**	**31,320.00**	**58,617.05**	**66,206.24**
			1,640.53	*1,463.26*	*0.00*	*0.00*	*3,103.79*	*3,949.75*
MIL 022301000152 Clear and grub, cut and chip, medium trees, to 10" diameter	3	ACR	4,101.33	3,658.14	0.00	0.00	7,759.47	9,874.37
(Note: Assume 1/4 of the total acreage will need to be cleared and grubbed. Then, 10 acres x 1/4 = 2.5 acre.)								
			218.06	*459.59*	*0.00*	*0.00*	*677.66*	*834.91*
AF 022302001060 Selective clearing, dry clearing, medium size brush, average grub and trees, excludes removal offsite	3	ACR	545.16	1,148.98	0.00	0.00	1,694.14	2,087.28
			8.21	*5.46*	*0.00*	*0.00*	*13.67*	*17.57*
MIL 022302002000 Selective clearing, load spoils, by machine, includes 2 mile haul to dump	1,305	CY	10,715.24	7,128.20	0.00	0.00	17,843.44	22,924.60

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
(Note: Assume 1 truck-load for every 1,000 sf. Say 12 CY/1,000 SF = 0.012 cy/sf --> 2.5 acres x 43,560 sf/acr x 0.012 cy/sf = 1305 cy)								
			0.00	*0.00*	*0.00*	*24.00*	*24.00*	*24.00*
USR Disposal Fee	1,305	CY	0.00	0.00	0.00	31,320.00	31,320.00	31,320.00
			0.00	*0.00*	*0.00*		*7.50*	*7.50*
03 Removal, Stockpile, Salvage and Disposal of the Exist. 15" Stone/Riprap Protection, 6" Bedding Material and Filter Fabric, and Gabion Mattress, Levee Sta. 103+00.00 to Sta. 152+00.00 and RCB Culvert	**7,425**	**CY**	**0.00**	**0.00**	**0.00**	**55,687.50**	**55,687.50**	**55,687.50**
(Note: Former quantity = 5600 cy. New quantity = 7425 cy (08/15/07) Production: 10 cy/hr per truck Hours needed = 742.5 hours Assume a truck fleet of 20 @ $75/hr (for truck+driver). Then, 742.5 hours x $75.00 = $55,688)								
			0.00	*0.00*	*0.00*	*75.00*	*75.00*	*75.00*
USR Trucking Cost	743	HR	0.00	0.00	0.00	55,687.50	55,687.50	55,687.50
			169.71	*218.64*	*50.00*		*438.35*	*536.10*
04 Reconstruction of Existing Concrete/Earthen Irrigation Canals (CIC/EIC)	**40**	**HR**	**6,788.40**	**8,745.43**	**2,000.00**	**0.00**	**17,533.83**	**21,444.04**
(Note: Allow 40 hours for this crew to do reconstruction and relocation of CIC and EIC. According to the designer, there will be a max of 10 cy of concrete needed.)								
			0.00	*91.68*	*0.00*	*0.00*	*91.68*	*107.86*
MAP H25CA027 HYDRAULIC EXCAVATOR, CRAWLER, 75,700 LBS, 2.09 CY BUCKET, 21.58' MAX DIGGING DEPTH	40	HR	0.00	3,667.36	0.00	0.00	3,667.36	4,314.54
			0.00	*18.75*	*0.00*	*0.00*	*18.75*	*22.06*
GEN L50Z4640 LOADER / BACKHOE, WHEEL, 0.80 CY (0.6M3) FRONT END BUCKET, 9.8' (3.0M) DEPTH OF HOE, 24" (0.61M) DIPPER, 4X4	40	HR	0.00	750.05	0.00	0.00	750.05	882.41
			0.00	*49.99*	*0.00*	*0.00*	*49.99*	*58.81*
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	40	HR	0.00	1,999.69	0.00	0.00	1,999.69	2,352.57
			0.00	*27.53*	*0.00*	*0.00*	*27.53*	*32.39*
EP R30BO006 ROLLER, STATIC, SELF-PROPELLED, SMOOTH DRUM, DOUBLE DRUM, 10 TON, 50" WIDE ASPHALT COMPACTOR	40	HR	0.00	1,101.13	0.00	0.00	1,101.13	1,295.45
			0.00	*61.36*	*0.00*	*0.00*	*61.36*	*72.19*
GEN T60Z7910 TRUCK, WATER, OFF-HIGHWAY, 5,000 GAL (18,927 L), W/175 HP (130 KW) TRACTOR	20	HR	0.00	1,227.20	0.00	0.00	1,227.20	1,443.77
(Note: allow half the time for the water truck.)								
			30.74	*0.00*	*0.00*	*0.00*	*30.74*	*41.44*
MIL X-EQOPRMED Outside Equip. Operators, Medium (3 men)	120	HR	3,688.80	0.00	0.00	0.00	3,688.80	4,972.47
			32.74	*0.00*	*0.00*	*0.00*	*32.74*	*44.25*
MIL X-EQOPRMED Outside Equip. Operators, Medium	40	HR	1,309.60	0.00	0.00	0.00	1,309.60	1,769.83
			26.39	*0.00*	*0.00*	*0.00*	*26.39*	*35.33*
MIL X-EQOPROIL Outside Equip. Oilers	40	HR	1,055.60	0.00	0.00	0.00	1,055.60	1,413.16

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
			18.36	*0.00*	*0.00*	*0.00*	*18.36*	*25.00*
MIL X-LABORER Outside Laborers, (Semi-Skilled) (checker/grader)	40	HR	734.40	0.00	0.00	0.00	734.40	999.85
			0.00	*0.00*	*200.00*	*0.00*	*200.00*	*200.00*
MIL 033102200150 Structural concrete, ready mix, normal weight, 3000 psi, includes material only	10	CY	0.00	0.00	2,000.00	0.00	2,000.00	2,000.00
			220.32	*0.00*	*110.00*		*330.32*	*409.95*
05 Seal Existing 18" CMP's and RCP's, with Controlled Low Strength Material (CLSM), Levee	**35**	**CY**	**7,711.20**	**0.00**	**3,850.00**	**0.00**	**11,561.20**	**14,348.39**
(Note: Productivity = 1cy/hr Hours needed = 20 hours. Allow 3 laborers.)								
			0.00	*0.00*	*110.00*	*0.00*	*110.00*	*110.00*
USR Control Slow Strength Material	35	CY	0.00	0.00	3,850.00	0.00	3,850.00	3,850.00
			18.36	*0.00*	*0.00*	*0.00*	*18.36*	*25.00*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	420	HR	7,711.20	0.00	0.00	0.00	7,711.20	10,498.39
			2.08	*4.69*	*0.00*		*16.77*	*18.33*
06 Stripping and Disposal of 6" Topsoil, Levees and Dikes and Dention Basin	**4,920**	**CY**	**10,211.95**	**23,093.36**	**0.00**	**49,200.00**	**82,505.31**	**90,194.27**
(Note: Former quantity = 2,500 cy. New quantity = 4,920 cy (08/17/07) Assume disposal site is 10-mile radius, per designer.)								
			30.74	*0.00*	*0.00*	*0.00*	*30.74*	*41.44*
MIL X-EQOPRMED Outside Equip. Operators, Medium (1 for dozer, 1 for loader)	197	HR	6,049.63	0.00	0.00	0.00	6,049.63	8,154.85
			18.36	*0.00*	*0.00*	*0.00*	*18.36*	*25.00*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	98	HR	1,806.62	0.00	0.00	0.00	1,806.62	2,459.62
			0.00	*115.56*	*0.00*	*0.00*	*115.56*	*135.95*
GEN T15Z6520 TRACTOR, CRAWLER (DOZER), 181-250 HP (135-186 KW), POWERSHIFT, LGP, W/UNIVERSAL BLADE	98	HR	0.00	11,370.99	0.00	0.00	11,370.99	13,377.64
			0.00	*79.91*	*0.00*	*0.00*	*79.91*	*94.01*
GEN L35Z4260 LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	98	HR	0.00	7,862.68	0.00	0.00	7,862.68	9,250.21
			0.00	*39.22*	*0.00*	*0.00*	*39.22*	*46.15*
GEN T50Z7580 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	98	HR	0.00	3,859.69	0.00	0.00	3,859.69	4,540.81
			23.94	*0.00*	*0.00*	*0.00*	*23.94*	*32.63*
MIL X-TRKDVRHV Outside Truck Drivers, Heavy	98	HR	2,355.70	0.00	0.00	0.00	2,355.70	3,211.13
			0.00	*0.00*	*0.00*	*10.00*	*10.00*	*10.00*
USR Disposal Fee	4,920	CY	0.00	0.00	0.00	49,200.00	49,200.00	49,200.00
			7.53	*2.07*	*0.20*		*9.80*	*11.73*
07 Compacted Fill, Levee, Detention Basin and Dikes	**42,540**	**CY**	**320,498.46**	**87,873.99**	**8,508.00**	**0.00**	**416,880.44**	**499,105.81**

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
(Note: Former quantity = 29,560 cy. New quantity = 42,540 cy.)								
			6.96	*1.27*	*0.00*		*8.23*	*9.82*
01 Load and Haul	**42,540**	**CY**	**296,189.42**	**54,006.32**	**0.00**	**0.00**	**350,195.74**	**417,875.05**
			0.00	*56.46*	*0.00*	*0.00*	*56.46*	*66.42*
GEN L40Z4397 LOADER, FRONT END, WHEEL, ARTICULATED, 3.25 CY (2.5 M3) BUCKET, 4X4	284	HR	0.00	16,011.52	0.00	0.00	16,011.52	18,837.08
			0.00	*133.97*	*0.00*	*0.00*	*133.97*	*157.62*
MAP T15CA016 TRACTOR, CRAWLER (DOZER), 310 HP, POWERSHIFT, W/15.3 CY SEMI-U BLADE (ADD ATTACHMENTS)	284	HR	0.00	37,994.80	0.00	0.00	37,994.80	44,699.77
			30.74	*0.00*	*0.00*	*0.00*	*30.74*	*41.44*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Loader)	284	HR	8,717.86	0.00	0.00	0.00	8,717.86	11,751.61
			30.74	*0.00*	*0.00*	*0.00*	*30.74*	*41.44*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Dozer)	284	HR	8,717.86	0.00	0.00	0.00	8,717.86	11,751.61
			18.36	*0.00*	*0.00*	*0.00*	*18.36*	*25.00*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	851	HR	15,620.69	0.00	0.00	0.00	15,620.69	21,266.74
			117.00	*0.00*	*0.00*	*0.00*	*117.00*	*137.65*
USR 1 trkdriver + 1 truck, 16 - 23.5 cy per load	2,249	HR	263,133.00	0.00	0.00	0.00	263,133.00	309,568.24
(Note: Reference for Unit Labor Cost, see Excel Spreadsheet file: "Hauling Cost for TresRios Ph 1B.xls" [08/08/07])								
			0.57	*0.80*	*0.20*		*1.57*	*1.91*
02 Place and Compact	**42,540**	**CY**	**24,309.04**	**33,867.66**	**8,508.00**	**0.00**	**66,684.71**	**81,230.76**
			0.34	*0.54*	*0.00*	*0.00*	*0.88*	*1.09*
MIL 023153105900 Compaction, of backfill, structural, 6" lifts, self propelled roller	42,540	ECY	14,452.74	22,783.16	0.00	0.00	37,235.90	46,330.62
			0.23	*0.26*	*0.20*	*0.00*	*0.69*	*0.82*
MIL 023153109000 Water for compaction, 3000 gallon truck, 3 mile haul	42,540	ECY	9,856.30	11,084.50	8,508.00	0.00	29,448.80	34,900.15
			0.47	*0.13*	*32.00*		*39.61*	*39.80*
08 4" Rock Mulch Protection, Levee, Access Ramp and Detention Basin	**2,120**	**TON**	**1,005.18**	**283.95**	**67,840.00**	**14,840.00**	**83,969.13**	**84,375.60**
(Note: Former quantity = 1,500 tons (06/28/07). New quantity = 2,120 tons. (08/17/07) Item Description is changed to "4-inch" instead of "2-inch". Bid Abstract Info from Tres Rios Ph 1A (07/14/2005): Quantity required: 1,223 CY (1) GE = $58.00 (2) TPA-CKY = $65.00 (3) Macro-Z = $105.00 (4) Hal Hays = $75.00 (5) Miramar = $78.50 (6) MRM = $146.00 Average w/o GE = $93.90. Average w/ GE = $87.92)								
			0.00	*0.00*	*32.00*	*0.00*	*32.00*	*32.00*
USR Rock cost	2,120	TON	0.00	0.00	67,840.00	0.00	67,840.00	67,840.00
			0.66	*0.19*	*0.00*	*0.00*	*0.85*	*1.12*
USR 029105001200JD 4" Rock placement (1.4 ton/cy)	1,514	CY	1,005.18	283.95	0.00	0.00	1,289.13	1,695.60
(Note: 1,500 ton / 1.4 ton/cy = 1,071 cy)								
			0.00	*0.00*	*0.00*	*7.00*	*7.00*	*7.00*
USR Trucking Cost	2,120	TON	0.00	0.00	0.00	14,840.00	14,840.00	14,840.00

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
(Note: Quoted from Pioneer Sand Co., (480) 833-0441 (Ken))								
			5.61	*1.75*	*120.00*		*127.36*	*129.67*
09 Grout and Asphalt Protection, New Levee, Landing Area, RCB Culvert and Detention Basin	**300**	**CY**	**1,681.60**	**524.93**	**36,000.00**	**0.00**	**38,206.53**	**38,900.99**
(Note: Per designer, the grout protection is for the riprap at RCB Culvert, and the asphalt is used for the road surface. Productivity: 20 cy/hr Hours needed = 15 hours. (let's give them 16 hours))								
			29.66	*0.00*	*0.00*	*0.00*	*29.66*	*39.92*
MIL X-EQOPRLT Outside Equip. Operators, Light	16	HR	474.56	0.00	0.00	0.00	474.56	638.73
			20.36	*0.00*	*0.00*	*0.00*	*20.36*	*27.80*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	16	HR	325.76	0.00	0.00	0.00	325.76	444.87
			18.36	*0.00*	*0.00*	*0.00*	*18.36*	*25.00*
MIL B-LABORER Laborers (3)	48	HR	881.28	0.00	0.00	0.00	881.28	1,199.82
			0.00	*32.81*	*0.00*	*0.00*	*32.81*	*38.60*
EP C55MO003 CONCRETE PUMP, 50 CY/HR, TRAILER MTD	16	HR	0.00	524.93	0.00	0.00	524.93	617.56
			0.00	*0.00*	*120.00*	*0.00*	*120.00*	*120.00*
MIL 040607500300 Sand (ready-mix), screened and washed, includes 30 mile haul	300	CY	0.00	0.00	36,000.00	0.00	36,000.00	36,000.00
			0.31	*0.28*	*20.00*		*50.60*	*50.75*
10 15" & 27" Stone Protection, New Levee, Landing Area, RCB Culvert and Detention Basin	**2,400**	**TON**	**751.08**	**683.64**	**48,000.00**	**72,000.00**	**121,434.72**	**121,808.50**
(Note: Quantity is changed from 45 ton to 50 tons [06/28/07] New quantity = 2400 tons. (08/17/07))								
			0.00	*0.00*	*20.00*		*50.00*	*50.00*
01 Stone Price and Transportation	**2,400**	**TON**	**0.00**	**0.00**	**48,000.00**	**72,000.00**	**120,000.00**	**120,000.00**
			0.00	*0.00*	*20.00*	*30.00*	*50.00*	*50.00*
USR 01 Stone Price and Transporation	2,400	TON	0.00	0.00	48,000.00	72,000.00	120,000.00	120,000.00
			0.31	*0.28*	*0.00*		*0.60*	*0.75*
02 Stone Placement	**2,400**	**TON**	**751.08**	**683.64**	**0.00**	**0.00**	**1,434.72**	**1,808.50**
(Note: Productivity = 120 ton/hr Needed hours = 2 (let's allow 4 hours))								
			0.00	*91.68*	*0.00*	*0.00*	*91.68*	*107.86*
MAP H25CA027 HYDRAULIC EXCAVATOR, CRAWLER, 75,700 LBS, 2.09 CY BUCKET, 21.58' MAX DIGGING DEPTH	4	HR	0.00	366.74	0.00	0.00	366.74	431.45
			0.00	*79.22*	*0.00*	*0.00*	*79.22*	*93.21*
EP L40CA014 LOADER, WHEEL, INTEGRATED TOOL CARRIER, 4.25 CY LOADER; 13,670 LB @ 12.42' HIGH, FORK LIFT, OR 5,040 LB @ 22.67' HIGH, MATERIAL HANDLING ARM	4	HR	0.00	316.90	0.00	0.00	316.90	372.82
			0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*

Currency in US dollars

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
MAP T50XX002 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X2	4	HR	0.00	0.00	0.00	0.00	0.00	0.00
			30.74	*0.00*	*0.00*	*0.00*	*30.74*	*41.44*
MIL X-EQOPRMED Outside Equip. Operators, Medium	8	HR	245.92	0.00	0.00	0.00	245.92	331.50
			21.30	*0.00*	*0.00*	*0.00*	*21.30*	*28.93*
MIL X-TRKDVRLT Outside Truck Drivers, Light	4	HR	85.20	0.00	0.00	0.00	85.20	115.71
			39.30	*0.00*	*0.00*	*0.00*	*39.30*	*51.96*
MIL B-RODMAN Rodmen	8	HR	314.40	0.00	0.00	0.00	314.40	415.71
			26.39	*0.00*	*0.00*	*0.00*	*26.39*	*35.33*
MIL X-EQOPROIL Outside Equip. Oilers	4	HR	105.56	0.00	0.00	0.00	105.56	141.32
			9.20	*11.13*	*18.00*		*38.32*	*43.55*
11 Bedding Materials, Levee and Dikes (Assume 4" Thick)	**2,250**	**CY**	**20,690.80**	**25,036.28**	**40,500.00**	**0.00**	**86,227.08**	**97,996.27**
(Note: Designer: "Bedding Materials are natural soils (4" thick). The purpose of using 4" bedding layer is to protect geotextile fabric from tearing apart caused by placing 15" riprap." Former quantity = 2,250 cy. New quantity = 3,220 cy (08/15/07))								
			1.02	*1.24*	*2.00*		*4.26*	*4.84*
Base Preparation	**20,250**	**SY**	**20,690.80**	**25,036.28**	**40,500.00**	**0.00**	**86,227.08**	**97,996.27**
(Note: Base preparation assumed to be performed with grader with toothed blade, compacted, and covered)								
			0.82	*1.05*	*0.00*		*1.87*	*2.34*
03 Scarify & Compact	**20,250**	**SY**	**16,556.40**	**21,231.52**	**0.00**	**0.00**	**37,787.92**	**47,415.58**
			0.82	*1.05*	*0.00*	*0.00*	*1.87*	*2.34*
USR 02340500Channel Soil stabilization for base, 4" deep, includes scarifying and compaction	20,250	SY	16,556.40	21,231.52	0.00	0.00	37,787.92	47,415.58
(Note: CSI Task 023405002020 without lime stabilization Crew modified as B74C)								
			1.84	*1.69*	*18.00*		*21.53*	*22.48*
4" Bedding	**2,250**	**CY**	**4,134.40**	**3,804.76**	**40,500.00**	**0.00**	**48,439.16**	**50,580.69**
			0.00	*0.00*	*18.00*	*0.00*	*18.00*	*18.00*
USR Bedding material	2,250	CY	0.00	0.00	40,500.00	0.00	40,500.00	40,500.00
			0.00	*32.19*	*0.00*	*0.00*	*32.19*	*37.87*
GEN L40Z4390 LOADER, FRONT END, WHEEL, ARTICULATED, 1.75 CY (1.3 M3) BUCKET, 4X4	40	HR	0.00	1,287.58	0.00	0.00	1,287.58	1,514.80
			31.77	*0.00*	*0.00*	*0.00*	*31.77*	*42.88*
RSM B-EQOPRCRN Equip. Operators	80	HR	2,541.60	0.00	0.00	0.00	2,541.60	3,430.69
			19.91	*0.00*	*0.00*	*0.00*	*19.91*	*27.17*
RSM B-SKILLWKR Skilled Workers	80	HR	1,592.80	0.00	0.00	0.00	1,592.80	2,173.81
			0.00	*62.93*	*0.00*	*0.00*	*62.93*	*74.03*

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
GEN R45Z5690 ROLLER, VIBRATORY, SELF-PROPELLED, DOUBLE DRUM, SMOOTH, 12 TON (10.9 MT), 67" (1.7 M) WIDE, ASPHALT COMPACTOR	40	HR	0.00	2,517.18	0.00	0.00	2,517.18	2,961.39
			0.31	*0.18*	*0.80*		*1.29*	*1.43*
12 Filter Fabric, Levee and Dikes, and Access Ramps	**20,880**	**SY**	**6,461.11**	**3,792.12**	**16,704.00**	**0.00**	**26,957.22**	**29,953.70**
(Note: Former quantity = 16,350 SY. New quantity = 20,880 SY (08/15/07) Productivity = 300 sy/hr Hours needed = 20,880 / 300 = 70 hours.)								
			0.31	*0.18*	*0.80*	*0.00*	*1.29*	*1.43*
CIV 023403001600 Geotextile Filter Fabric, non-woven polypropylene, 60 mils thick	20,880	SY	6,461.11	3,792.12	16,704.00	0.00	26,957.22	29,953.70
			3.78	*2.51*	*20.04*		*41.32*	*43.06*
13 3" ABC, O&M Roads and Turn-Arounds / Landing Area	**2,900**	**TON**	**10,957.20**	**7,267.37**	**58,101.50**	**43,500.00**	**119,826.07**	**124,882.36**
(Note: Former quantity = 2,500 tons. New quantity = 2,900 tons (08/15/07) Designer: "Two locations (one on top of the levee and other at toe of levee)")								
			0.00	*0.00*	*20.00*		*35.00*	*35.00*
01 Rock Price and Transportation	**2,900**	**TON**	**0.00**	**0.00**	**58,000.00**	**43,500.00**	**101,500.00**	**101,500.00**
			0.00	*0.00*	*20.00*	*15.00*	*35.00*	*35.00*
USR 01 Material Price and Transportation Cost	2,900	TON	0.00	0.00	58,000.00	43,500.00	101,500.00	101,500.00
			3.78	*2.51*	*0.04*		*6.32*	*8.06*
02 Placement	**2,900**	**TON**	**10,957.20**	**7,267.37**	**101.50**	**0.00**	**18,326.07**	**23,382.36**
(Note: Productivity = 200 ton/hr Hours needed = 2,100 / 200 = 11 hours (let's allow 24 hours at each location, totaling to 48 hours))								
			0.00	*49.99*	*0.00*	*0.00*	*49.99*	*58.81*
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	60	HR	0.00	2,999.53	0.00	0.00	2,999.53	3,528.86
			0.00	*27.53*	*0.00*	*0.00*	*27.53*	*32.39*
EP R30BO006 ROLLER, STATIC, SELF-PROPELLED, SMOOTH DRUM, DOUBLE DRUM, 10 TON, 50" WIDE ASPHALT COMPACTOR	60	HR	0.00	1,651.69	0.00	0.00	1,651.69	1,943.17
			0.00	*4.38*	*0.00*	*0.00*	*4.38*	*5.15*
MAP T40RS002 TRUCK OPTIONS, WATER TANK, 3,000 GAL (ADD 40,000 GVW TRUCK)	60	HR	0.00	262.67	0.00	0.00	262.67	309.03
			0.00	*39.22*	*0.00*	*0.00*	*39.22*	*46.15*
GEN T50Z7580 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	60	HR	0.00	2,353.47	0.00	0.00	2,353.47	2,768.79
			0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
MAP T50XX002 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X2	60	HR	0.00	0.00	0.00	0.00	0.00	0.00
			30.74	*0.00*	*0.00*	*0.00*	*30.74*	*41.44*
MIL X-EQOPRMED Outside Equip. Operators, Medium (2 graders)	120	HR	3,688.80	0.00	0.00	0.00	3,688.80	4,972.47

Currency in US dollars

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
			30.74	*0.00*	*0.00*	*0.00*	*30.74*	*41.44*
MIL X-EQOPRMED Outside Equip. Operators, Medium (1 roller)	60	HR	1,844.40	0.00	0.00	0.00	1,844.40	2,486.24
			18.36	*0.00*	*0.00*	*0.00*	*18.36*	*25.00*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	60	HR	1,101.60	0.00	0.00	0.00	1,101.60	1,499.77
			32.74	*0.00*	*0.00*	*0.00*	*32.74*	*44.25*
MIL X-EQOPRMED Outside Equip. Operators, Medium	60	HR	1,964.40	0.00	0.00	0.00	1,964.40	2,654.74
			39.30	*0.00*	*0.00*	*0.00*	*39.30*	*51.96*
MIL B-RODMAN Rodmen, (grade checker)	60	HR	2,358.00	0.00	0.00	0.00	2,358.00	3,117.80
			0.00	*0.00*	*0.05*	*0.00*	*0.05*	*0.05*
USR Water Cost	2,030	GAL	0.00	0.00	101.50	0.00	101.50	101.50
			2.87	*1.75*	*6.75*		*11.36*	*12.70*
14 Four-Wire R/W Fence	**5,350**	**LF**	**15,328.74**	**9,340.42**	**36,112.50**	**0.00**	**60,781.66**	**67,951.36**
(Note: 4' H, 10' oc, Production = 80 lf/hr Hours needed = 5350 / 80 = 67 hours)								
			2.87	*1.75*	*6.75*	*0.00*	*11.36*	*12.70*
MIL 028201306540 Chain link fence, industrial, galvanized, 9 ga. mesh, 1-5/8" top rail, 4' high, posts in concrete, excludes excavation	5,350	LF	15,328.74	9,340.42	36,112.50	0.00	60,781.66	67,951.36
			260.00	*150.00*	*450.00*		*860.00*	*980.45*
15 14' Wide Double Swing Gate	**4**	**EA**	**1,040.00**	**600.00**	**1,800.00**	**0.00**	**3,440.00**	**3,921.79**
(Note: Quantity is changed from 3 EA to 4 EA on 06/28/07. Quantity is changed from 4 EA to 3 EA on 08/15/07.)								
			260.00	*150.00*	*450.00*	*0.00*	*860.00*	*980.45*
MIL 028201507125 Gates, swing, chain link, without barbed wire, double, galvanized, 4' high, 12' wide, excludes excavation	4	EA	1,040.00	600.00	1,800.00	0.00	3,440.00	3,921.79
			2.12	*2.44*	*20.00*		*28.56*	*29.72*
16 27" Riprap Slope Protection, Dikes	**560**	**TON**	**1,187.76**	**1,367.27**	**11,200.00**	**2,240.00**	**15,995.03**	**16,641.30**
(Note: Riprap source: approx. 2 miles away)								
			0.00	*0.00*	*20.00*		*24.00*	*24.00*
01 Stone Price and Transportation	**560**	**TON**	**0.00**	**0.00**	**11,200.00**	**2,240.00**	**13,440.00**	**13,440.00**
			0.00	*0.00*	*20.00*	*4.00*	*24.00*	*24.00*
USR 01 Stone Price and Transportation	560	TON	0.00	0.00	11,200.00	2,240.00	13,440.00	13,440.00
			2.12	*2.44*	*0.00*		*4.56*	*5.72*
02 Stone Placement	**560**	**TON**	**1,187.76**	**1,367.27**	**0.00**	**0.00**	**2,555.03**	**3,201.30**
(Note: Productivity = 100 ton/hr Needed hour = 8)								
			0.00	*91.68*	*0.00*	*0.00*	*91.68*	*107.86*
MAP H25CA027 HYDRAULIC EXCAVATOR, CRAWLER, 75,700 LBS, 2.09 CY BUCKET, 21.58' MAX DIGGING DEPTH	8	HR	0.00	733.47	0.00	0.00	733.47	862.91

Currency in US dollars

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
			0.00	*79.22*	*0.00*	*0.00*	*79.22*	*93.21*
EP L40CA014 LOADER, WHEEL, INTEGRATED TOOL CARRIER, 4.25 CY LOADER; 13,670 LB @ 12.42' HIGH, FORK LIFT, OR 5,040 LB @ 22.67' HIGH, MATERIAL HANDLING ARM	8	HR	0.00	633.80	0.00	0.00	633.80	745.65
			0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
MAP T50XX002 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X2	8	HR	0.00	0.00	0.00	0.00	0.00	0.00
			30.74	*0.00*	*0.00*	*0.00*	*30.74*	*41.44*
MIL X-EQOPRMED Outside Equip. Operators, Medium	16	HR	491.84	0.00	0.00	0.00	491.84	663.00
			21.30	*0.00*	*0.00*	*0.00*	*21.30*	*28.93*
MIL X-TRKDVRLT Outside Truck Drivers, Light	8	HR	170.40	0.00	0.00	0.00	170.40	231.41
			39.30	*0.00*	*0.00*	*0.00*	*39.30*	*51.96*
MIL B-RODMAN Rodmen	8	HR	314.40	0.00	0.00	0.00	314.40	415.71
			26.39	*0.00*	*0.00*	*0.00*	*26.39*	*35.33*
MIL X-EQOPROIL Outside Equip. Oilers	8	HR	211.12	0.00	0.00	0.00	211.12	282.63
			0.98	*4.35*	*0.00*		*5.32*	*6.41*
17 Excavation and Spreading Excavated Materials for Gabion Mattresses, Levees and Dikes	**7,980**	**CY**	**7,787.88**	**34,674.79**	**0.00**	**0.00**	**42,462.67**	**51,140.11**
			0.98	*4.35*	*0.00*		*5.32*	*6.41*
01 Excavation and spreading	**7,980**	**CY**	**7,787.88**	**34,674.79**	**0.00**	**0.00**	**42,462.67**	**51,140.11**
(Note: Productivity = 300 cy/hr Hours needed = 27 hours)								
			0.00	*290.73*	*0.00*	*0.00*	*290.73*	*342.03*
MAP S20CA005 SCRAPER, TANDEM POWERED, STANDARD LOADING, 44 CY, 52 TON, 4X4, D-11 ASSISTED LOADING	108	HR	0.00	31,398.59	0.00	0.00	31,398.59	36,939.52
(Note: 4 pieces of equipment x 27 hours = 108 hours)								
			35.00	*61.36*	*0.00*	*0.00*	*96.36*	*113.36*
GEN T60Z7910 TRUCK, WATER, OFF-HIGHWAY, 5,000 GAL (18,927 L), W/175 HP (130 KW) TRACTOR	27	HR	945.00	1,656.72	0.00	0.00	2,601.72	3,060.85
(Note: This cost item includes water truck and driver costs.)								
			0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
MAP T50XX005 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X4	27	HR	0.00	0.00	0.00	0.00	0.00	0.00
			32.74	*0.00*	*0.00*	*0.00*	*32.74*	*44.25*
MIL X-EQOPRMED Outside Equip. Operators, Medium (1 for scraper, 1 for dozer)	54	HR	1,767.96	0.00	0.00	0.00	1,767.96	2,389.26
			18.36	*0.00*	*0.00*	*0.00*	*18.36*	*25.00*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	27	HR	495.72	0.00	0.00	0.00	495.72	674.90

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
			21.30	*0.00*	*0.00*	*0.00*	*21.30*	*28.93*
MIL X-TRKDVRLT Outside Truck Drivers, Light	27	HR	575.10	0.00	0.00	0.00	575.10	781.01
			29.66	*0.00*	*0.00*	*0.00*	*29.66*	*39.92*
MIL X-EQOPRLT Outside Equip. Operators, Light	135	HR	4,004.10	0.00	0.00	0.00	4,004.10	5,389.30
(Note: Let's allow 5 operators here. Then, 5 x 27 = 135 hours)								
			0.00	*4.02*	*0.00*	*0.00*	*4.02*	*4.73*
MAP T10CA007 TRACTOR ATTACHMENTS, BLADE, POWER ANGLE, HYDRAULIC, FOR D5, 2.53 CY (ADD D5 TRACTOR)	27	HR	0.00	108.53	0.00	0.00	108.53	127.69
			0.00	*5.37*	*0.00*	*0.00*	*5.37*	*6.31*
MAP T10CA008 TRACTOR ATTACHMENTS, POWER WINCH, FOR D5 (ADD D5 TRACTOR)	27	HR	0.00	144.89	0.00	0.00	144.89	170.46
			0.00	*34.15*	*0.00*	*0.00*	*34.15*	*40.18*
USR T15CS005 TRACTOR, CRAWLER (DOZER), 75 HP, POWERSHIFT, W/2.50 CY UNIVERSAL BLADE (ADD ATTACHMENTS)	40	HR	0.00	1,366.05	0.00	0.00	1,366.05	1,607.12
			18.81	*8.74*	*56.25*		*83.80*	*92.02*
18 12" Gabion Mattress Scour Apron, Levee and Dikes	**7,800**	**TON**	**146,698.50**	**68,207.97**	**438,750.00**	**0.00**	**653,656.47**	**717,792.87**
(Note: Former quantity = 6440 ton. New quantity = 7800 ton (08/15/07))								
			10.03	*4.66*	*30.00*	*0.00*	*44.69*	*49.08*
MIL 023704500600 Gabions, galvanized steel mesh mats or boxes, stone filled, 12" deep	14,625	SY	146,698.50	68,207.97	438,750.00	0.00	653,656.47	717,792.87
(Note: Assume the gabion is laid for 12" deep, and we use the conversion factor of 1.575 ton/ccy (for in-fill average riprap rock). Then, 7800 ton / 1.6 ton/cy / 12" = 14,625 sy. Per ITR Review comments, reduced crew productivity from 19.125 sy/hr to 15 sy/hr, and increased material cost from $21.07/sy to $30.00/sy.)								
			0.85	*4.31*	*0.00*		*5.17*	*6.21*
19 Interior Drainage Excavation, Collector Channel & RCB Culvert	**35,100**	**CY**	**29,916.90**	**151,437.20**	**0.00**	**0.00**	**181,354.10**	**217,818.37**
(Note: Quantity is changed from 14,600 cy to 25,000 cy. [06/28/07] (Productivity = 300 cy/hr) New quantity = 35,100 cy (08/17/07) Productivity: 35,100 / 300 = 117 hours.)								
			0.00	*290.73*	*0.00*	*0.00*	*290.73*	*342.03*
MAP S20CA005 SCRAPER, TANDEM POWERED, STANDARD LOADING, 44 CY, 52 TON, 4X4, D-11 ASSISTED LOADING	468	HR	0.00	136,060.56	0.00	0.00	136,060.56	160,071.25
(Note: 4 pieces of equipment x 117 hours = 468 hours)								
			0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
MAP T10CA014 TRACTOR ATTACHMENTS, BLADE, POWER ANGLE, HYDRAULIC, FOR D7, 5.08 CY (ADD D7 TRACTOR)	117	HR	0.00	0.00	0.00	0.00	0.00	0.00
			0.00	*70.06*	*0.00*	*0.00*	*70.06*	*82.43*
MAP T15CA008 TRACTOR, CRAWLER (DOZER), 145 HP, POWERSHIFT, W/5.60 CY SEMI-U BLADE (ADD ATTACHMENTS)	117	HR	0.00	8,197.50	0.00	0.00	8,197.50	9,644.12
			35.00	*61.36*	*0.00*	*0.00*	*96.36*	*113.36*

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
GEN T60Z7910 TRUCK, WATER, OFF-HIGHWAY, 5,000 GAL (18,927 L), W/175 HP (130 KW) TRACTOR	117	HR	4,095.00	7,179.13	0.00	0.00	11,274.13	13,263.68
(Note: This cost item includes water truck and driver costs.)								
			0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
MAP T50XX005 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X4	117	HR	0.00	0.00	0.00	0.00	0.00	0.00
			32.74	*0.00*	*0.00*	*0.00*	*32.74*	*44.25*
MIL X-EQOPRMED Outside Equip. Operators, Medium	117	HR	3,830.58	0.00	0.00	0.00	3,830.58	5,176.74
			18.36	*0.00*	*0.00*	*0.00*	*18.36*	*25.00*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	117	HR	2,148.12	0.00	0.00	0.00	2,148.12	2,924.55
			21.30	*0.00*	*0.00*	*0.00*	*21.30*	*28.93*
MIL X-TRKDVRLT Outside Truck Drivers, Light	117	HR	2,492.10	0.00	0.00	0.00	2,492.10	3,384.39
			29.66	*0.00*	*0.00*	*0.00*	*29.66*	*39.92*
MIL X-EQOPRLT Outside Equip. Operators, Light	585	HR	17,351.10	0.00	0.00	0.00	17,351.10	23,353.64
(Note: Let's allow 5 operators here. Then, 5 x 117 = 585 hours)								
			1.83	*2.90*	*0.20*		*4.93*	*6.09*
20 Interior Drainage Structural Compaction, Collector Channel, Detention Basin & RCB Culvert	**4,000**	**CY**	**7,309.23**	**11,591.87**	**800.00**	**0.00**	**19,701.10**	**24,349.39**
(Note: Quantity is changed from 1150 cy to 1500 cy [06/28/07] New quantity = 4,000 cy (08/15/07))								
			1.26	*2.10*	*0.00*		*3.36*	*4.18*
01 Load and Haul	**4,000**	**CY**	**5,023.47**	**8,407.33**	**0.00**	**0.00**	**13,430.79**	**16,711.33**
			23.94	*41.61*	*0.00*	*0.00*	*65.55*	*81.59*
RSM COEIB34B 1 trkdvrhv + 1 truck, dump, 16-23.5 CY	80	HR	1,915.20	3,329.16	0.00	0.00	5,244.36	6,527.33
(Note: Assume productivity = 150 cy/hr. Allow 3 dump trucks.)								
			0.00	*56.46*	*0.00*	*0.00*	*56.46*	*66.42*
GEN L40Z4397 LOADER, FRONT END, WHEEL, ARTICULATED, 3.25 CY (2.5 M3) BUCKET, 4X4	27	HR	0.00	1,505.55	0.00	0.00	1,505.55	1,771.23
			0.00	*133.97*	*0.00*	*0.00*	*133.97*	*157.62*
MAP T15CA016 TRACTOR, CRAWLER (DOZER), 310 HP, POWERSHIFT, W/15.3 CY SEMI-U BLADE (ADD ATTACHMENTS)	27	HR	0.00	3,572.62	0.00	0.00	3,572.62	4,203.08
			0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
MAP T10CA017 TRACTOR ATTACHMENTS, BLADE, UNIVERSAL, HYDRAULIC, FOR D8, 15.30 CY (ADD D8 TRACTOR)	27	HR	0.00	0.00	0.00	0.00	0.00	0.00
			30.74	*0.00*	*0.00*	*0.00*	*30.74*	*41.44*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Loader)	27	HR	819.73	0.00	0.00	0.00	819.73	1,104.99
			30.74	*0.00*	*0.00*	*0.00*	*30.74*	*41.44*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Dozer)	27	HR	819.73	0.00	0.00	0.00	819.73	1,104.99

Currency in US dollars

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
			18.36	*0.00*	*0.00*	*0.00*	*18.36*	*25.00*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	80	HR	1,468.80	0.00	0.00	0.00	1,468.80	1,999.69
			0.57	*0.80*	*0.20*		*1.57*	*1.91*
02 Place and Compact	**4,000**	**CY**	**2,285.76**	**3,184.55**	**800.00**	**0.00**	**6,270.31**	**7,638.06**
			0.34	*0.54*	*0.00*	*0.00*	*0.88*	*1.09*
MIL 023153105900 Compaction, of backfill, structural, 6" lifts, self propelled roller	4,000	ECY	1,358.98	2,142.28	0.00	0.00	3,501.26	4,356.43
			0.23	*0.26*	*0.20*	*0.00*	*0.69*	*0.82*
MIL 023153109000 Water for compaction, 3000 gallon truck, 3 mile haul	4,000	ECY	926.78	1,042.27	800.00	0.00	2,769.05	3,281.63
			126.31	*3.99*	*146.03*		*276.32*	*323.01*
21 Interior Drainage Concrete, Collector Channel & RCB Culvert	**2,500**	**CY**	**315,772.12**	**9,964.14**	**365,075.28**	**0.00**	**690,811.54**	**807,518.71**
(Note: Quantity was changed from 4050 cy to 4500 cy [06/28/07] New quantity = 2,500 cy (08/15/07))								
			5.17	*3.99*	*120.50*		*129.66*	*132.22*
01 Placement	**2,500**	**CY**	**12,932.80**	**9,964.14**	**301,250.00**	**0.00**	**324,146.94**	**330,538.38**
			161.66	*124.55*	*0.00*	*0.00*	*286.21*	*366.10*
RSM CLABC20 6 laborers + 1 concrete pump, 117 CY/hr	80	HR	12,932.80	9,964.14	0.00	0.00	22,896.94	29,288.38
			0.00	*0.00*	*120.50*	*0.00*	*120.50*	*120.50*
MIL 033102200150 Structural concrete, ready mix, normal weight, 3000 psi, includes material only	2,500	CY	0.00	0.00	301,250.00	0.00	301,250.00	301,250.00
			5,738.21	*0.00*	*11,320.00*		*17,058.21*	*19,109.87*
02 Finishing and Curing	**1**	**EA**	**5,738.21**	**0.00**	**11,320.00**	**0.00**	**17,058.21**	**19,109.87**
			0.18	*0.00*	*0.00*	*0.00*	*0.18*	*0.24*
MIL 033503000010 Concrete finishing, floors, monolithic, screed finish	5,000	SF	900.44	0.00	0.00	0.00	900.44	1,220.31
(Note: Quantity assumed.)								
			0.54	*0.00*	*0.24*	*0.00*	*0.78*	*0.97*
MIL 033503500600 Concrete finishing, walls, float finish, 1/16" thick	5,000	SF	2,701.33	0.00	1,200.00	0.00	3,901.33	4,860.92
(Note: Quantity assumed.)								
			2.67	*0.00*	*12.65*	*0.00*	*15.32*	*16.29*
MIL 033902000100 Curing, burlap, 12 oz., 4 uses assumed	800	CSF	2,136.44	0.00	10,120.00	0.00	12,256.44	13,028.65
(Note: quantity assumed.)								
			3.06	*0.00*	*0.54*		*3.60*	*4.71*
03 Forming	**97,232**	**SFC**	**297,101.10**	**0.00**	**52,505.28**	**0.00**	**349,606.38**	**457,870.46**

(Note: The slope of the Collector Channel is 2H:1V, the height of the channel is 5', and the length of the channel is 4,120 LF (begins at Sta. 7+40 and ends at Sta. 48+60.8), the width of the sloping surface is calculated to be 11.8', (square root of sum of 5-squared and 10-squared). Then, the square-foot contact area is calculated to be: 11.8' x 4120' x 2 sides = 97,232 SFCA.)

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
			3.06	*0.00*	*0.54*	*0.00*	*3.60*	*4.71*
MIL 031104554750 C.I.P. concrete forms, retaining wall, battered, job built plywood, to 8' high, 4 use, includes erecting, bracing, stripping and cleaning	97,232	SFC	297,101.10	0.00	52,505.28	0.00	349,606.38	457,870.46
			120.63	*0.00*	*1,100.00*		*1,220.63*	*1,259.50*
22 Interior Drainage Rebar, Collector Channel & RCB Culvert	**175**	**TON**	**21,110.10**	**0.00**	**192,500.00**	**0.00**	**213,610.10**	**220,412.23**
(Note: Assume the channel and wall quantities are 50-50. Quantity is changed from 250 tons to 300 tons [06/28/07] New quantity = 175 ton (08/15/07))								
			136.46	*0.00*	*1,100.00*	*0.00*	*1,236.46*	*1,280.43*
MIL 032106000600 Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60	88	TON	11,940.10	0.00	96,250.00	0.00	108,190.10	112,037.46
(Note: Original material cost is increased by 40%)								
			104.80	*0.00*	*1,100.00*	*0.00*	*1,204.80*	*1,238.57*
MIL 032106000700 Reinforcing steel, in place, walls, #3 to #7, A615, grade 60	88	TON	9,170.00	0.00	96,250.00	0.00	105,420.00	108,374.77
(Note: Original material cost is increased by 40%)								
			314.40	*0.00*	*1,500.00*		*2,399.40*	*2,500.71*
23 Interior Drainage Trash Rack, RCB Culvert	**5**	**EA**	**1,572.00**	**0.00**	**7,500.00**	**2,925.00**	**11,997.00**	**12,503.53**
(Note: Quotation: ACF Environmental Distributor Reed & Graham, Carl Springer (888) 381-0800 (11/09/2006). The material price is $1,500 per each, plus freight to Phoenix, AZ, $585.00. Crew: 2 masonary workers. Productivity = 2 hours per each.)								
			0.00	*0.00*	*1,500.00*	*585.00*	*2,085.00*	*2,085.00*
USR Trash Rack by ACF Environmental	5	EA	0.00	0.00	7,500.00	2,925.00	10,425.00	10,425.00
(Note: Shipping Cost (freight) is placed in "UserCost1")								
			39.30	*0.00*	*0.00*	*0.00*	*39.30*	*51.96*
MIL B-STRSTEEL Structural Steel Workers	40	HR	1,572.00	0.00	0.00	0.00	1,572.00	2,078.53
(Note: 2 workers x 4 hours per each x 5 ea = 40 hours)								
			53.10	*15.00*	*5,000.00*		*5,068.11*	*5,089.58*
24 Interior Drainage Headwalls, RCB Culvert	**2**	**EA**	**106.21**	**30.00**	**10,000.00**	**0.00**	**10,136.21**	**10,179.16**
			53.10	*15.00*	*5,000.00*	*0.00*	*5,068.11*	*5,089.58*
CIV 026101000530 Headwall, concrete, precast, 30 degree skewed wingwall, 18" diameter pipe	2	EA	106.21	30.00	10,000.00	0.00	10,136.21	10,179.16
			1,026.27	*109.49*	*2,200.00*		*3,335.76*	*3,687.24*
25 Interior Drainage Wingwalls, RCB Culvert	**4**	**EA**	**4,105.09**	**437.95**	**8,800.00**	**0.00**	**13,343.04**	**14,748.95**
			240.27	*109.49*	*2,200.00*	*0.00*	*2,549.76*	*2,647.97*
CIV 112851900100 Wingwall	4	EA	961.09	437.95	8,800.00	0.00	10,199.04	10,591.88
			39.30	*0.00*	*0.00*	*0.00*	*39.30*	*51.96*
MIL B-STRSTEEL Structural Steel Workers	80	HR	3,144.00	0.00	0.00	0.00	3,144.00	4,157.06
(Note: Allow 2 workers, and 80 hours.)								

Currency in US dollars

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
			8,976.00	*5,600.00*	*2,000.00*		*16,576.00*	*20,798.94*
26 Survey Markers (Bench Marks/Monuments) Removal & Installation for Levee	**1**	**EA**	**8,976.00**	**5,600.00**	**2,000.00**	**0.00**	**16,576.00**	**20,798.94**
			40.85	*0.00*	*0.00*	*0.00*	*40.85*	*56.45*
FOP FC-SURYR Surveyors (Foreman)	80	HR	3,268.00	0.00	0.00	0.00	3,268.00	4,515.89
(Note: Assumed a Occupation Code of #99659 Survey Technician. Allow 80 hours. For hourly labor cost quotation, see Means Building Construction Cost Data, 2004, Crew A-7 (p.589))								
			32.05	*0.00*	*0.00*	*0.00*	*32.05*	*44.22*
FOP FC-FLDRT Instrument Technician	80	HR	2,564.00	0.00	0.00	0.00	2,564.00	3,537.75
(Note: Assumed a Occupation Code of #29063 Drafter III. Allow 80 hours. For hourly labor cost quotation, see Means Building Construction Cost Data, 2004 (p.589))								
			39.30	*0.00*	*0.00*	*0.00*	*39.30*	*51.96*
MIL B-RODMAN Rodman/Chainman	80	HR	3,144.00	0.00	0.00	0.00	3,144.00	4,157.06
USR Survey Instruments	1	LS	0.00	5,000.00	0.00	0.00	5,000.00	5,882.35
			0.00	*6.00*	*20.00*	*0.00*	*26.00*	*27.06*
USR Monuments	100	EA	0.00	600.00	2,000.00	0.00	2,600.00	2,705.88
(Note: For material and equipment cost quotation, see Means Building Construction Cost Data, 2004, 01107-700-0600. Quanitity assumed.)								
			10,260.80	*0.00*	*0.00*		*20,260.80*	*24,158.08*
27 As-Built Drawings	**1**	**EA**	**10,260.80**	**0.00**	**0.00**	**10,000.00**	**20,260.80**	**24,158.08**
			37.58	*0.00*	*0.00*	*0.00*	*37.58*	*51.85*
FOP FC-ENGCI Engineers, Civil	160	HR	6,012.80	0.00	0.00	0.00	6,012.80	8,296.78
(Note: Assumed a Occupation Code of #29086 Engineer Technician IV)								
			26.55	*0.00*	*0.00*	*0.00*	*26.55*	*36.63*
FOP FC-FLDRT Field Draftsmen	160	HR	4,248.00	0.00	0.00	0.00	4,248.00	5,861.30
(Note: Assumed a Occupation Code of #29063 Drafter III)								
			0.00	*0.00*	*0.00*	*10,000.00*	*10,000.00*	*10,000.00*
USR Miscellaneous Costs	1	EA	0.00	0.00	0.00	10,000.00	10,000.00	10,000.00
			240.27	*109.49*	*14,250.00*		*14,599.76*	*14,697.97*
0024 Interior Drainage Flap Gates, RCB Culvert	**5**	**EA**	**1,201.36**	**547.44**	**71,250.00**	**0.00**	**72,998.80**	**73,489.86**
			240.27	*109.49*	*250.00*	*0.00*	*599.76*	*697.97*
CIV 112851900100 Flap gates, (Waterman, F-10), 6" dia. Flatback, head wall mounting	5	EA	1,201.36	547.44	1,250.00	0.00	2,998.80	3,489.86
(Note: Material quoted was obtained from Contractors/Engineers Supplies, (602) 272-1369 (Kris).)								
			0.00	*0.00*	*14,000.00*	*0.00*	*14,000.00*	*14,000.00*
USR Flap Gates, 3'x5' per each	5	EA	0.00	0.00	70,000.00	0.00	70,000.00	70,000.00
(Note: Price quoted from Hydro Gate, (303) 288-7873, x245, (Susan Dye), www.hydrogate.com. On the fax: "Model 50, with cast iron flat back seat, cast iron cover, bronze seating faces, ductile iron links, bronze bushings and stainless steel fasteners. Stainless Steel Anchor bolts." The price quoted includes freight to job site.)								

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
			178.45	*195.61*	*60.00*		*434.06*	*531.61*
09A Soil Cement	**20**	**CY**	**3,568.94**	**3,912.29**	**1,200.00**	**0.00**	**8,681.23**	**10,632.18**
			0.89	*0.72*	*0.00*	*0.00*	*1.60*	*2.04*
HNC 023154260205 Load, bank measure, medium material, 3/4 C.Y. bucket, wheeled loader	20	BCY	17.74	14.31	0.00	0.00	32.05	40.80
			0.17	*1.39*	*0.00*	*0.00*	*1.56*	*1.86*
HNC 023154902300 Hauling, excavated or borrow material, loose cubic yards, 6 mile round trip @ 40 MPH (2.1 cycles/hour), 40 C.Y., off highway haulers, excludes loading	24	LCY	4.00	33.35	0.00	0.00	37.35	44.68
			147.80	*161.03*	*50.00*	*0.00*	*358.83*	*439.45*
HNC 023707001300 Erosion control, soil cement, 7% portland cement, in place	24	ECY	3,547.20	3,864.64	1,200.00	0.00	8,611.84	10,546.69
(Note: 94-lb bag of cement)								
			1,536.17	*1,193.53*	*0.00*		*18,389.71*	*19,148.62*
0030 Clear Site and Remove Obstructions, Diversion Channel	**2**	**ACR**	**3,072.35**	**2,387.06**	**0.00**	**31,320.00**	**36,779.41**	**38,297.25**
			1,640.53	*1,463.26*	*0.00*	*0.00*	*3,103.79*	*3,949.75*
MIL 022301000152 Clear and grub, cut and chip, medium trees, to 10" diameter	1	ACR	820.27	731.63	0.00	0.00	1,551.89	1,974.87
(Note: Assume 1/4 of the total acreage will need to be cleared and grubbed. Then, 2 acres x 1/4 = 0.5 acre.)								
			218.06	*459.59*	*0.00*	*0.00*	*677.66*	*834.91*
AF 022302001060 Selective clearing, dry clearing, medium size brush, average grub and trees, excludes removal offsite	1	ACR	109.03	229.80	0.00	0.00	338.83	417.46
			8.21	*5.46*	*0.00*	*0.00*	*13.67*	*17.57*
MIL 022302002000 Selective clearing, load spoils, by machine, includes 2 mile haul to dump	261	CY	2,143.05	1,425.64	0.00	0.00	3,568.69	4,584.92
(Note: Assume 1 truck-load for every 1,000 sf. Say 12 CY/1,000 SF = 0.012 cy/sf --> 43,560 sf x (0.5 acre) x 0.012 cy/sf = 261 cy)								
			0.00	*0.00*	*0.00*	*24.00*	*24.00*	*24.00*
USR Disposal Fee	1,305	CY	0.00	0.00	0.00	31,320.00	31,320.00	31,320.00
			2.63	*7.29*	*0.20*		*10.12*	*12.32*
0031 Excavation, Compacted Fill, and Spreading Excavated Materials, Diversion Channel	**10,250**	**CY**	**26,995.69**	**74,729.19**	**2,050.00**	**0.00**	**103,774.88**	**126,233.77**
			1.13	*4.95*	*0.00*		*6.07*	*7.32*
01 Excavation and Spreading Excavated Materials	**10,250**	**CY**	**11,537.60**	**50,712.33**	**0.00**	**0.00**	**62,249.93**	**74,989.33**
			1.13	*4.95*	*0.00*		*6.07*	*7.32*
01 Excavation and spreading	**10,250**	**CY**	**11,537.60**	**50,712.33**	**0.00**	**0.00**	**62,249.93**	**74,989.33**
(Note: Productivity = 300 cy/hr Hours needed = 10,265 cy / 300 cy/hr = 40 hours (allowed))								

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
			0.00	*290.73*	*0.00*	*0.00*	*290.73*	*342.03*
MAP S20CA005 SCRAPER, TANDEM POWERED, STANDARD LOADING, 44 CY, 52 TON, 4X4, D-11 ASSISTED LOADING	160	HR	0.00	46,516.43	0.00	0.00	46,516.43	54,725.21
(Note: 4 pieces of equipment x 40 hours = 160 hours)								
			35.00	*61.36*	*0.00*	*0.00*	*96.36*	*113.36*
GEN T60Z7910 TRUCK, WATER, OFF-HIGHWAY, 5,000 GAL (18,927 L), W/175 HP (130 KW) TRACTOR	40	HR	1,400.00	2,454.40	0.00	0.00	3,854.40	4,534.59
(Note: This cost item includes water truck and driver costs.)								
			0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
MAP T50XX005 TRUCK, HIGHWAY, CONVENTIONAL, 3/4 TON PICKUP, 4X4	40	HR	0.00	0.00	0.00	0.00	0.00	0.00
			32.74	*0.00*	*0.00*	*0.00*	*32.74*	*44.25*
MIL X-EQOPRMED Outside Equip. Operators, Medium (1 for scraper, 1 for dozer)	80	HR	2,619.20	0.00	0.00	0.00	2,619.20	3,539.65
			18.36	*0.00*	*0.00*	*0.00*	*18.36*	*25.00*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	40	HR	734.40	0.00	0.00	0.00	734.40	999.85
			21.30	*0.00*	*0.00*	*0.00*	*21.30*	*28.93*
MIL X-TRKDVRLT Outside Truck Drivers, Light	40	HR	852.00	0.00	0.00	0.00	852.00	1,157.05
			29.66	*0.00*	*0.00*	*0.00*	*29.66*	*39.92*
MIL X-EQOPRLT Outside Equip. Operators, Light	200	HR	5,932.00	0.00	0.00	0.00	5,932.00	7,984.15
(Note: Let's allow 5 operators here. Then, 5 x 40 = 200 hours)								
			0.00	*4.02*	*0.00*	*0.00*	*4.02*	*4.73*
MAP T10CA007 TRACTOR ATTACHMENTS, BLADE, POWER ANGLE, HYDRAULIC, FOR D5, 2.53 CY (ADD D5 TRACTOR)	40	HR	0.00	160.79	0.00	0.00	160.79	189.17
			0.00	*5.37*	*0.00*	*0.00*	*5.37*	*6.31*
MAP T10CA008 TRACTOR ATTACHMENTS, POWER WINCH, FOR D5 (ADD D5 TRACTOR)	40	HR	0.00	214.65	0.00	0.00	214.65	252.53
			0.00	*34.15*	*0.00*	*0.00*	*34.15*	*40.18*
USR T15CS005 TRACTOR, CRAWLER (DOZER), 75 HP, POWERSHIFT, W/2.50 CY UNIVERSAL BLADE (ADD ATTACHMENTS)	40	HR	0.00	1,366.05	0.00	0.00	1,366.05	1,607.12
			1.51	*2.34*	*0.20*		*4.05*	*5.00*
02 Compacted Fill	**10,250**	**CY**	**15,458.09**	**24,016.87**	**2,050.00**	**0.00**	**41,524.95**	**51,244.45**
			0.94	*1.55*	*0.00*		*2.48*	*3.09*
01 Load and Haul	**10,250**	**CY**	**9,600.83**	**15,856.46**	**0.00**	**0.00**	**25,457.30**	**31,671.92**
			23.94	*41.61*	*0.00*	*0.00*	*65.55*	*81.59*
RSM COEIB34B 1 trkdvrhv + 1 truck, dump, 16-23.5 CY	68	HR	1,635.90	2,843.66	0.00	0.00	4,479.56	5,575.43
(Note: Assume productivity = 150 cy/hr. and a truck fleet of 20. Then, 10,265/150 = 70 hours)								

Labor ID: LB07AZ EQ ID: EP05R07 Currency in US dollars TRACES MII Version 2.2

Description	Quantity	UOM	LaborCost	EQCost	MatlCost	UserCost1	BareCost	DirectCost
			0.00	*56.46*	*0.00*	*0.00*	*56.46*	*66.42*
GEN L40Z4397 LOADER, FRONT END, WHEEL, ARTICULATED, 3.25 CY (2.5 M3) BUCKET, 4X4	68	HR	0.00	3,857.97	0.00	0.00	3,857.97	4,538.79
			0.00	*133.97*	*0.00*	*0.00*	*133.97*	*157.62*
MAP T15CA016 TRACTOR, CRAWLER (DOZER), 310 HP, POWERSHIFT, W/15.3 CY SEMI-U BLADE (ADD ATTACHMENTS)	68	HR	0.00	9,154.84	0.00	0.00	9,154.84	10,770.40
			30.74	*0.00*	*0.00*	*0.00*	*30.74*	*41.44*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Loader)	68	HR	2,100.57	0.00	0.00	0.00	2,100.57	2,831.55
			30.74	*0.00*	*0.00*	*0.00*	*30.74*	*41.44*
MIL X-EQOPRMED Outside Equip. Operators, Medium (Dozer)	68	HR	2,100.57	0.00	0.00	0.00	2,100.57	2,831.55
			18.36	*0.00*	*0.00*	*0.00*	*18.36*	*25.00*
MIL X-LABORER Outside Laborers, (Semi-Skilled)	205	HR	3,763.80	0.00	0.00	0.00	3,763.80	5,124.22
			0.57	*0.80*	*0.20*		*1.57*	*1.91*
02 Place and Compact	**10,250**	**CY**	**5,857.26**	**8,160.40**	**2,050.00**	**0.00**	**16,067.66**	**19,572.53**
			0.34	*0.54*	*0.00*	*0.00*	*0.88*	*1.09*
MIL 023153105900 Compaction, of backfill, structural, 6" lifts, self propelled roller	10,250	ECY	3,482.38	5,489.60	0.00	0.00	8,971.98	11,163.35
			0.23	*0.26*	*0.20*	*0.00*	*0.69*	*0.82*
MIL 023153109000 Water for compaction, 3000 gallon truck, 3 mile haul	10,250	ECY	2,374.87	2,670.81	2,050.00	0.00	7,095.68	8,409.18

Currency in US dollars

Description	Page

APPENDIX B

HYDRAULIC AND HYDROLOGIC ANALYSIS

US Army Corps of Engineers
Los Angeles District

TRES RIOS ENVIRONMENTAL RESTORATION PROJECT
FLOOD CONTROL NORTH LEVEE
PHASE 1A & 1B

DESIGN DOCUMENTATION REPORT

Appendix B
Hydraulic Analysis

July 2012

LOS ANGELES DISTRICT, CORPS OF ENGINEERS
HYDRAULICS SECTION

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Purpose

The purpose of this appendix is to document the hydraulic analysis completed in support of the Tres Rios Environmental Restoration Project for Flood Control North Levee (Phases 1A & 1B). The hydraulic analysis was conducted (1) to determine levee heights and bank protection, (2) to determine proper toe down depths, (3) to determine the risk and uncertainty of the levee heights (4) to design interior drainage features, and (5) to determine the 100-yr floodplain delineation. Detailed hydraulic documentation and calculations are maintained in the Hydraulics Section's files.

1.2 Description of Study Area

The study area is located at the confluence of the Salt, Gila, and Agua Fria Rivers, west of the City of Phoenix, Arizona. Because of the confluence of the three rivers within this close proximity, the project has been identified as "Tres Rios," meaning "three rivers" in the Spanish language.

In the Feasibility Report (2000) the upstream boundary of the project is located at 87th Avenue, about 2,500 ft upstream (east) from the City of Phoenix's 91st Avenue Waste Water Treatment Plant. The study area extends west from the treatment plant for approximately seven miles through the confluence of both the Gila and Agua Fria Rivers. The downstream boundary of the project is the Agua Fria River. The Feasibility Report describes and outlines project alternatives that were considered for basis of design of the Tres Rios Environmental Restoration Project. The project recommended plan included the North Levee (Phase I); Pump Station, Regulating and Overbank Wetlands (Phase II); Riparian Corridors (Phase III); an underground reclaimed water pipe (Phase IV); and open water marsh along the south side of the Salt River (Phase V).

The study area north levee limit was later shortened in 2004 and 2011 based on a review of historical aerial photography, newer topography and hydraulic analyses. The north levee upstream boundary was eliminated from 105th to 95th Avenue (2004) and the proposed floodwall along El Mirage Road (i.e. Phase 1c) was also eliminated (2011).

2.0 STUDY METHODOLOGY

2.1 Guidance

The hydraulic design was prepared following the guidance contained in U.S. Army Corps of Engineers (USACE) Engineering Manual (EM) 1110-2-1601, "Hydraulic Design of Flood Control Channels" (1994). Additional guidance was provided by EM 1110-2-1619, "Risk-Based Analysis for Flood Damage Reduction Studies" (1996b).

2.2 Analysis and Design Tools

The computer programs USACE Hydrologic Engineering Center's River Analysis System (HEC-RAS) (USACE, 2010a) and USACE Engineer Research and Development Center's RMA-2 (USACE, 2003) were used for the hydraulic analysis. The computer program, "Sedimentation in Stream Networks" (HEC-6T) (1997) was used for the sedimentation analysis. The USACE's HEC Flood Damage Analysis (HEC-FDA) program (USACE, 2008) was used to compute the uncertainty and assurance [conditional non-exceedance probability (CNP)] of the levee to reduce the flood risks from the 1% Annual Exceedance Probability (AEP). The AEP is formally known as the 100-year flood event. The AEP is a measure of the likelihood of exceeding a specified target in any year. This implies that the annual maximum stage in any year has a 1 percent chance (0.01 probability) of exceeding the elevation of the top of the river.

2.3 Hydrology and Design Discharges

The level of protection provided by the levee was analyzed in the "Tres Rios, Arizona, Feasibility Report" (USACE, 2000) and selected based upon an economic analysis and non-Federal sponsor requirements. The methodologies and assumptions used to determine the hydrology and design discharges for the study area are documented in the Hydrology Appendix of the Tres Rios Feasibility Report. Table 1 summarizes the discharges that were analyzed for the project. A detailed description of the hydrology used in the Sedimentation Analysis is provided in Exhibit II.

3.0 HYDRAULIC ANALYSIS

3.1 Summary of WEST Consultants 2004 Report

The WEST Consultants (WEST) report (2004) titled "PED Hydraulic Design of Tres Rios North Levee, Volume II Pre-Final Project Analysis Final Report" (refer to Exhibit III) presents the results of the hydraulic and sediment transport, and scour analyses conducted for the design of the north levee. The results are summarized below.

3.1.1. Hydraulic Model.

Basic Analysis Assumptions: In applying the numerical model (HEC-RAS), the flow is in a one-dimensional, uniform, steady state. The one-dimensional assumption is applicable since during high flows most of the flow travels downstream along the channel allowing the model to be analyzed in one direction. The uniform flow statement is reasonable since in most situations flow depth and velocity is gradually changing. Steady flow states that the change in depth is constant as a function of time. The steady state assumption is reasonable for most of the study reach except at specific locations where there are abrupt changes in the cross sectional flow; examples include hydraulic jumps, abrupt channel bends and changes in bed slope (USACE, 2010a).

2001 Topography: The topography for the model used in WEST 2004 Report was primarily 1 foot contours dated 2001. Limited portions of overbank geometry were cut from the topography used in the WEST report (1999) titled "Rio Salado Oeste Study: Without Project Final Hydraulic Design Analysis Report". All vertical elevations are based on North American Datum of 1983 (NAD 83), and horizontal distances are based on National Geodetic Vertical Datum (NGVD 29). All the topography was developed using State Plane coordinates, Arizona – Central.

Cross Sections: The cross sections were selected to match Federal Emergency Management Agency (FEMA) cross sections. Cross sections where flows from the Salt and Upper Gila rivers overlapped were cut off where a line of separation follows the natural high ground between the two rivers.

Ineffective Flow Areas: Ineffective flow areas were set at the regime bank stations to elevations high enough such that the 5-yr discharge was completely contained within the channel, but low enough to allow the 20-yr discharge to flow uncontained. The ineffective flow limits along the north bank were developed based on the 100-yr event. A maximum of 4:1 expansion was maintained in developing these areas, where necessary. The ineffective area heights were raised vertically sufficient to contain high flows.

Also, ineffective flow areas were defined at the ends of cross sections where the two flows, Salt and Upper Gila rivers would otherwise meet one another.

Bridges: The 116th Avenue Bridge and the Bullard Avenue Bridge geometries were obtained from the Maricopa County Department of Transportation as-built plans and coded into the hydraulic model. Per guidance contained in the HEC-RAS Reference Manual (USACE, 2010a), the contraction and expansion coefficients were set to 0.3 and 0.5 at bridges when contraction/expansion conditions exist. These coefficients were set to 0.3 and 0.5 for contraction and expansion respectively, in the bridge bounding cross sections.

Since the bridges are supported by piers that extend into the channel cross section, the highest energy solution between: Energy Only (standard Step), Momentum, and Yarnell (Class A only) appropriate for each bridge was selected for low flow conditions.

Manning's N-Values: The primary factor in the estimation of Manning's roughness coefficients (n-values) was vegetation. Field observations along with hydraulic relationships and values assigned as per methodologies outlined by "Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona" (Thomsen and Hjalmarson, 1991), and USGS "Guide for Selecting Manning's Roughness Coefficients for Natural Channel and Floodplains" (Arcement and Schneider, 1984) were used in the estimation process. Table 2 summarizes the Manning's n-values that were adopted.

Analysis of Water Surface Elevations: A two-dimensional model (RMA-2) was developed for the with-levee condition to resolve uncertainty in the water surface elevations (WSE) and velocities and provide a better analysis of toe-down depth requirements and protection needs for the levee. Based on the results of the analysis it was determined that there was no need to modify the Manning's n-values in the hydraulic model.

3.1.2. Floodplain Delineation. The combination of HEC-RAS and Geospatial River Analysis System (GeoRAS) were used to delineate floodplains within the study area. HEC-GeoRAS operates within ESRI's ArcView (version 3.2a) and was used to process geospatial data for use with HEC-RAS. The 2001 elevation dataset used to construct the main channel model geometry was composed primarily of 1-foot vertical resolution. Additional limited portions of overbank geometry were cut from topography used in the WEST (1999) analysis which supplemented areas where the 1-foot data did not completely contain the 1% AEP.

The 1% AEP for without-project, with-levee only (from approximately 91st Ave. to near Dysart Rd.), and with-project (levee with open-water marshes and ponds) are plotted in Exhibit III. Existing 1% AEP floodplains as a result of local drainage were not analyzed in this project because there are no local flooding sources mapped by FEMA or regulated by Flood Control District of Maricopa County (FCDMC) present on the landward side of the levee.

Additionally, in 2004 continued hydraulic modeling refinement utilizing historical aerial photography and more recent topography indicated that there was no significant lateral movement of the north bank upstream of 105th Avenue. Based on the relatively stable bank condition, no major overland breakout flows occurred until downstream of 105th Avenue and therefore the levee section from 105th to 95th Avenue was eliminated from the project (refer to Exhibit X for additional details).

3.1.3. Levee Height Analysis. Levee heights were analyzed for worst case conditions (i.e. highest water surface elevations) using HEC-RAS, RMA-2 and HEC-FDA. The water surface elevations were determined using the existing conditions model with the levee in place to determine impacts. The software HEC-FDA was used to obtain the necessary minimum height for the levee for a 95% reliability level for levee overtopping. Stage uncertainty was computed using the methodology described in EM 1110-2-1619 (USACE, 1996b).

Three feet above the computed water surface elevation was sufficient to maintain the minimum 95% reliability level for the 1% AEP along the project reach. Table 6-1 in Exhibit III tabulates the minimum required levee elevations.

3.1.4. Sediment Transport. The computer program (HEC-6T) was used to conduct the numerical sediment transport modeling for without-project, with-levee only and with-project (levee with open-water marshes and ponds). The HEC-6T model simulation was performed for 105-years of record (1889 – 1993 period). Detailed discussion of the sedimentation analysis and results are documented in Exhibit III. For without-project conditions, the results show an overall lowering of the average bed elevations indicating potential for erosion in most areas. The analysis of the with-levee only condition is similar to the without-project conditions. The long term degradation is approximately 3 ft.

The results for with-project are shown in Figure 5-8 on page 67 of Exhibit III. In the Salt River area, the addition of ponds immediately upstream of the 116th Avenue Bridge provides additional conveyance on the overbanks resulting in lower velocities within the channel. The results show an increase in the average bed elevations. This deposition results in the depletion of the sediment load as the flow moves downstream. As a result of the upstream deposition, there is erosion in the Lower Gila River as the flows tend to regain equilibrium by scouring to increase the sediment load that was lost due to deposition in the Salt River portion of the model. The location of the ponds will act as a sediment trap and retain nearly all sediment inflows from the Gila River during low flows, which could lead to increased degradation downstream of the confluence.

Following sediment transport analysis, the resulting bed elevations were coded into the HEC-RAS model and rerun, and inundation limits were remapped. Post-sediment transport inundation limits indicate that the lateral extent of inundation decreased in most locations through the study reach. These results are consistent with the overall trend of erosion and slight channel deepening indicated in the sediment transport analysis.

3.1.5. Toe-Down Depth. An estimate of local scour or toe-down depth along the proposed levee was performed so that levee protection could be placed sufficiently low in the streambed to prevent undermining damage from potential degradation. A 105-year long-term period of record hydrograph was simulated using HEC-6T to determine the future river thalweg. Several regime equations were then used to calculate the general scour. The average depths of scour obtained from the equations were added to the magnitude of predicted degradation to arrive at the total required toe-depth. A 30% safety factor was added to account for uncertainty. The resulting toe depth recommended is 10 ft below the existing thalweg.

3.2 Recommended Levee Bank Protection and Toedown

3.2.1. Hydraulic Criteria for Bank Protection. WEST report titled "PED Hydraulic Design of Tres Rios North Levee – 2D Model Analysis, Final Design Report" (Exhibit IV) was used as a starting point in developing the final bank and toe protection alternative. The purpose of the study was to conduct a two-dimensional (2D) numerical model analysis in order to assess the vulnerability of the north levee bank system with respect to historical and simulated 1% AEP flood frequency event conditions. Design guidance for stone size protection and revetment toe scour estimation were computed using the procedures outline in EM 1110-2-1601 (USACE, 1994).

In the process of developing this design alternative, specific criteria was identified that established a reasonable risk for setting the design parameters based on the information contained in the report as well as known historical data within the project reach. The memorandum titled "Tres Rios Preconstruction Engineering and Design (PED) – Hydraulic Criteria for Bank Protection" (Exhibit V) outlines the specific criteria used for the final design alternative. This memorandum contains velocity magnitudes and vector information as well as a logic diagram that were used to establish the final design. Graphical results indicate that the recommended bank protection features reduce the lateral impingement forces against the north bank.

After careful consideration of historical flood information in the project area; an examination of the functional performance of existing bank protection features within the project reach; and an assessment of the 2-D model results as presented in the Final Report, it was determined that much of the original proposed bank protection design and associated toe protection measures as recommended in the Final report should be incorporated in the final design. However, an exception to the total acceptance of the Final Report's design recommendations is being made for the upstream reach between 91st Avenue and 107th Avenue. In this sub-reach of the project there were specific reasons to replace the proposed dikes or bendway weirs with a single dike (See Exhibit V). The primary purpose for this dike near the 95th Avenue extension is to offset any major catastrophic threat in this localized area of relative high flow velocities immediately adjacent to the high terrace bank. The protection of the levee was set to the local scour depth, but protection of the high terrace was set to the ultimate scour depths. Riprap bank protection would be used throughout the face of the levee.

3.2.2. Riprap Calculations. The riprap design guidance outlined in EM 1110-2-1601 (USACE, 1994) was used to determine the minimum required riprap sizes. Velocities from the HEC-RAS and RMA2 numerical models were used for riprap calculations. A specific gravity of 2.65 was assumed for the riprap. The ratio of V_{SS}/V_{AVG} was assumed to be 1.0 where V_{SS} and V_{AVG} are the velocity of the riprap sideslope at 20% of the flow depth and the average flow velocity, respectively. A design safety factor of 1.1 was used based on guidance in EM 1110-2-1601 (USACE, 1994).

Both angular and rounded riprap was considered. For rounded riprap, the stability coefficient for incipient failure vertical velocity distribution coefficient, C_S, was adjusted to 0.375 (0.30 for angular rock).

Additional consideration was made for impinging flows. For braided streams having impinged flow, the stone sizing procedures were modified in two areas: the method of velocity estimation and the velocity distribution coefficient, C_V. In this case, the ratio of V_{ss}/V_{avg} was multiplied by 1.5 and C_V was adjusted to 1.25 (1.0 for parallel flow).

Although the results show that a 9-inch layer of riprap would be adequate at most locations, a 15-inch layer of riprap (angular or rounded) is recommended for several reasons: 1) there is not much difference between the angular or rounded rock required thickness; 2) the stone size requirements using the HEC-2 numerical models are thicker than 9 inches and averages to approximately 15 inches; and 3) theft is not a concern within the populated area. For these reasons, a 15-inch layer of riprap is recommended.

3.2.3. Launchable Toe Stone. Launchable toe stone was used based on economic analysis. The guidelines described in EM 1110-2-1601 (USACE, 1994) were used to determine the volume of launchable toe stone. This concept simply uses toe scour as a substitute for mechanical excavation. This method also has the advantage of providing a "built-in" scour gage, allowing easy monitoring of high-flow scour and the need for additional stone reinforcement by visual inspection of the remaining toe stone. This method of toe protection is useful where water levels prohibit excavation for a toe section or where the cost of extra stone required to produce a launched thickness equal to or greater than 1.5T is exceeded by the cost of excavation required to carry the design thickness T down the slope.

To compute the required launchable stone volume, the following assumptions were used: 1) launch slope = 1 vertical on 2 horizontal (1V:2H); 2) scour depth = existing elevation – maximum scour elevation; 3) thickness after launching = 1.5 times the thickness of the bank revetment T. For a 15 ft scour depth protection, the launchable toe stone height and width would be approximately 8.0 ft.

3.3 Updated Floodplain Delineation

The WEST 2004 hydraulic model was refined by JE Fuller (Fuller), HNTB, WEST, and USACE, and then further adjusted based on additional discussions with WEST and FCDMC (WEST, 2011). The changes to the model are described below.

3.3.1. Manning's N-Values:

Horizontal roughness variation was revised by HNTB based on updated land cover information. The updated model also increased and reassigned roughness values to have vertical variation as a function to discharge. The first evaluated assumption was the roughness values Fuller used for the main channel. Evaluation of the representation of the cottonwood areas along the edge of the channel suggests that the values were somewhat conservative. The Fuller model uses the vertical distribution module in HEC-RAS to change the Manning's n-value based on discharge. The Fuller model uses a vertical distribution of 0.15 for the 5-yr event, 0.10 for the 20-yr event and 0.07 for events greater than or equal to the 100-yr event. However, based on more recent field observations, the Manning's n-value was decreased from 0.07 to 0.04 for the cottonwood areas.

Vertical variation in Manning's roughness coefficients were used at every cross section in the model except immediately upstream and downstream of the 116th Avenue Bridge. These two cross sections did not utilize the vertical variation in Manning's roughness coefficients because this bridge was modeled as a multiple opening analysis, and HEC-RAS will not allow vertical variation in Manning's roughness coefficients for a multiple opening analysis.

3.3.2. Levees and Dikes

Dikes were added at various locations for additional bank protection and to prevent flow from impinging on the levee. There are seven dikes at approximate levee stations 171+50, 164+00, 158+00, 141+00, 126+50, 119+50, 112+00. The dikes are about 300 feet in length, 10 feet wide at the crest, slope at 2H:1V, and protected by 27" riprap. See Plate 1 for typical dike plan and profile.

The levee alignment was coded into the model by HNTB, which updated the representation of the north levee using as-built information. Additionally, the seven dikes were represented with ground elevations capturing the shape of the dike.

Several cross sections included features defined as levees that did not represent the actual Tres Rios North Levee. These areas were located along the south bank of the Salt and Lower Gila rivers. These previous levee features were changed to ineffective flow areas.

3.3.3. <u>2008 Topography</u>

New topography flown in 2008 was contracted out by the FCDMC. The topography was developed using State Plane coordinates, Arizona – Central, NAD 83 and NAVD 88 with 2-foot contour intervals. The FCDMC's contractor WEST utilized the FEMA "Multiple Conversion Factors (Stream by Stream)" approach to develop a conversion factor to shift the elevation data provided in the 2008 mapping dataset from referencing the NAVD 88 vertical datum to referencing the NGVD 29 vertical datum. This was done to match the portion of the hydraulic model upstream of El Mirage Road based on 2001 topography that already references NGVD 29. The FEMA method used is outlined in Section B.4.1.2 of Exhibit B of FEMA's Flood Hazard Mapping Program Guidelines and Specifications for Flood Hazard Mapping Partners (FEMA, 2003).

The FEMA document requires that, "Under this approach, the Mapping Partner performing the flood hazard analyses shall develop an average conversion factor for each flooding source by establishing separate conversion factors at the upstream end of the studied reach, at the downstream end, and at an intermediate point, and developing an average conversion factor from those data. If the maximum offset from the average conversion factor determined for a flooding source converted in this fashion exceeds 0.25 foot, the Mapping Partner shall follow the protocol described in subsection B.4.1."

As per the FEMA regulations, WEST took coordinates from the upstream end of the study reach, the downstream end, and several intermediate points corresponding to various locations along the Tres Rios North Levee and in the portion of the study reach downstream of El Mirage Road. Each of these coordinates was entered into the USACE CORPSCON program, and a conversion factor between NGVD and NAVD was determined for each point. The average conversion for all of these points was calculated to be 2.10 feet. Therefore, a shift of minus 2.10 was applied to the elevation mass points of the 2008 topography. These shifted mass points along with the break lines in the mapping product were then used to create a TIN which references the NGVD 29 vertical datum. This TIN was then utilized to update the geometry of the HEC-RAS model, and the hydraulic calculations were recomputed in HEC-RAS based on this geometry.

Phase 1 of the Tres Rios Environmental Restoration Project consists of three distinct project phases: Phases 1A, 1B and 1C. Phases 1A and 1B consist of a new Tres Rios North Levee and modified existing Holly Acres Levee along the north bank of the Salt-Lower Gila River system. Phase 1C consists of a floodwall to be constructed along the west side of El Mirage Road from the Salt River to Southern Avenue. The purpose of utilizing the 2008 topography in an updated analysis is described in the Memorandum for Record (refer to Appendix X) and was to evaluate whether or not Phase 1C was still needed.

Note that the 2001 topography is used for the project area upstream of El Mirage Road and the 2008 topography is used downstream of El Mirage Road. In comparison to the old topography, the 2008 topography results show a decrease in invert bed elevation of approximately one foot downstream at El Mirage Road. Bed elevations continue to scour moving downstream, up to 5.2 feet at the downstream end of the project. Accordingly, the water surface profile has also *dropped, up to 3 feet with the 2008 topography. The water surface profile drop progresses upstream of El Mirage Road to the confluence of the Gila and Salt Rivers. However, the bed elevation in the model may not reflect additional scour east of El Mirage Road since it uses the older 2001 topography. The FCDMC has noted that there has been both scour and deposition in several locations since the older topography. Based on the analysis using the 2008 topography, the 100-year overflow boundary will not overtop El Mirage Road and Phase 1C was no longer needed.*

3.3.4. Cross Sections

The cross sections from the Upper Gila River reach and junction feature were removed from the original model since previous FEMA mapping excluded the GRIC. Cross sections from river station 199.52 to river station 200.27 were extended to the south to include the revised floodplain area from the Upper Gila River area.

3.3.5. Ineffective Flow Areas

The area from the cross section extensions discussed in Section 3.3.4 was modeled as ineffective flow areas.

3.3.6. Bridges

The only bridge within the evaluation reach is the 116th Avenue Bridge. Contraction and expansion coefficients were changed to 0.1 and 0.3 respectively since contraction/expansion conditions do not exist at this bridge. Pier debris with a width of 2 feet on either side of each pier (USACE, 2004) was also added to the 116th Avenue Bridge.

3.3.7. Computed Water Surface Elevations

The final 1% AEP water surface profile is shown in Exhibit VI. Typical cross section information upon which the hydraulic model was developed is presented in Exhibit VII. Finally, the supporting pertinent hydraulic data for the above referenced water surface profile is displayed in tabulated format and shown in Exhibit VIII.

3.3.8. FEMA Tie-In Floodplain Boundaries

The FEMA method used to determine upstream and downstream tie-in locations is outlined in Section C.3 of Exhibit VII of FEMA's Flood Hazard Mapping Program Guidelines and Specifications for Flood Hazard Mapping Partners (FEMA, 2009).

At the upstream end of the model the computed WSE at cross section 203.08 ties into FEMA's effective floodplain profile within the 0.5 foot maximum vertical variance regulations enforced by FEMA for new studies to tie-ins to the effective floodplain profiles. FEMA effective floodplain profiles are discussed in Volume 1 of 5 Salt-Gila River Floodplain Delineation Restudy (Baker, 1999). Cross section 203.99 in the effective model has a WSE of 972.42 ft, whereas the current model WSE at cross section 203.08 is 972.36 ft, a difference of 0.06 feet. The floodplain ties-in horizontally at this location as well.

Downstream of the North Levee, the computed WSE at cross section 198.02 is 933.72 ft. The WSE at cross section 198.02 in the effective model is 934.16 ft, which is a 0.44 difference. At this location the model ties in vertically to the effective model within the 0.5 foot limit and ties in horizontally as well.

At the downstream area (below El Mirage Road) the floodplain boundary was slightly modified. A low point occurs just downstream of the tie-in location at cross section 197.69. Hydraulically, the backwater from this breakout would inundate the area north of Southern Avenue. In FEMA's effective study (Baker, 1999) Southern Avenue was treated as a roadway embankment that was removed to analyze the failure of this embankment. As such, Southern Avenue is shown as a fail-able embankment and wets the area north of Southern Avenue upstream of cross section 197.69. At the downstream tie-in location, the backwater elevation of 933.74 ft is shown to progress upstream. Refer to Plate 2 for 1% AEP floodplain delineation.

3.4 Risk and Uncertainty Analysis

Objective of Risk-Based Analysis. The probability of exceedance and uncertainty analysis of levee containment is accepted by FEMA National Flood Insurance Program (NFIP) levee system evaluation requirements. This policy requirement applies to all new and existing levees (FEMA, 2003b; USACE 2006). However, FEMA's primary focus has been a reliance on the concept of "freeboard". FEMA's levee certification requirements are discussed in detail in the Code of Federal Regulations (CFR)—specifically 44 CFR Section 65.10(b)(1))—outlining the NFIP regulations as well as in Guidelines and Specifications for Flood Hazard Mapping Partners, Exhibit H – Guidance for Mapping of Areas Protected by Levee Systems (FEMA, 2003b). Essentially, their requirements consist of, in general terms, 3 ft of freeboard above the computed water surface elevation for the 1% AEP, plus an additional foot of freeboard at bridges, and an additional 0.5 foot required at the upstream end and tapering to the minimum at the downstream end of the levee (FEMA, 2003; FEMA, 1991). Exceptions to the freeboard requirement may be pursued, based on the FEMA policy of permitting other Federal agencies responsible for levee construction to certify that levees will pass the FEMA Base Flood (i.e. denoted as % annual chance flood) (USACE, 2010b).

The USACE probability of exceedance and uncertainty analysis procedure for riverine levees is described in Chapters 4 and 5 of Engineering Manual (EM) 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies (USACE, 1996b). A Monte Carlo simulation in the USACE's HEC-FDA program version 1.2.5 was used to compute the assurance CNP of the levee to contain the 1% AEP (USACE, 1996b; USACE, 2010b). Levees with 3 ft or more of freeboard must have at least 90% assurance of containment of the 1% AEP, and levees with freeboard less than 3 ft and greater than 2 ft must have at least 95% assurance of containment of the 1% AEP (USACE, 2010b).

Description of Levee Evaluation Reach. The evaluation reach was divided into two levee segments: Phase 1A (Salt River upstream of the confluence with the Upper Gila River) and Phase 1B (Gila River below confluence with the Salt River). See Plate 3 for locations.

3.4.1 **Computational Methodology Process.** Following the guidance found in EM 1110-2-1619 (USACE, 1996b) and HEC-FDA User's Manual (USACE, 2008), the computational methodology for the risk-based analysis requires a two part process to determine the necessary input information into the HEC-FDA program. The first part is to compute the "Stage Uncertainty", and the second part is to determine "HEC-FDA Reliability Analysis". A discussion of its development is as follows:

3.4.1.1 **<u>Part One: Stage Uncertainty</u>**. Total stage uncertainty is a function of natural uncertainty ($S_{natural}$) and model uncertainty (S_{model}).

A. Natural uncertainty is a function of four parameters; watercourse bed composition, drainage area, 1% AEP flow, and stage range.

<u>Watercourse Bed Composition (Bed Identifier).</u> With respect to the water course bed composition factor, information in "Table 5-1" was utilized (USACE, 1996b). A higher value relates to higher "mobility" of the bed material. (Note this is completely independent of the smoothness of the bed material). Manning's n variation is a function of S_{model} (as will be discussed later). For the bed material, consider how confident one can be that the bottom topography will remain unchanged over time. A less "mobile" material will resist scour and erosion better.

Table 5-1 Bed Identifiers (I_{Bed})	
Material	Identifier
Rock/Resistant Clay	0
Boulder	1
Cobbles	2
Gravels	3
Sands	4
Engineer Manual EM 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies, 1 August 1996b	

Since the evaluation reach invert is comprised of sands, the bed composition factor corresponds to 4.

<u>Drainage Area.</u> The Salt River area is impacted by 13,000 square miles (sq mi) of land that make up the drainage area and the Lower Gila River area is impacted by 39,700 sq mi of land.

<u>The 1% AEP (previously known as 100-year) Event Flow.</u> Through the evaluation reach, the 1% AEP peak discharge used for the analysis are 162,000 cubic ft per second (cfs) for the Salt River above the Gila River confluence; and 227,000 cfs for the Gila River below the Salt River confluence.

Stage Range. Range is defined as the maximum predicted or observed range of stage on the watercourse. The minimum flow in the river is set to zero, therefore, the minimum water surface elevation is equal to the invert elevation at any location. In a theoretical worst case scenario, the water surface could rise to the height of the levee and then by some additional value while overtopping. For this evaluation, the height of the levees plus one foot was determined to be the maximum water surface elevation at any given cross section river station.

The four parameters listed above serve as inputs for the equation below, which yields natural uncertainty. As explained in EM 1110-2-1619 (USACE, 1996b). This equation is written to use metric units of measure and therefore requires conversion before calculating.

$$S_{natural} = [\ 0.07208 + 0.04936\, I_{bed} - 2.2626 \times 10^{-7}\, A_{basin} + 0.02164\, H_{range} + 1.4194 \times 10^{-5}\, Q_{100}\ ]^{2}$$

Where I_{bed} = stream bed identifier for the size of the bed material which controls flow in the reach of interest

A_{basin} = drainage basin area in square kilometers

H_{range} = maximum expected or observed range in stage in meters

Q_{100} = peak discharge of the (1% AEP) flood in cubic meters per second

Since an HEC-RAS model was available for the evaluation reach, invert and levee elevations data can be found in tabular form for each designated cross section. With this information, a $S_{natural}$ value was determined for each cross section. The hydrologic, hydraulic and natural uncertainty data are displayed in tabular format in Exhibit IX – Hydraulic Pertinent Data and Risk and Uncertainty Input Results.

B. Model Uncertainty (Smodel) from Computer Model Data. As defined in EM 1110-2-1619 (USACE, 1996b), model uncertainty is associated with the accuracy of the Manning's n-values used in the model of the watercourse. Because the n-value is not a measurable quantity, there is some inherent uncertainty with the n-values used in a computer model or a mathematical calculation.

As mentioned, the Manning's n-value determination is not exact. This is demonstrated in the graph presented as Figure 5-4 in EM 1110-2-1619 (USACE, 1996b), which plots n deviation versus assumed n. This figure provides information on a good plus or minus range for any assumed n-values. i.e.; if the n value assigned is 0.04, the selected value is determined to be within 0.014 of that value, or between 0.026 and 0.054.

To calculate the model uncertainty, two modified geometries for the evaluation reach were created in HEC-RAS (USACE, 2010a); one with a lower range (assumed n minus uncertainty from Figure 5-4 in EM 1110-2-1619) and one with an upper range (assumed n plus uncertainty from Figure 5-4 in EM 1110-2-1619) of n-values. In addition to modifying Manning's n-values, debris parameters were adjusted in the HEC-RAS model to create a best and worst case scenario. For this study, the "best case" geometry with low n-values was modeled with the debris option not factored in (i.e. turned off in the model). Debris for the high n-value geometry was set at two feet on each side of piers, stretching from the river bed to the waterline. This condition is referred to as the "worst case" geometry.

The value of model uncertainty is the standard deviation of the variation in water surface elevations between the "best case" and "worst case" geometries. This being the case, a steady state analysis was conducted for both the "best case" and "worst case" geometries using HEC-RAS. The output results from both iterations were then displayed on a spreadsheet with a focus on determining the water surface elevation at each cross section within the evaluation reach. Finally, in accordance with EM 1110-2-1619 (USACE, 1996b), these water surface values were averaged to determine an E_{mean} for the study reach. The deviation in the water surface profiles were then calculated using Eqn. 5-7 (USACE, 1996b) which is reproduced below.

$$S_{\text{model}} = \frac{E_{mean}}{4}$$

Where E_{mean} = mean difference between the upper and lower limits of the calculated stage

For this assessment, model uncertainty was averaged over the damage reach. The model uncertainty calculation is listed in Exhibit IX.

C. Total uncertainty (S_{total}). Model and natural uncertainty are related using the Eqn. 5-6 (USACE, 2006) to calculate the total uncertainty at the damage reach's cross-sections stations. Because the HEC-FDA program uses one designated index station within each damage sub-reach, the natural uncertainty for that specific station was combined with the average model uncertainty for the encompassing reach to calculate the total uncertainty at that index station applicable to its damage sub-reach (defined below). The index location for the evaluation reach is specified to aggregate stage-damage functions with uncertainty for flood damage analysis calculations. For this analysis the index location was set at the cross section location with the least freeboard for the 100-yr discharge.

$$S_t = \sqrt{S^2_{natural} + S^2_{\text{model}}}$$

Where S_t = total standard deviation of uncertainty

$S_{natural}$ = standard deviation of uncertainty as a function of pertinent natural physical characteristics of the watershed and conveyance

S_{model} = standard deviation of uncertainty of computed water surface data using mathematical models

The total uncertainty calculation for this analysis is also listed in Exhibit IX.

3.4.1.2. **Part Two: HEC-FDA Reliability Analysis.**

A. Step One - Configure (Damage Reaches and Index Stations)

Defining Damage Reaches. The evaluation reach was subdivided into two shorter river sub-reaches since there is a change in discharge frequencies within the project reach. The sub-reaches area denoted as "Phase 1A" and "Phase 1B". See Plate 3 for damage reach and index locations.

Selecting Sub-Reach Index Stations for Damage Reaches. HEC-FDA (USACE, 2008) evaluates the reliability of an entire damage reach based on the reliability at one index station within the sub-reach. Information on the reach index station parameters are shown in Exhibit IX. The cross section with the lowest freeboard within each sub-reach was selected as the index location. River Station 200.48 was selected for sub-reach Phase 1A, while river station 198.70 was selected for sub-reach Phase 1B (see Exhibit IX).

B. Step Two - Hydraulic Data (Water Surface Profile, Stage-Discharge, Exceedance Probability, Levee Information)

Water Surface Profile Data. The reliability analysis is based on the 1% AEP and associated water surface elevations. The HEC-FDA analysis requires more information; specifically, water surface profiles for eight different frequency flow events. The normal default events are the 2-, 5-, 10-, 25-, 50-, 100-, 250-, and 500-yr events. These defaults were changed based on available information. This analysis utilized the 20-yr and 200-yr events instead of the 25-yr and 250-yr events (Refer to Table 1). Once all eight flow regimes were established, they were each used to complete a steady state analysis with the base project geometry in HEC-RAS. Appendix C of the HEC-FDA User's Manual (USACE, 2010a) describes in detail how to export the water surface profiles from the HEC-RAS model into the HEC-FDA program.

Stage Discharge Function with Uncertainty. Defining the uncertainty about each water surface profile across the different frequency flow events is required. Once the water surface profiles are established, the HEC-FDA program then retrieves a stage-discharge function from the water surface profile. Subsequently, the stage uncertainty needs to be assigned for each index station. The HEC-FDA software will calculate the uncertainty based off a normal distribution and an error and stage input by the user. The uncertainty at each index station is calculated and then applied to the corresponding 1% AEP water surface elevation at the given index location. The normal distribution assumes that uncertainty will not be higher than the user-entered stage value, and this analysis also assumes that the uncertainty will reduce linearly to zero as flow reduces to zero. Exhibit IX identifies the uncertainty and stage values that were used for each index location.

Exceedance Probability Function with Uncertainty. The basic information for this task is also extracted from the applicable HEC-RAS water surface profiles. The graphical determination option was used in the analysis to define the uncertainty in the discharge exceedance probability relationship. This approach requires a value in years for the equivalent record length (USACE, 2008). The discharge-frequency data was based on an equivalent streamgage record length of 105 yrs.

<u>Levee Data:</u> Levee top of bank elevations for each sub-reach index location was entered into HEC-FDA (see Exhibit IX).

C. Step Three - Reliability Analysis. With the above information as input into the HEC-FDA program, an "Evaluation by Analysis Years" was performed on the evaluation reach. The results of this analysis, which specify the CNP per sub-reach for the specified frequency events, indicated that the evaluation reach has a 95% or greater non-exceedance probability for a 1% AEP with over 2 ft of freeboard, which is required for levee certification. These results for the 1% AEP are summarized in Table 3. Freeboard at each index location is also included in the table and discussed below.

3.4.2. Risk & Uncertainty Summary. The risk-based analysis of levee containment is accepted by the FEMA NFIP levee system evaluation requirements if the levee is shown to have 3 ft of freeboard above the computed water surface elevation for the 1% AEP, plus an additional foot of freeboard at bridges, and an additional 0.5 foot required at the upstream end and tapering to the minimum at the downstream end of the levee (FEMA, 1991; FEMA, 2003). The 3 ft of freeboard required by FEMA can be reduced to 2 ft if there is assurance of 95% or greater of containment of the 1% AEP. All segments of the levee system achieved at least a 2 ft freeboard clearance and greater than 4 ft upstream and downstream of the 116th Avenue Bridge.

The USACE probability of exceedance and uncertainty analysis procedure used in the HEC-FDA program is used to determine if the levee system has a minimum CNP of 95%, with a minimum of 2 ft of freeboard added to the computed water surface elevation of the 1% AEP (USACE, 1996b). As discussed, the results from the HEC-FDA analysis confirmed that the entire levee evaluation reach has greater than a 95% non-exceedance probability for the 1% AEP with greater than 2 ft of freeboard.

3.5 Hydraulics Results

Hydraulic modeling of the levee evaluation reach indicates that freeboard for the 1% AEP is over 2 ft for the North Levee Phase 1A and 1B segments. An evaluation of risk and uncertainty using the HEC-FDA program showed that the entire evaluation reach passes the 1% AEP with greater than or equal to a 95% probability.

The final water surface profile for the evaluation reach is shown in Exhibit VI. Typical cross section information upon which the hydraulic model was developed is presented in Exhibit VII. Finally, the supporting pertinent hydraulic data for the above referenced water surface profile is displayed in tabulated format and shown in Exhibit VIII. The hydraulic pertinent data and risk and uncertainty input results are listed in Exhibit IX.

4.0 INTERIOR DRAINAGE

4.1 Hydrologic Basis for Design of Interior Drainage Features

The hydrologic basis for the interior drainage design is discussed in Exhibit I. The intent of the analysis (USACE, 2002) was to prevent or minimize induced flooding along the line-of-protection resulting from construction of the north levee. The procedure for analyzing the interior runoff for this phase of the Tres Rios project was based on the same procedure used for the Rio Salado Interior Drainage study (USACE, 1998). The peak discharge and volume relationships in the Rio Salado Interior Drainage study were developed using an 8-drain sample of urbanized drainage areas.

In the 8-drain sample method used rainfall-runoff modeling software to estimate N-year peak discharges and maximum 24-hour runoff volumes for 8 side drains arbitrarily selected to provide a wide range of drainage area sizes. A family of frequency curves were generated by regressing the peak discharges for the 24-hour volumes against drainage area, from which the peak discharges for the remaining drains were be estimated (USACE, 1998). The relationships developed for the peak discharge and volumes were developed from side drains in mostly urbanized areas. Should future development occur, the flow rates and volumes will already account for increase in impervious cover and improved drainage systems.

Existing 1% AEP floodplains as a result of local drainage were not analyzed in this project because there are no local flooding sources mapped by FEMA or regulated by FCDMC present on the landward side of the levee.

4.2 Collector Channels

The computer program HEC-RAS was used for hydraulic design of the concrete collector channels. In general, the slopes of the concrete channels follow the existing ground. As much as practicable, the top of the collector channels match the existing ground, i.e. no freeboard was utilized. A Manning's roughness coefficient of 0.015 was used for the concrete. The expansion and contraction coefficients were 0.3 and 0.1, respectively. The channels are trapezoidal, with 1V:2H sideslopes. The minimum channel basewidth is 14 ft in order to maintain the channel. The flow regime of the collector channels is mixed, i.e. subcritical and supercritical. The boundary condition at the downstream end of the channel assumed a full catch basin and the upstream end of the channel was set to normal depth. Tables 4 through 5 and Plates 4 through 5 summarize the collector channel design.

4.3 Catch Basins

The catch basins for this phase of the project are located at 115th Avenue and El Mirage Road. The volumes are based on the required volumes determined by the Interior Drainage Hydrology (Exhibit I). The depth was limited to approximately 3 to 4 ft below existing ground to minimize the tailwater restrictions caused by the 1% AEP water surface. In other words, the basins were kept fairly shallow so they would more likely drain during high flows to the river. The catch basins are graded so that low flows drain towards the outlets.

4.4 Catch Basin Outlets

The catch basin outlets were sized to handle the peak flows determined in the Interior Drainage Hydrology (Exhibit I). Modeling using HEC-RAS was used to determine the size and number of reinforced concrete boxes (RCBs) required. The HEC-RAS culvert routine was used to analyze the boxes. Due to their length, the culverts were also analyzed as a covered channel. A Manning's roughness coefficient of 0.015 was used for the concrete. The downstream boundary condition was assumed to be critical depth. Loss coefficients of 1.0 were used to account for flapgates; and inlet and outlet losses, etc. The expansion and contraction coefficients were 0.3 and 0.1, respectively. The RCBs are inlet control. The flow regime inside the culverts is subcritical. The summary printout and profile are shown in Tables 6 through 7 and Plates 6 through 7.

4.5 Flapgates

Flapgates are needed at the catch basin outlets to prevent river flows from going into the catch basins. The flapgates are rectangular, standard size, and are 5 ft wide by 3 ft high.

4.6 Stormdrain Channel

The hydrologic criteria for the design of the Tres Rios Project stormdrain channel were re-examined. In particular, it was determined whether or not the peak flows used to design the original stormdrain channel are still applicable. The basic hydrologic criteria that were used for the current stormdrain channel design is the following (excerpted from Exhibit I, Hydrology for Interior Drainage):

"Existing conditions results from the Durango Area Drainage Master Plan, FCD #99-41, Hydrology Report, Maricopa County Flood Control District, dated April 2003, were used to estimate peak discharges from the interior area along the line-of-protection as well as volumetric data. Then, regression curves for estimation of peak flow rates, 24-hour flood volumes, and average annual runoff volumes developed for the Rio Salado Interior Drainage study were utilized to make the interior runoff estimates. As a consequence, the peak flow rates and volumes estimated using the relationships developed from this data should somewhat overestimate runoff from the existing, mostly agricultural areas. Should future development occur, the flow rates and volumes will already account for increases in impervious area and improved drainage systems. In addition, because of the uncertainty involved in sizing the Interior Drainage facilities, use of relationships for urbanized areas should provide a factor of safety. Using this criterion, the resulting peak flow at the corner of 91st Avenue and Roeser Road was calculated to be 600 cfs (400 cfs existing conditions). At the Salt River, the flow is 750 cfs (500 cfs existing conditions)."

However, it was determined that the above interior drainage criteria, specific to this area, may be too conservative for the following reasons: 1) The hydrology criteria used was based on the Rio Salado Study and took into account future development; and 2) new developments in the area are already subject to Maricopa County regulations to retain the 100-yr, 2-hr storm volume. In other words, the existing conditions hydrology will still be applicable in the foreseeable future. For these reasons, the existing conditions hydrology values, i.e. 400 cfs at the corner of 91st Avenue and Roeser Road, and 500 cfs at the Salt River (instead of 600 cfs and 750 cfs, respectively) would be more appropriate.

As a direct consequence of the above, the stormdrain channel was redesigned using the existing conditions hydrology. Modeling using HEC-RAS was used for the hydraulic design of the stormdrain channel. The resulting channel will be an earthen trapezoidal channel. The basewidth is 50 ft and the sideslopes are 1V:3H. The channel depth is between 2 and 4 ft. The design flow rate is between 400 and 500 cfs. The flow is subcritical with velocities between 2 and 5 ft per second (ft/s). The slopes of the stormdrain channel follow the existing ground. As much as practicable, the top of the stormdrain channel match the existing ground, i.e. no freeboard was utilized. However, from station 64+00 to the downstream end of the channel, levees up to 2.5 ft high are needed to contain the flow. A Manning's roughness coefficient of 0.025 was used for the channel. The starting water surface elevation at the downstream end of the channel is 962.53 ft. Table 8 and Plate 8 summarize the stormdrain channel design.

5.0 HYDRAULIC CONSIDERATIONS FOR OPERATION AND MAINTENANCE

5.1 Flood Operation Procedures

The completed flood control improvements should be rapidly but completely patrolled to determine their readiness to accommodate stormflow. The responsibilities of the patrols include the following:

a) Side drain gates should be freed of any debris and their proper seating checked.

b) Equipment and material should be readied for use at locations where trouble might occur.

c) Any condition endangering any flood control structure should be corrected.

5.2 Routine Maintenance Measures

1. Periodic inspections shall be made and immediate steps will be taken to correct dangerous conditions so that:

a) The river thalweg has not encroached into the overbank wetlands area;

b) No unusual settlement, sloughing, or material loss of grade or levee cross section has taken place;

c) No caving has occurred on either the landside or the riverside of the levee, which might affect the stability of the levee section;

d) No seepage, saturated areas, or sand boils are occurring;

e) Drains through the levees and gates on said drains are in good working condition;

f) No revetment work or riprap has been displaced, washed out, or removed;

g) Access roads to and on the levee are being properly maintained;

h) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

i) Encroachments are not being made on the levee right-of-way, which might endanger the structure or hinder its proper and efficient functioning during times of emergency.

j) Engineering Technical Letter (ETL) 1110-2-571, "Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures" (USACE, 2009) requires that vegetation such as trees, bushes, or undesirable weeds should be kept out of the a vegetation-free zone. A vegetation-free zone is an area adjacent to the landside and/or riverside toe of the levee. This zone is required for maintenance and flood-fighting activities and must be accessible at all times.

k) Vegetation should not increase the hydraulic roughness of the river. Vegetation should be removed during operation and maintenance. Vegetation on the levee or in the river could increase the water surface elevation, which may cause problems when evaluating the levee to meet the USACE Process for the National Flood Insurance Program (NFIP) EC 1110-2-6067, (USACE, 2010b).

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Exhibit I – Hydrologic Analysis for Design of Interior Drainage Features. U.S. Army Corps of Engineers, Los Angeles District. December 2002.

Exhibit II – Development of Hydrology for Sedimentation Analysis. U.S. Army Corps of Engineers, Los Angeles District. May 2005.

Exhibit III – PED Hydraulic Design of Tres Rios North Levee, Volume II Pre-Final Project Analysis Final Report. WEST Consultants, Inc. April 2004.

Exhibit IV – PED Hydraulic Design of Tres Rios North Levee – 2D Model Analysis, Final Design Report. WEST Consultants, Inc. April 2004.

Exhibit V – Memorandum: Tres Rios Preconstruction Engineering and Design (PED) – Hydraulic Criteria for Bank Protection. U.S. Army Corps of Engineers, Los Angeles District. February 2004.

Exhibit VI – Evaluation Reach HEC-RAS Water Surface Profile

Exhibit VII – Evaluation Reach HEC-RAS Typical Cross Sections

Exhibit VIII – HEC-RAS Summary Output Table for Evaluation Reach

Exhibit IX – Hydraulic Pertinent Data and Risk and Uncertainty Input Results

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Exhibit I

Hydrologic Analysis for Design of Interior Drainage Features

SUBJECT: TRES RIOS, PED STUDY, INTERIOR DRAINAGE

TO: CESPL-ED-HH

FROM: CESPL-ED-HH, Nick N. Adelmeyer (x3570)

DATE: 12 December 2002

Hydrologic Analysis for Design of Interior Drainage Facilities.

The following discussion is based upon my participation in the subject analysis during the Feasibility Study and PED, including the team meeting in Phoenix on 10 December 2002. The intent is to provide a basis for design of Interior Drainage facilities to prevent or minimize induced flooding along the line-of-protection resulting from construction of the levee on the north bank of the Salt-Gila Rivers.

1. Introduction

a) The construction of a levee on the north side of the Salt River from 91st Avenue, extending downstream of the confluence with the Gila River, will intersect and impound surface runoff which normally reaches these rivers in this reach.

b) There appear to be three sources of surface water runoff from the interior areas to the rivers along the line of protection:

1. Excess rainfall (i.e. incident precipitation in excess of the infiltration rate of the soil/land surfaces;
2. Irrigation return flow (water delivered to the farms for irrigation in excess of demand due to antecedent/coincident precipitation);
3. Stormwater runoff conveyed within irrigation canals and or wasteways[1] (off-site water which may have been conveyed to line-of-protection via delivery/wasteway systems).

c) At a *minimum* the project must ensure that interior flooding is not aggravated by the levee construction. Hence, the Interior Drainage study should address impacts of the project on these 3 sources of surface water along the line-of-protection, and attempt to pass this water to the river without inducing additional flooding.

d) **Interior flooding away from the line-of-protection is NOT the responsibility of a Federal cost-shared project**. It is a local responsibility to provide delivery systems to reduce or mitigate such flooding. There is some question as to the effect on local/interior runoff and subsequent flooding caused by the proposed berm around the wetlands/regulatory basin to be constructed as a project feature. The basin

[1] The term "wasteway" is used herein to describe tail water drainage ditches which collect excess, cycled, or unused irrigation water and convey it to the rivers.

will be located between 91st and 99th Avenues just north of the Salt River. My understanding of the basin/wetland functions are that it will reduce the biological and hydraulic "loading" resulting from diurnal variation in effluent discharge, and serve as a detention facility for discharge of effluent during high river stages. An initial evaluation indicates there may be some concentration of runoff along the north and west flanks, but if anything the *quantity* of surface runoff should decrease because the wetlands should intersect and store the incident precipitation. A delivery system to convey *concentrated* surface water flow from the interior areas to and through the levee may be required in order to prevent or reduce flooding induced by the project upstream of the levee.

2. **Excess Rainfall (Local Stormwater Runoff).**

a) During the Feasibility Study I arranged to conduct the Interior Drainage Analysis in a sequential/compartmentalized process. I deferred to the Flood Control District of Maricopa County (FCDMC) for determination of contributing interior drainage areas and flow paths. This arrangement was based upon the understanding that the FCDMC had recently contracted the Master Drainage Plan for the Durango area (prepared by Dibble & Associates Consulting Engineers). Integral to this arrangement was the knowledge that the FCDMC was much more familiar with interior runoff and flooding problems, delivery systems, and topography than I was, and would be able to provide their expertise in this matter without additional project costs.

b) The draft report (flow paths and contributing drainage areas) provided by FCDMC was then used to estimate peak discharges from the interior area along the line-of-protection as well as volumetric data. The procedure followed was one I had developed for the Rio Salado Interior Drainage study, and was applicable to this area as well. Regression curves for estimation of peak flow rates, 24-hour flood volumes, and average annual runoff volumes developed for the Rio Salado Study were utilized to make the interior runoff estimates. **Note: peak discharge and volume relationships for the Rio Salado Interior Drainage study were developed from an 8-drain sample of urbanized drainage areas in the Phoenix vicinity. As a consequence, the peak flow rates and volumes estimated using the relationships developed from this data should somewhat overestimate runoff from the existing, mostly agricultural areas. However, should future development occur, the flow rates and volumes will already account for increases in impervious area and improved drainage systems. In addition, because of the uncertainty involved in sizing the Interior Drainage facilities, use of relationships for "urbanized" areas should provide a factor of safety.** Interior runoff information was necessary to make preliminary estimates of the size/location of catch basins and culverts, and levee penetrations to accommodate interior runoff.

c) The meteorology of the study area is nearly identical to that of the Rio Salado area. The average annual precipitation in the Phoenix metropolitan area for the period from 1948 to 2000 (Sky Harbor Airport, Gage ID No. 6481) is 7.69 inches (The Phoenix City Precipitation Gage ID No. 6486 average annual precipitation for the period from 1948 – 1998 is 7.87 inches; however data is missing or incomplete for 11 years in that period.). Annual precipitation totals at the 2 listed gages vary from slightly less than 3 inches to more than 15 inches. *Please refer to Figure 1 for a graphical summary of the annual precipitation data.*

Based upon analysis of daily precipitation totals for these two gages, there are on average approximately 10 days per year when cumulative daily precipitation totals ≥ 0.25 inches; approximately 4-5 days per year when cumulative daily precipitation totals ≥ 0.50 inches; and approximately 1 - 1.5 days per year when cumulative daily precipitation totals ≥ 1.00 inches. There have been a total of only 12 days (3 days in the 53 years of record at Sky Harbor and 9 days in the 51 years of record at the City of Phoenix) when precipitation totals exceeded 2.00 inches at *either* gage. Of these, on 2 days precipitation exceeded 2 inches at *both* gages. On another day (September 5th 1970, recorded precipitation at Sky Harbor Airport = 2.43 inches), precipitation data for the City of Phoenix gage was not available. Most likely the depth at this location would also have been close to 2 inches, based upon the magnitude of this event. Hence the relative annual frequency of cumulative daily precipitation ≥ 2.00 inches is approximately once every 5 years on average. This is in agreement with NOAA Atlas 2 precipitation duration isopluvials for the Phoenix area that indicate the 5-year, 24-hour precipitation depth is 2.0 inches. *Figures 2 and 2a present a graphical summary of the daily precipitation-exceedance data described in the preceding text. The daily data is accumulated on a monthly basis for the entire period of observation.*

Almost all of the precipitation falls as rainfall and occurs in 2 distinct rainfall seasons as described in the text below (*Note: Figures 3 and 3a present a graphical summary of the daily precipitation-exceedance data, condensed according to seasonal groupings per the descriptions below. The "relative" seasonal exceedance frequency is displayed in Figures 4 and 4a.*):

1. Summer months. The summer "monsoon" season (typically June through September) is characterized by intense local precipitation, often in the form of thunderstorms, of short duration and small areal extent. The smaller interior areas are more responsive to this type of rainfall event, and higher peak flows will result.
2. Winter months. The winter season (typically November through March) is characterized by more general precipitation, less intense in nature, and covering large areas for extended periods of time. The smaller interior

areas are less responsive to this type of rainfall, and lower peaks will result, although runoff may continue for a longer duration.

3. Note: occasionally a late-summer to early fall (typically August through October) event resulting from a dissipating tropical depression or hurricane (such as the August 1951 General Summer Storm or the Labor Day 1970 storm) may occur; this type of storm may include intensities characteristic of thunderstorms with areal extent and duration associated with the general winter storms. Such an event might produce high peak flow as well as volume from the interior areas.
4. Spring Months. During the late spring-early summer (April though May) period there is very little precipitation or resulting runoff. Hence the diagrams (*Figures 3, 3a, 4, and 4a*) summarizing the distribution of precipitation by season *compare warm and cold weather months only*. The results may not total 100% when warm/cold weather month data is combined (this typically is limited to 24-hour events = 0.50 inches, although 2 of the 62 24-hour events exceeding 1.00 inches at the City of Phoenix gage did occur in the spring).

d) **Based upon historical information and long-term simulated flood history (105-year period from 1889 through 1993) representative of "existing conditions"**, the river condition for each meteorological case described above is summarized in the following narrative (*Baseline data for the Salt River below Granite Reef Dam is portrayed in Figures 5 and 6. Refer to Figure 5 for a summary of the spilling frequency and volume on a monthly basis. Figure 6 includes the annual maxima and resulting discharge-frequency relationship*):

1. Warm weather months ("monsoon" season through late-summer, early-autumn "hurricane" season) – there was only 1 simulated spill (very minor) during the entire 105-year period for the months of June through October; hence I fully anticipate the river will be dry during this season. As a consequence, there will be no tailwater-induced limitations on interior runoff during these months. If catch basins and culverts are sized to handle the peak interior runoff there will be no induced flooding problem along the line-of-protection.
2. Cold weather months (November through March) – Most significant spills from the upstream SRP system occur during the period from January through March. (Significant spills can also occur on a less frequent basis during the colder-weather transition months of November

through December, and the warmer-weather transition months of April through May.) *Sequential depictions of the monthly contribution to the annual flooding potential are provided in Figures 6a and 6b. Figure 6a includes all the cold weather months from December to April (refer also to Figure 5 which indicates these are the months with the most frequent and large spills), and compares this combined sample with the annual discharge-frequency relationship. Figure 6b limits the cold weather monthly spills to the most volatile of all the months, January to March (re: Figure 5).* It is apparent that the annual maximum discharge-frequency relationship is almost entirely dependent upon the spills from the cold weather months of January through March. *Figures 7 and 7a present monthly discharge-frequency relationships for both sets of cold weather data referred to above, including the integrated curve (Figure 7a) for the months of January through March. Finally, Figure 8 compares the annual maxima, and annual maximum discharge-frequency curve to the integrated cold weather curve for the months of January through March.* The results indicate that the flood threat in the Salt River is almost entirely contained within the months of January through March. The flood threat from the remaining months only affects the discharge-frequency relationship at about the 5-year level (*re: Figure 8*). Discharges associated with the 5-year event will not restrict interior drainage to the river.

3. Although interior runoff during the cold weather months will have a lower peak discharge, the duration of runoff may increase. If interior runoff reaches the line-of-protection during periods when spills have occurred, high river stages may create adverse hydraulic conditions. Hence catch basins should be designed to accommodate a substantial portion of the interior runoff. The following table summarizes preliminary Interior Drainage calculations performed to estimate interior runoff during the Feasibility Study, and expanded to include annual runoff volumes as well as 100-year, 10-year, and 5-year runoff information.

INTERIOR DRAINAGE: HYDROLOGIC ESTIMATES FOR TRES RIOS LEVEES.
NNA/14July1999/ Volumes Revised 13 Dec 2002

	LOCATION				
	99th Avenue	107th Avenue	115th Avenue	El Mirage Road	Dysart Road
Drainage Area, sq mi	1.5	1	0.25	0.35	0.25
100-yr Peak Discharge, cfs	**1000**	**700**	**200**	**280**	**200**
100-yr Volume, ac-ft	200	120	30	40	30
10-yr Volume, ac-ft	60	40	10	14	10
5-yr Volume, ac-ft	**40**	**28**	**8**	**10**	**8**
Annual Volume, ac-ft	**140**	**85**	**20**	**30**	**20**

Notes: **data (peak and volume estimates) based upon Figures 3-1, 3-3 from Appendix A, Rio Salado Feasibility Report, April 1998.**

100-yr volume represents entirety of 24-hour volume at the line-of-protection. If the river stage is low, the maximum impoundment will be less.

Annual Volumes estimated from Figure 3-7, data in ac-ft.

Estimates in Feasibility Study were incorrect. The value read from Fig. 3-3 had units of cfs/24-hours. Values should have been multiplied by 1.983471 to convert to ac-ft. NNA/13 Dec 2002.

[Note: the average annual runoff volume is approximately 70% of the 100-year, 24-hour volume and approximately 250% to 350% of the 5-year, 24-hour runoff volume. The 100-year interior runoff characteristics are more likely the result of a summer-early fall storm when the rivers are dry. However sufficient catchment basin volume should be included to provide temporary storage for interior runoff when river stages are high. If sufficient catchment volume were provided to store the runoff resulting from 2.00 inches of precipitation, there would be little chance of induced interior flooding. *Please refer to the discussion of seasonal precipitation, Section 2.c), which concludes that at the 2 long-term precipitation gages in the Phoenix area which were analyzed, the maximum 24-hour depth has never exceeded 2.00 inches during the cold-weather months*.]

e) Summary: Review of the discharges and volumetric information developed for the Feasibility Study indicates that the 100-year peak flow rates are reasonable estimates for design of the Interior Drainage system. Review of the Dibble & Associates drainage map as well as recent field confirmation indicates that much of the interior runoff from east of the 91st Avenue Wastewater Treatment Plant enters the Salt River upstream of the proposed levee. Similarly, most of the interior runoff south of the I-10 Freeway and west of 91st Avenue flows directly to the Agua Fria River or is diverted to the Agua Fria River by existing canals/drains. The Buckeye Feeder (south of Lower Buckeye Road) and the Voita Ditch (north of Southern Avenue) intercept most of the interior runoff bounded by 91st

Avenue on the east and Southern Avenue on the south, and divert the flow to the Agua Fria River.

The volumes provided in the Feasibility Study may be inadequate if the coincident river stage is high. Long-term simulation of the SRP system operation indicates that most significant spills occur during the cold-weather months of January through March. However, the most intense local precipitation occurs during the warm weather months when the rivers are dry. During these periods local drainage from the interior area can be conveyed to the rivers without inducing flood damage along the line-of-protection. During the cold-weather months there may be instances when an upstream spill from the SRP system results in high river stages for an extended time period. As a consequence, coincident local runoff from the interior areas may pond alongside the line-of-protection overflowing the catch basins when the river stage is high. To circumvent potential induced flooding problems during the January through March period, sufficient space should be provided in catch basins to store, *at a minimum,* the runoff resulting from 2.00 inches of precipitation. **Note: for comparison purposes, the volume of runoff from a 1 sq. mi. interior drainage area, resulting from 2.00 inches of precipitation in 24-hours, is 28 ac-ft, approximately 33% of the average annual runoff volume; the 10-year, 24-hour volume is 40 ac-ft, approximately 47% of the average-annual volume. (Source: Figures 3-4c, and 3-7, Rio Salado Feasibility Report, Appendix A.) The 10-year, 24-hour precipitation depth is 2.3 inches.**

3. **<u>Irrigation Return Flow</u>.**

a) There are irrigation networks within the study area including delivery canals and tail water ditches to remove water applied to the fields or excess water from the delivery system. The canal system delivers irrigation water to the agricultural areas; tail water ditches convey cycled irrigation water to the rivers. During periods of rainfall all or portions of the irrigation water in the delivery system may be unnecessary or unused. The delivery system is typically sized in a converse manner to a storm drain system in that the capacity *diminishes* in the downstream direction because the irrigation systems are designed to be distributary. As a consequence, "unused" irrigation water may exceed the capacity of the delivery system as it flows downstream. In addition, the capacity of the canal system may be overtaxed due to accumulation of stormwater within the canals, resulting either from external inflow or incident precipitation. The result may be interior flooding from overflow of delivery canals and/or downstream tail water ditches. If/when this type of interior flooding occurs away from the line-of-protection, it is a local responsibility. However, if flood control improvements induce upstream local flooding, then mitigation becomes a project responsibility. Since delivery of off-site runoff and irrigation return flow is accomplished through open channel conveyance such as tail water ditches, rather than pressure flow conveyance, the only adverse effects of the levee should be in the vicinity of the line-of-protection.

b) To offset any flooding induced by the levee to be constructed between 91st Ave. and Dysart Road, catch basins and culverts should be located at points where tail water ditches are intercepted by the levee. The culverts should be sized to carry the full capacity of each ditch, and the catch basins should be sized to detain 24-hour duration runoff (at full capacity) from each tail water ditch. For example, if a tail water ditch has hydraulic capacity to convey 15 ft^3/s flowing full, the 24-hour volume would be approximately 30 ac-ft. It is unlikely that the ditch would flow "full" for that length of time, since SRP would not continue "excess" deliveries for such a long duration, and excess precipitation does usually not last that long.

4. Stormwater Runoff Conveyed Within Irrigation Canals and or Wasteways.

a) In addition to tail water and storm runoff from the contributing drainage area that might be collected in the canals and tail water ditches, off-site runoff might enter the irrigation network and be delivered to the line-of-protection. This "occasional" water is very difficult to quantify, but should be accounted for in the estimation of Irrigation Return Flow. If occasional water is conveyed in the canals/tail water ditches, and they are presumed to be full, it should be included in the peak and volume estimates. Any excess on-site runoff should be accounted for in the estimate of excess rainfall and/or in the irrigation return flow estimates. No additional capacity should be required at the line-of-protection.

5. Summary.

a) Runoff from the interior area may pond along the line-of-protection behind the to-be-constructed levee during *high or extended stage in the Salt and Gila Rivers*. This condition *is typically limited to the winter-late spring months* when spills from the upstream SRP reservoirs are most likely to occur. *There is little chance of spills during the summer and autumn seasons*.

b) Interior runoff usually accompanies excess precipitation in the project drainage area. However, it may be aggravated by tail water from the SRP irrigation network and/or imported runoff via irrigation canals from off site.

c) Meteorological conditions in the study area reflect a low desert climate, including occasional short-duration thunderstorms during the summer "monsoon" season, typically limited to smaller drainage areas; less frequent, large-scale, general late-summer to early-fall storms resulting from dissipating tropical cyclones, typically of longer duration, which may contain embedded thunderstorms cells; general winter storms of large areal extent and longer duration, resulting from frontal and cutoff low-pressure systems, and carried inland by westerly winds off the Pacific Ocean.

d) Average annual precipitation recorded in the Phoenix area is approximately 7.6 inches (Sky Harbor Airport). Annual precipitation in the Phoenix area (1948 – 2000) has ranged from a maximum of more than 15 inches to less than 3 inches. Refer to Figure 1.

e) The *most intense precipitation occurs in the warm weather months* (24-hour depths in excess of 1.0 inches[2]), while the *most frequent precipitation occurs in the cold weather months* (24-hour depths in excess of 0.25 inches[3]). **All** of the 24-hour depths in excess of 2.0 inches (i.e. 5-year precipitation) have occurred during the warm weather months. Refer to Figures 2, 2a, 3, 3a, 4, and 4a.

f) Hence the incidence of significant runoff from the interior area is greatest in the warm weather months when high stage in the Salt-Gila Rivers is least likely. During the cold weather months when high stages are most likely, runoff from the interior areas is characterized by lower peak discharges of longer duration resulting from general winter storms.

g) Finally, there is a secondary threat of high stages in the Gila River downstream of the confluence with the Salt River during the late-summer early-autumn season resulting from large-scale warm-weather events characterized as "dissipating tropical cyclones". Such events have occurred in the past, notably in September 1926 on the San Pedro River and in October 1983 on both the San Pedro and Santa Cruz Rivers. Such events can produce high peak discharges as well as significant flood volumes. However, the 2 events mentioned, which are the greatest warm-weather events in the period of observation (since 1891), are still significantly smaller and of shorter duration in the project reach than large cold-weather events.

6. Recommendations.

a) The interior flooding problem caused by excess rainfall and resulting runoff collecting along the line-of-protection can be mitigated by two measures:

1. Provision of sufficient inlet/culvert capacity to convey the 100-year peak discharge determined for the contributing interior drainage areas between 91st Avenue and Dysart Road (areas based upon subarea mapping and flow paths provided by the FCDMC – Dibble & Associates Report on Durango Area Drainage Master Plan, Figure II-1, March 2001). The

[2] For the 2 gages analyzed, Sky Harbor Airport and the City of Phoenix, 72% and 60%, respectively, of these events occur in the warm weather months; 28% and 37%, respectively occur in the cold weather months.

[3] For the 2 gages analyzed, Sky Harbor Airport and the City of Phoenix, 41% and 35%, respectively, of these events occur in the warm weather months; 54% and 59%, respectively occur in the cold weather months

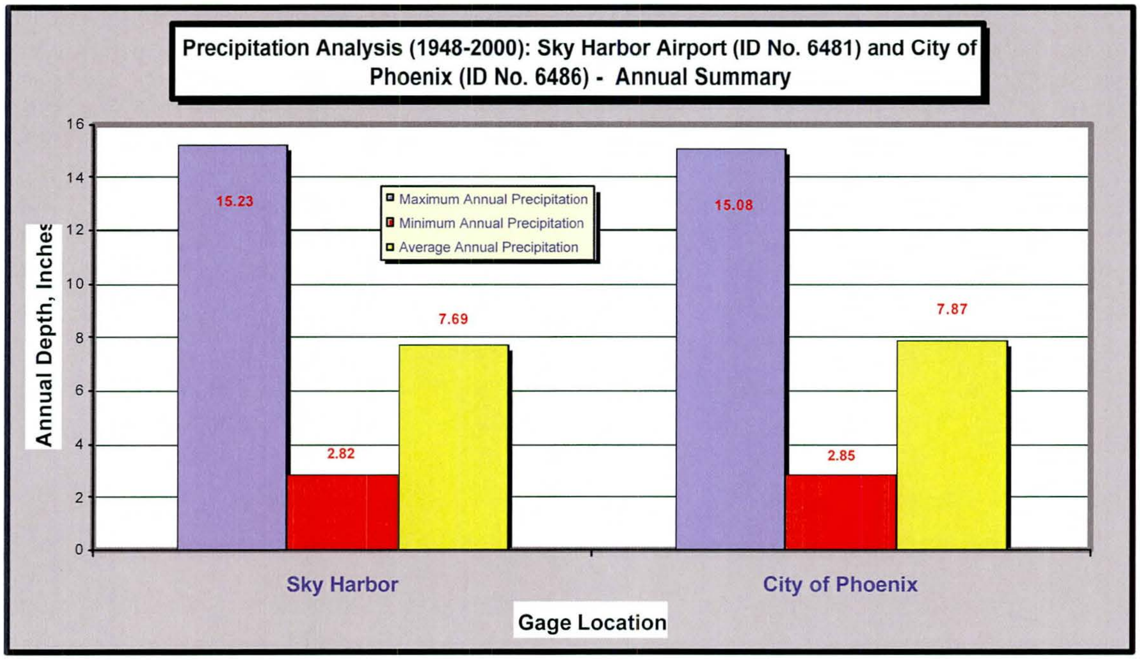
methodology for estimating peak discharges is application of regression curves developed for the Rio Salado study (Figure 3-1, Hydrology Appendix).

2. Provision of sufficient catch-basin volume to store the runoff resulting from 2.00 inches of precipitation in 24-hours (5-year, 24-hour precipitation). Runoff volume determined using the same criteria as above.

b) Interior flooding resulting from irrigation return flow or stormwater carried within irrigation canals and/or tail water ditches, can be mitigated by similar measures to the aforementioned.

1. Provision of sufficient inlet/culvert capacity to convey the full tail water ditch discharge through the levee.
2. Provision of sufficient catch-basin volume to store the 24-hour runoff volume determined presuming the ditches are flowing "full".

d) Finally, the construction of a regulatory basin near the 91st Avenue Wastewater Treatment Plant may result in concentration of sheet flow along the north and east embankments. Consideration should be given to such a situation, as well as provision of conveyance sized to accommodate concentrated runoff and safely direct the flow to the river. Capacity will be determined from the aforementioned regression curves. The contributing interior drainage area will be effectively reduced by approximately 0.4 sq. mi., since that is the approximate surface area of the basin. Direct precipitation over that area will be stored within the basin.



Precipitation Analysis (1948-2000): Sky Harbor Airport (ID No. 6481) and City of Phoenix (ID No. 6486) - Annual Summary
Maximum Annual Precipitation
Minimum Annual Precipitation
Average Annual Precipitation
Annual Depth, Inches
16
14
12
10
8
6
4
2
0
15.23
2.82
7.69
15.08
2.85
7.87
Sky Harbor
City of Phoenix
Gage Location

Figure 1.

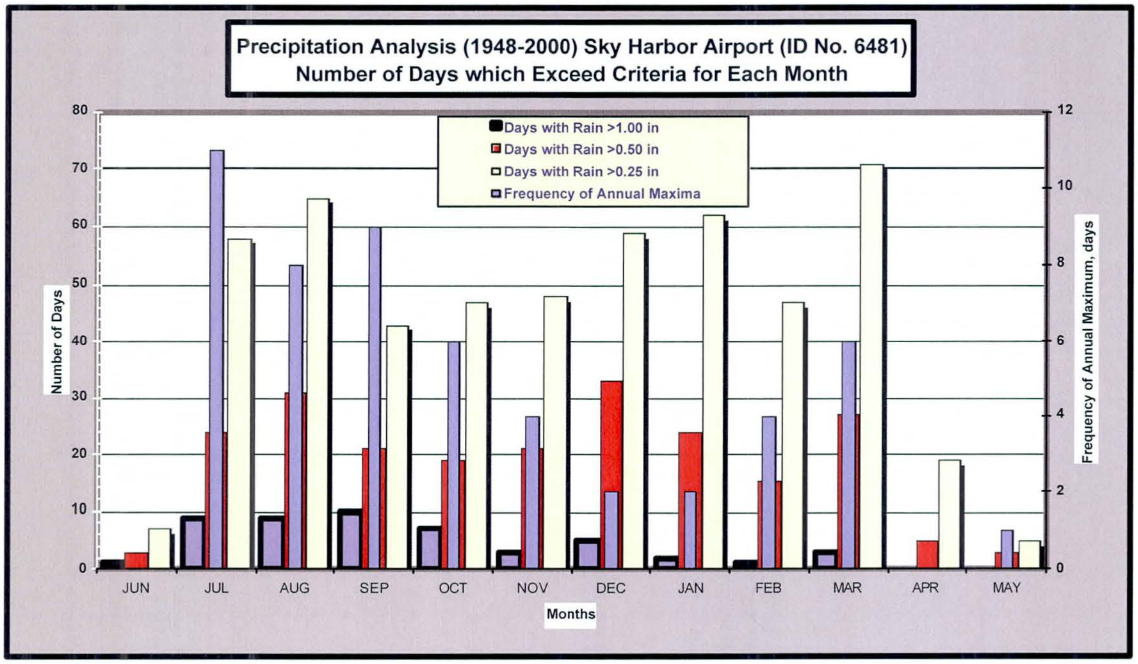


Figure 2.

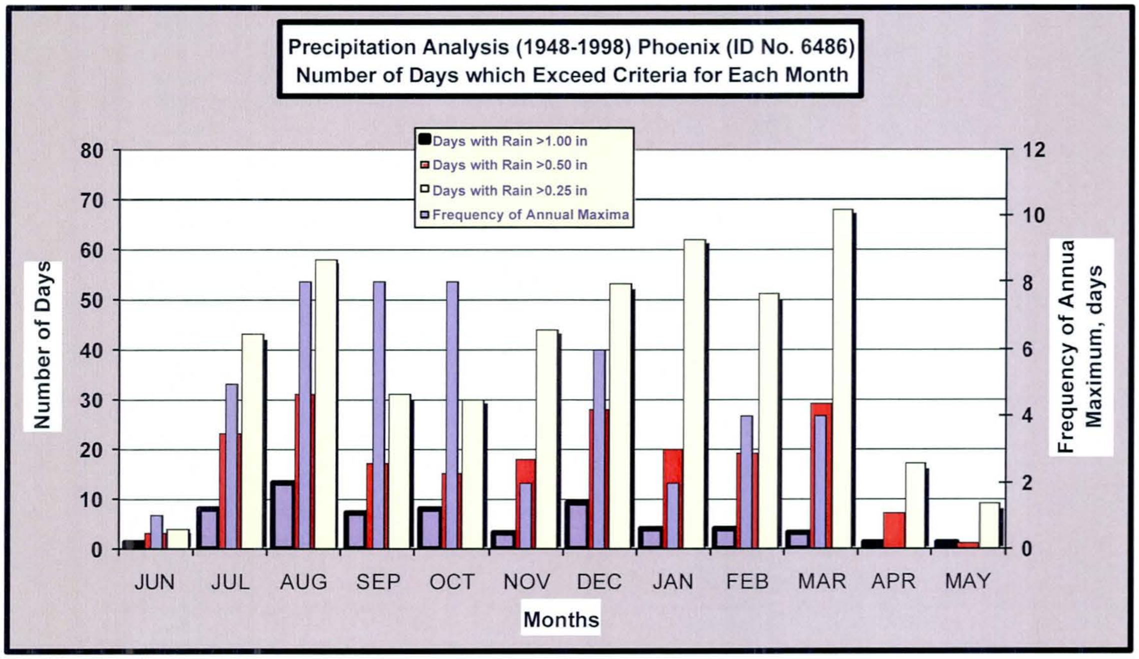


Figure 2a.

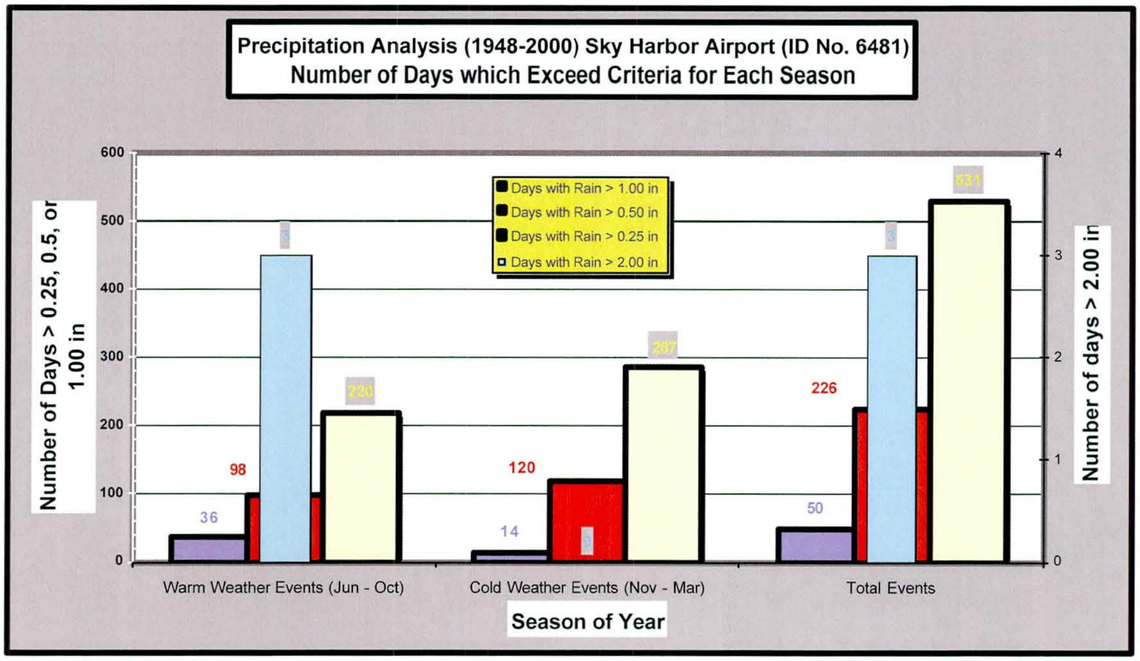


Figure 3.

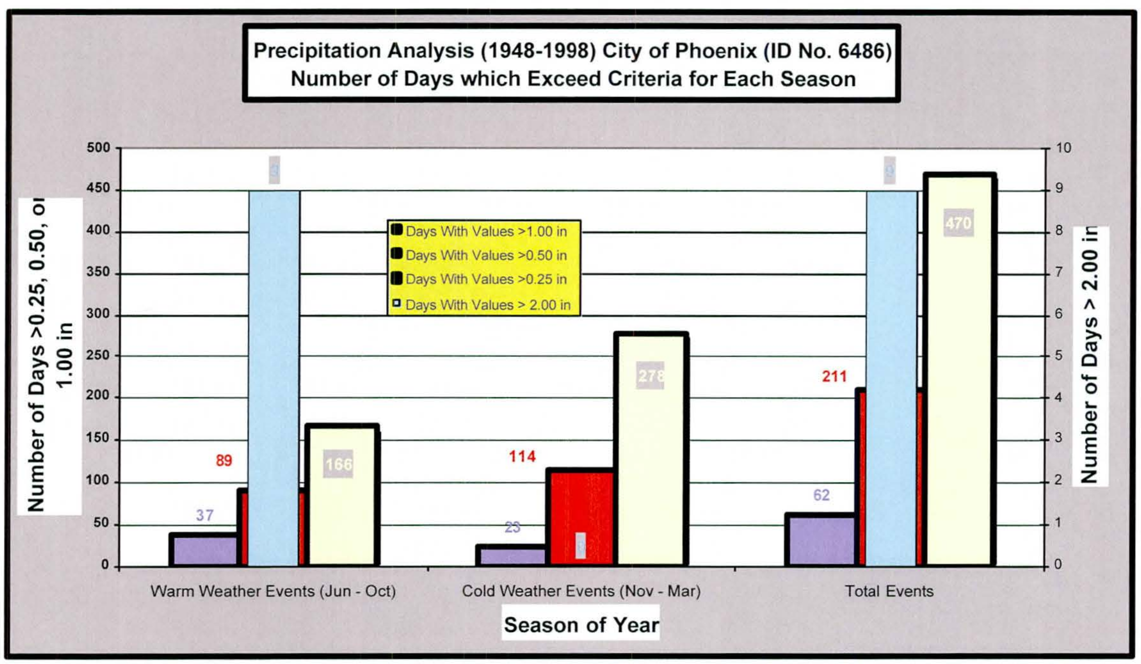


Figure 3a.

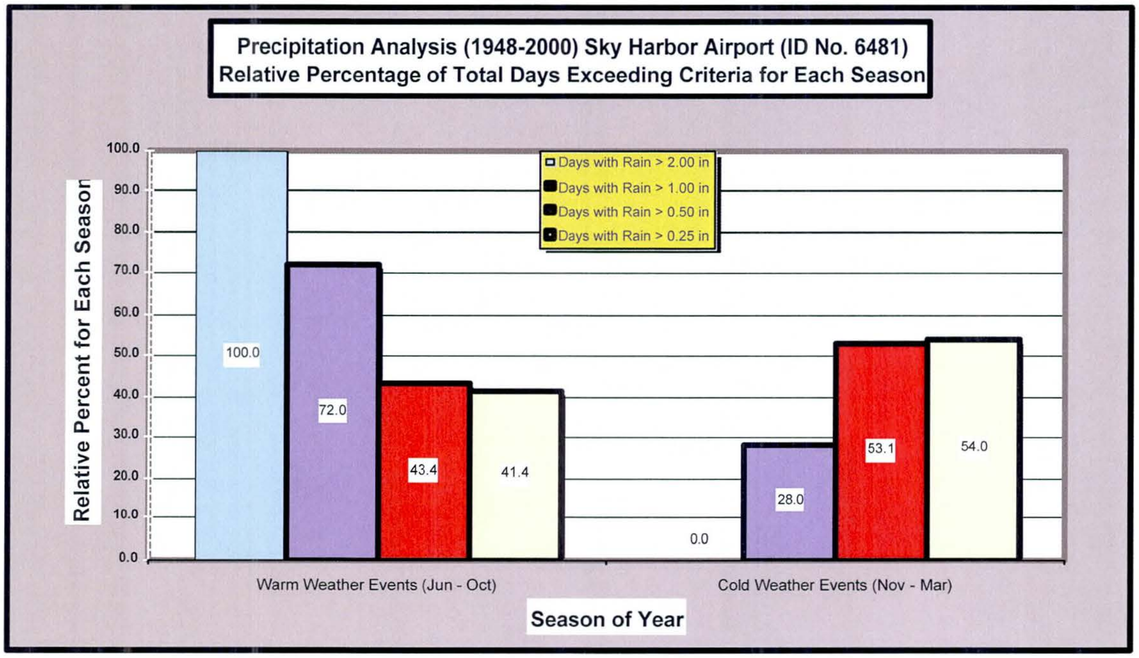


Figure 4.

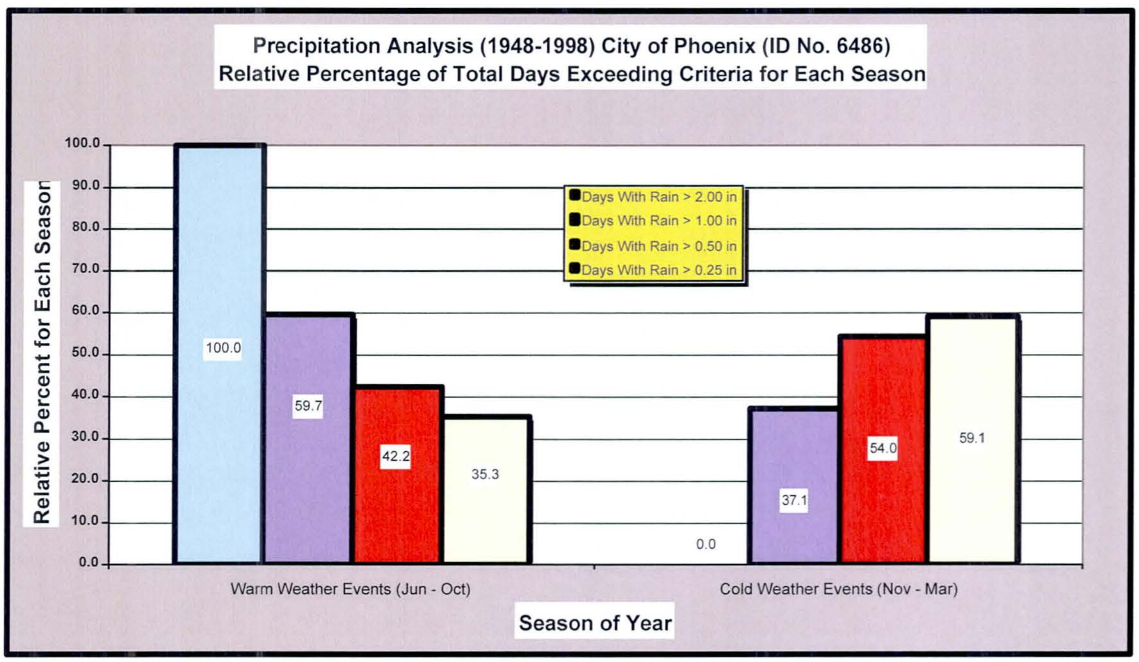


Figure 4a.

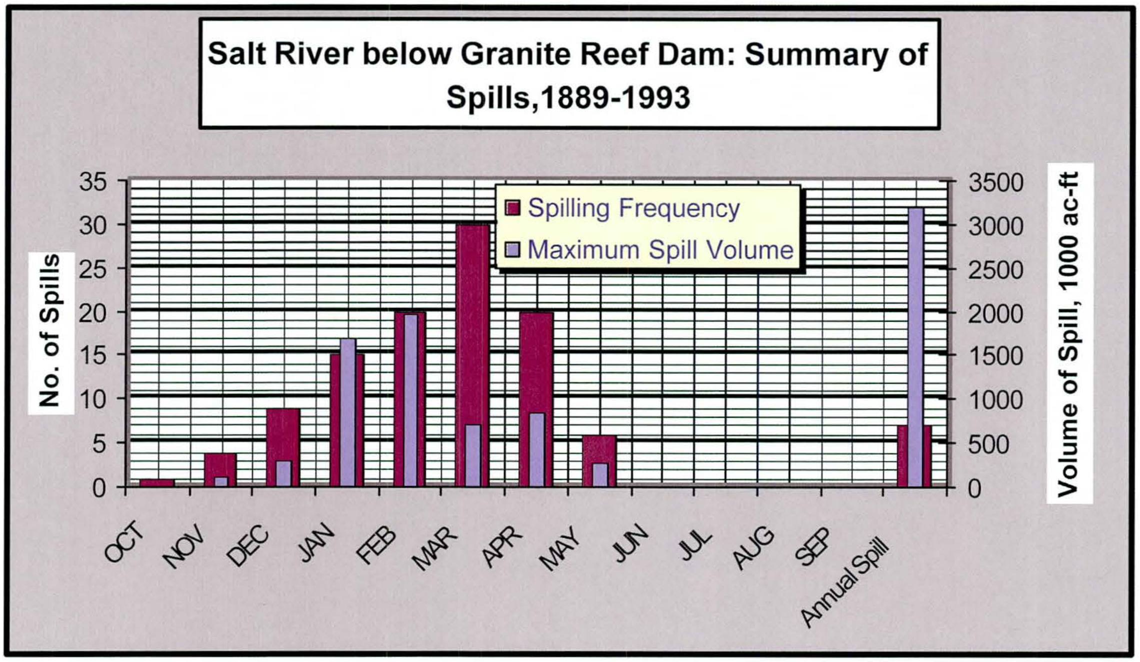


Figure 5.

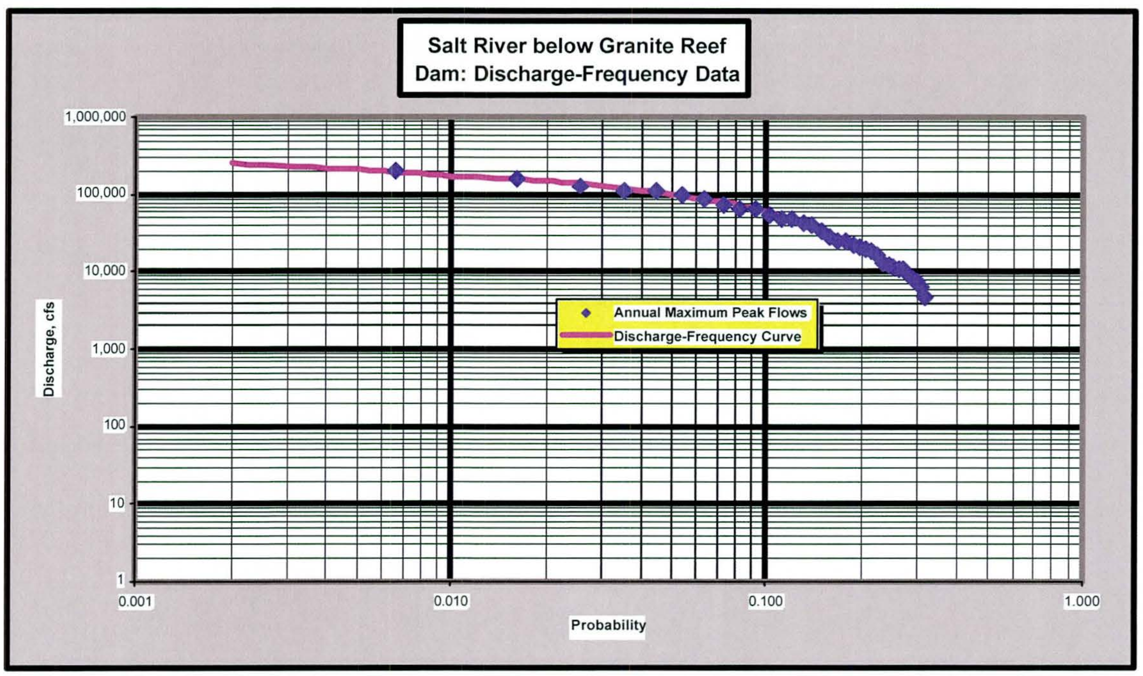


Figure 6. Annual Maximum Discharge-Frequency Curve with Annual Maxima.

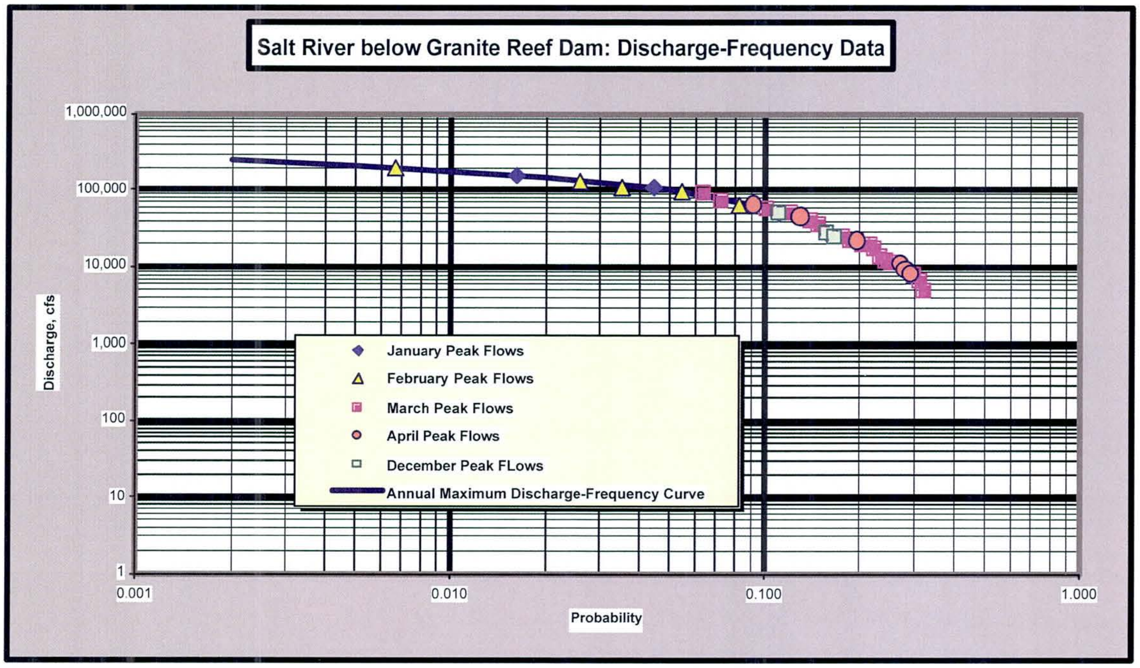


Figure 6a. Annual Maximum Discharge-Frequency Curve with December – April Maxima.

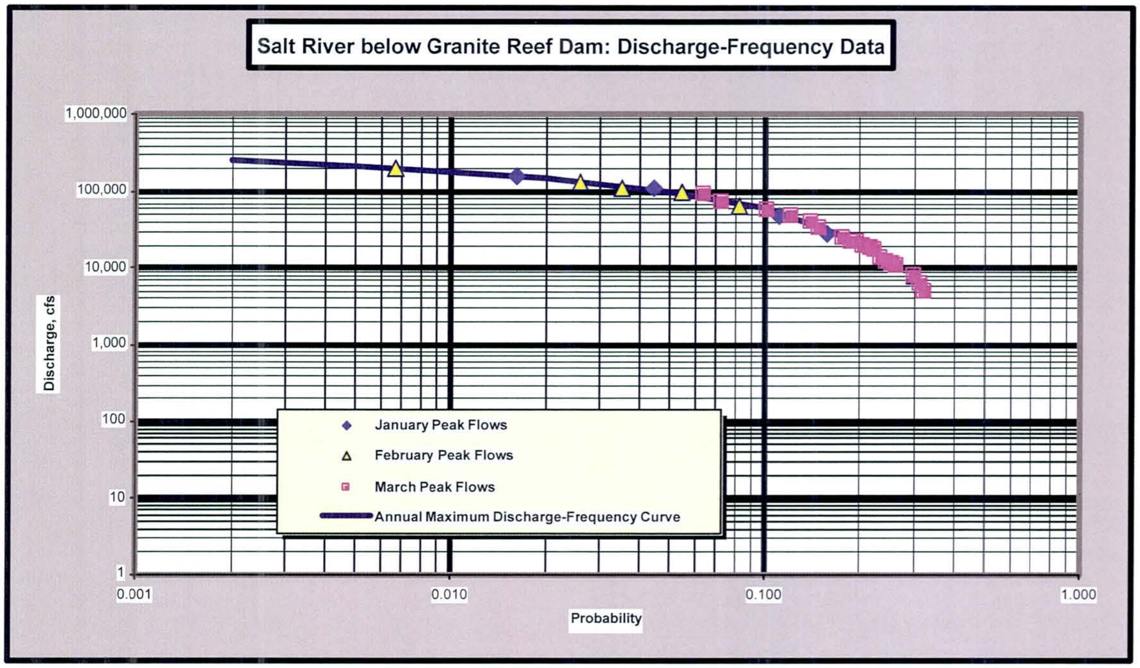


Figure 6b. Annual Maximum Discharge-Frequency Curve with January – March Maxima only.

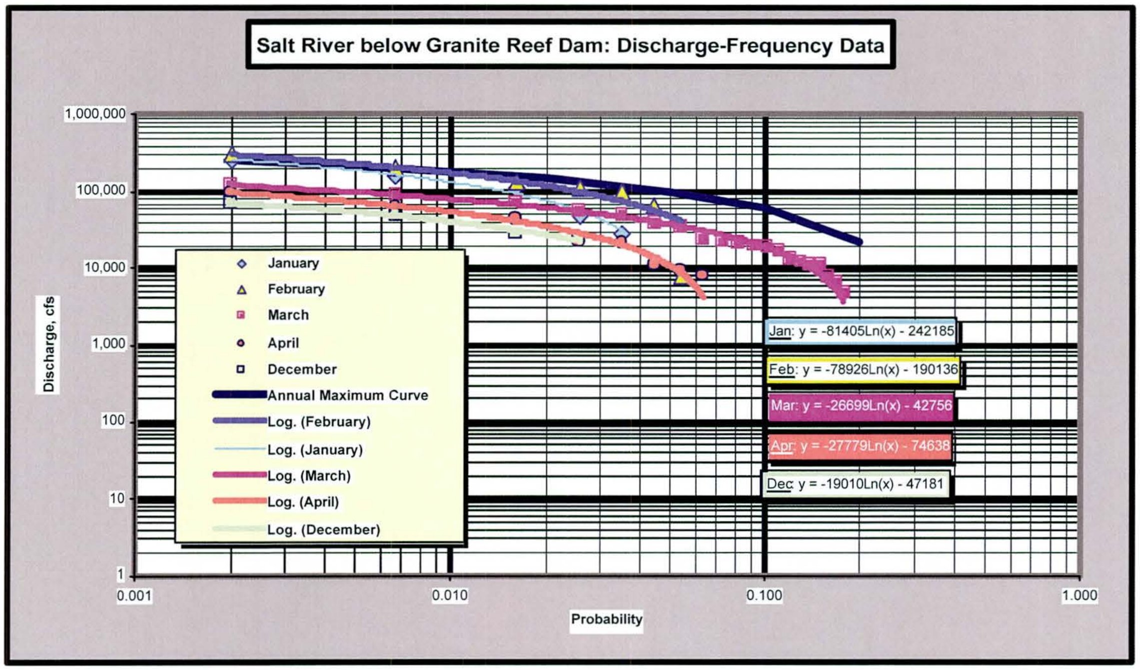


Figure 7. December – April Monthly Discharge-Frequency Curves (unadjusted) vs. Annual Curve.

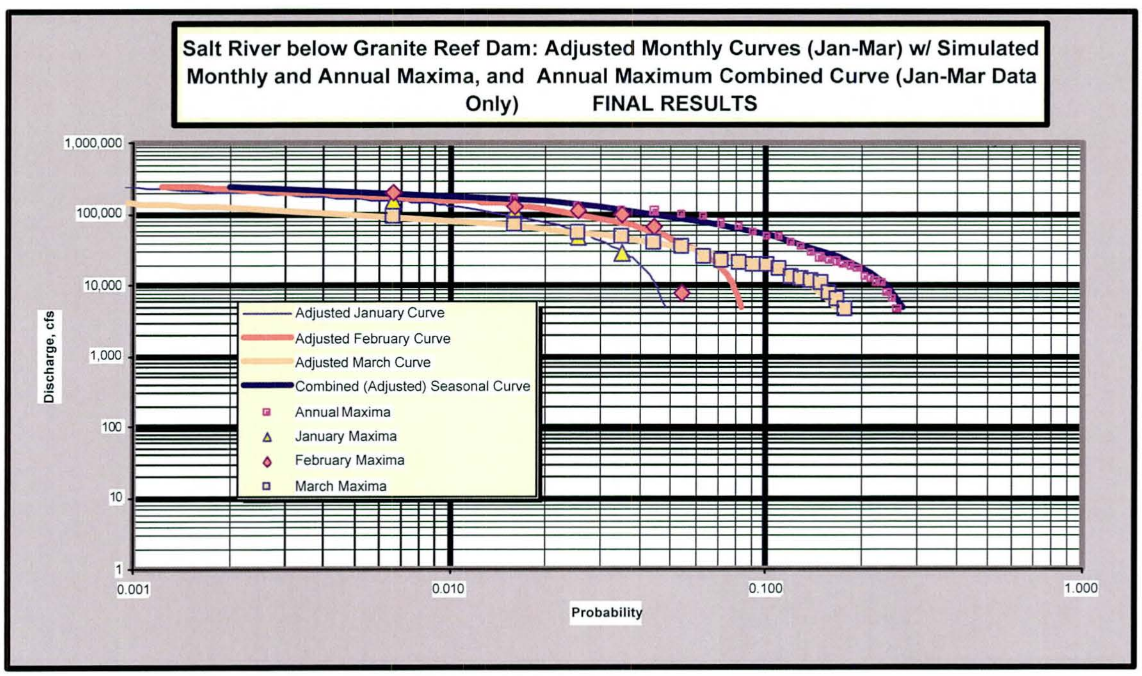


Figure 7a. January – March Monthly Discharge-Frequency Curves (adjusted) and Combined Seasonal Discharge-Frequency Curve.

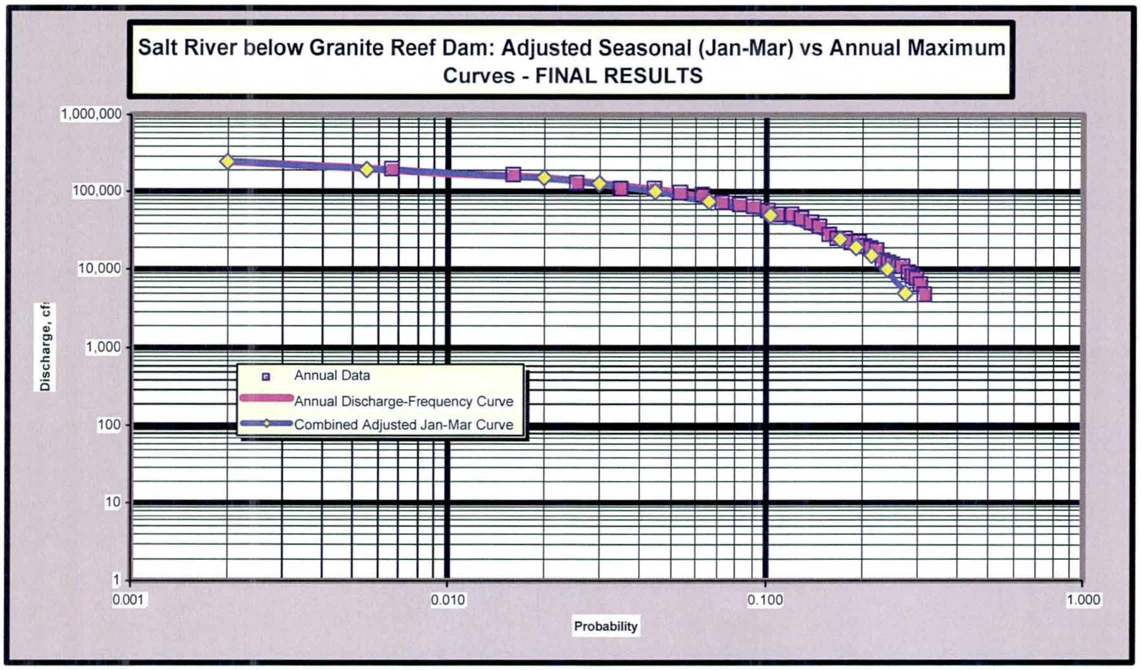
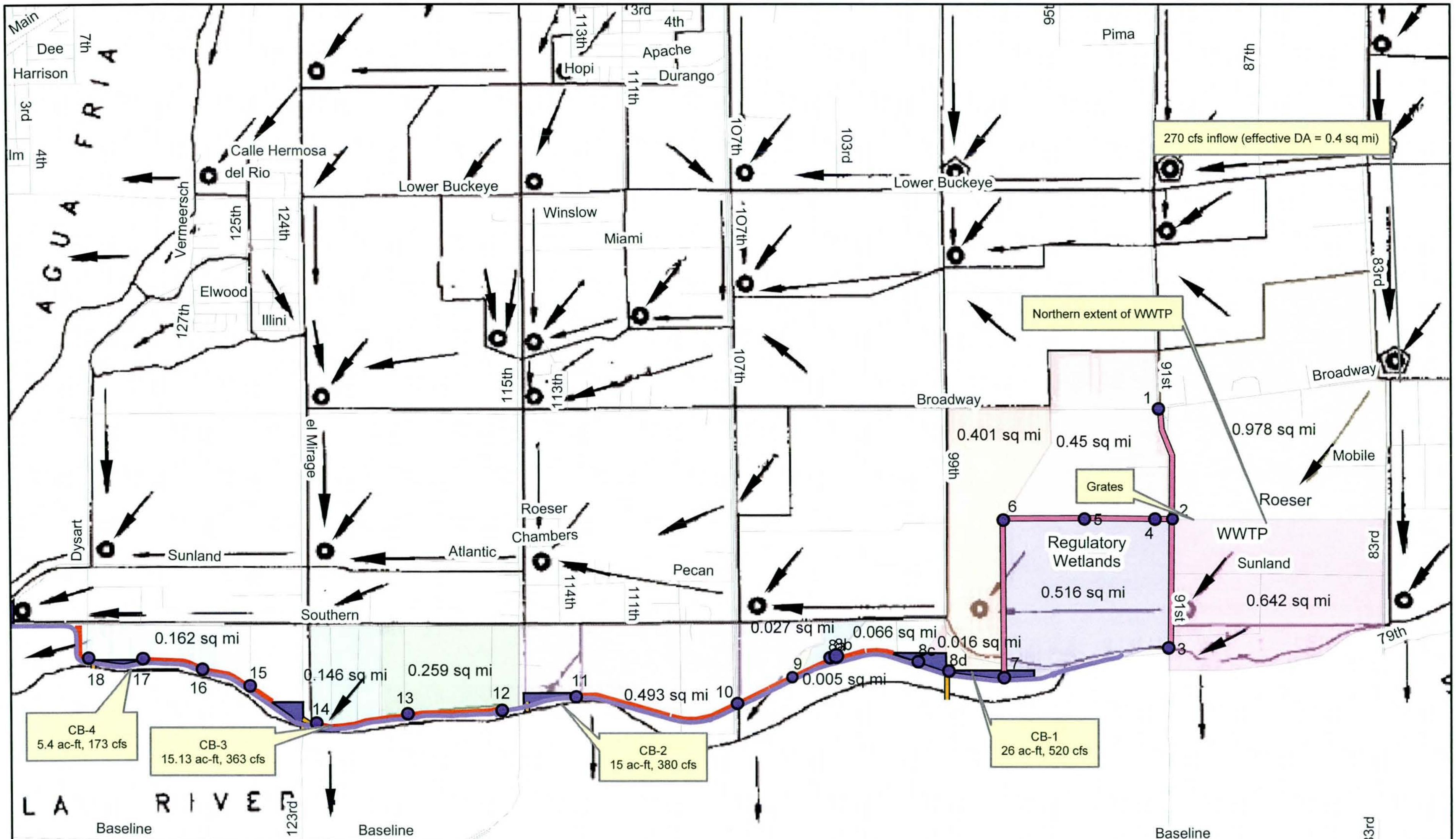


Figure 8. January – March Seasonal Discharge-Frequency Curve (adjusted) vs. Annual Curve



Node	Design Discharge (cfs)	Node	Design Discharge (cfs)	Node	Design Discharge (cfs)
1	300	10	253	9	10
2	300	11	380	8a	40
3	600	12	180	8b	300
4	100	13	363	8c	280
5	200	14	363	8d	270
6	320	15	90		
7	320	16	173		
8	-	17	173		
9	-	18	40		

Nodes
Surface Runoff
Levee Alignment

Legend

- Basin_drainage
- streets
- Catch Basin Outlet Pipes
- Collector Channel

0 0.5 1 2 3 Miles

NAD 1983; NGVD 1929

Date of Aerial Photography: 23 October 2001

Filename: InteriorDrainage4.mxd

Printed On: 27 June 2005

ADMP.jpg from Durango Area Drainage Master Plan (July 2000)

Tres Rios PED
Arizona

Interior Drainage Map

U.S. Army Corps of Engineers
Los Angeles District

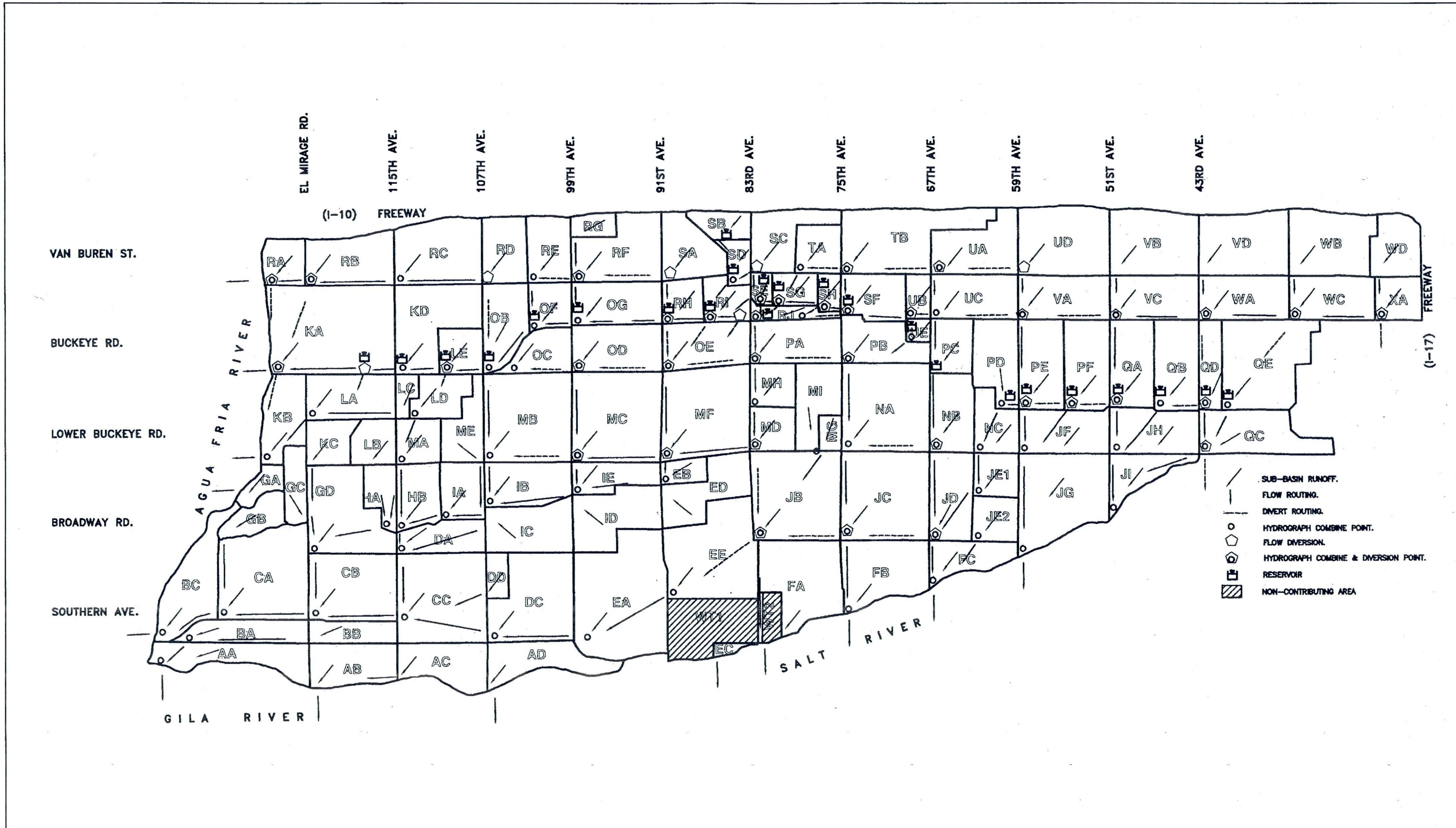


Figure 2 - Drainage Subareas

Exhibit II

Development of Hydrology for Sedimentation Analysis

APPENDIX A

DEVELOPMENT OF HYDROLOGY FOR

SEDIMENTATION ANALYSIS

TRES RIOS PROJECT LEVEE DESIGN

PREFACE

As part of the Tres Rios PED Levee design, development of the long-term sedimentation rate and variation throughout the project reach and within cross-sections was required. The project reach extended west from the Salt River at 91st Avenue to the Gila River at Dysart Road. Streamflow data for the Salt River in the project reach had been developed by the U.S. Army Corps of Engineers (Los Angeles District) previously in order to develop a flood operation plan for Modified Theodore Roosevelt Dam. That data represents existing conditions hydrologic data for the Salt River, and is available for the period from 1889 – 1993. Hydrologic data for the Gila River in the project reach is not directly available for this time period; in addition some of the hydrologic data for the Gila River in the project reach does not represent existing conditions. This report presents the development of existing conditions surface water hydrology for the Gila River in the project reach (i.e. at/above the confluence with the Salt River), to be used for the sedimentation analysis of the Tres Rios project and subsequent levee design. Included in this report are estimated peak discharges for "significant" runoff events, and daily flows for the period pre-1941 when streamflow data for the project reach was not available. Data for the Salt River provided informally by the Hydrology and Hydraulic Engineering Section, Los Angeles District, has been documented in a previous report as noted herein, and has not been published within this report. The data for the Gila River produced during this study, with the exception of daily flows for the gaged period from 1941 – 1993, have been included in this report, and have been developed specifically for the sedimentation analysis and may/may not represent actual historic flow rates and volumes.

APPENDIX A

DEVELOPMENT OF HYDROLOGY FOR SEDIMENTATION ANALYSIS
TRES RIOS PROJECT LEVEE DESIGN

Table of Contents

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TABLES

FIGURES

EXHIBITS

Number	Title
Rillito River @ Tucson: Partial Duration Balanced Hydrographs (DA = 918 mi^2)	
	1-Year Flow
A-2	**1.25-Year Flow**
A-3	**2-Year Flow**
	5-Year Flow
A-5	**10-Year Flow**
A-6	**25-Year Flow**
A-7	**50-Year Flow**
A-8	**100-Year Flow**

A-1. INTRODUCTION.

The information presented in this appendix was developed in order to provide sufficient streamflow information to enable quantification of the long-term rate, as well as ranges in variability, of sediment deposition or scour within the Tres Rios study reaches of the Salt and Gila Rivers. The resulting information will then be used to assess levee design criteria, including height and toe depth, required to ensure successful function of the project for flood control purposes. The study reaches include the Salt River from 91st Avenue to the Gila River confluence, and the Gila River from the confluence with the Salt River to Dysart Road (the existing Holly Acres Levee, beginning at 113th Avenue and continuing to El Mirage Road, will be raised). The levee alignment at Dysart Road will be extended north from the Gila River approximately 3500 ft. and be tied-back to existing topography.

The Salt River drains an effective area of nearly 13,000 square miles, of which approximately 12,500 square miles is controlled by the SRP system of dams and reservoirs. Runoff from the Gila River to the study area emanating upstream of the Salt River confluence (total contributing drainage area of 29,200 sq. mi.) is partially regulated by Coolidge Dam. The total drainage area controlled by Coolidge Dam is approximately 12,900 square miles. Hence, the total drainage area contributing to runoff in the study area downstream of the Salt-Gila confluence is approximately 42,900 square miles, of which approximately 60% (25,400 sq. mi.) is controlled.

A-2. DATA ACQUISITION AND DEVELOPMENT.

To assess the long-term rate and variability of sediment deposition or scour, streamflow data for the Salt River above the Gila River, and the Gila River above and below the Salt River confluence was required. Furthermore, the streamflow data must reflect *existing conditions*, i.e. with the Salt River Project (SRP) Dams[1] in-place and operated according to current practice, and Coolidge Dam in-place on the Gila River. Fortunately, the recent study[2] to develop the flood operation plan for "Modified Roosevelt" included simulation of the period-of-record (POR, viz.1889 - 1993) floods. Hence data, in the form of 6-hour computation-interval discharges, was available for specific time periods for many simulated runoff events in the Salt River above the Gila River confluence. In general this data was limited to the time period before and after the largest peak discharge for each simulated-spill year. Please refer to the following discussion (re: Salt River Discharges) for perspective on the data available. Monthly simulated-spill volumes below Granite Reef Diversion Dam are available for every month and year.

A-2.1. Salt River Discharges:

During most months of most years there is no flood runoff in the Salt River. Local inflows from the few tributaries (such as Indian Bend Wash), storm drains, tailwater drains (conveying irrigation returns), etc. do not contain sufficient volume to sustain flow through the broad Salt River channel. Almost the entire volume of runoff reaching the study area results from releases/spills from upstream SRP dams which are in excess of delivery system capacity and user demand. These flows, typically lasting for a week or more, spill across the Granite Reef diversion dam and continue downstream. During periods of sustained or high releases these spills reach Painted Rock Dam. Spills from the Salt River Dams occur almost always during the cold-weather months, and result from above normal precipitation, often accompanied by additional runoff from snowmelt or from snowmelt alone. The simulated flood history referred to above (1889- 1993) indicated spills would have occurred most frequently in the months of January through April, with the maximum spill threat in terms of volume occurring in January and February. Simulation of the POR did not result in any spill during the months of June through September; in addition there was only a single spill in October of negligible volume (3000 ac-ft) and only four spills in November, with the greatest spill (122,000 ac-ft) being *less than half* of the greatest spill from any of the other months from December through May. The simulated POR (1889 –1993, 105 years) resulted in a total of 105 months during which some

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[1] This includes Modified Theodore Roosevelt Dam (Modified Roosevelt) on the Salt River as well as the three downstream Salt River Dams and the two Verde River Dams operated by the SRP.

[2] SECTION 7 STUDY FOR MODIFIED ROOSEVELT DAM, ARIZONA (THEODORE ROOSEVELT DAM), HYDROLOGIC EVALUATION OF WATER CONTROL PLANS, SALT RIVER PROJECT TO GILA RIVER AT GILLESPIE DAM, U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT, MARCH 1996.

spill would have occurred. The simulated spills ranged from 3000 ac-ft (October 1983) to nearly 2,000,000 ac-ft (February 1891), and averaged about 250,000 ac-ft per month per spill event. In other words, the "average" monthly spill was about a quarter-million ac-ft., while each simulated spill *occurred on average* about once per year. However, there were only 34 years during which a simulated spill actually occurred (about a 32% chance of a spill occurring in a given year, or a 3-year recurrence interval). Many of the years in which spills would have occurred resulted from extended periods of above-normal runoff, and produced spills that occurred intermittently or continuously during a period of several months. The simulated monthly spill history is displayed in the following graph. Maximum spill volumes for each month are depicted along with the number of spills, as well as a summary of the largest spill and the largest number of monthly spills in any year.

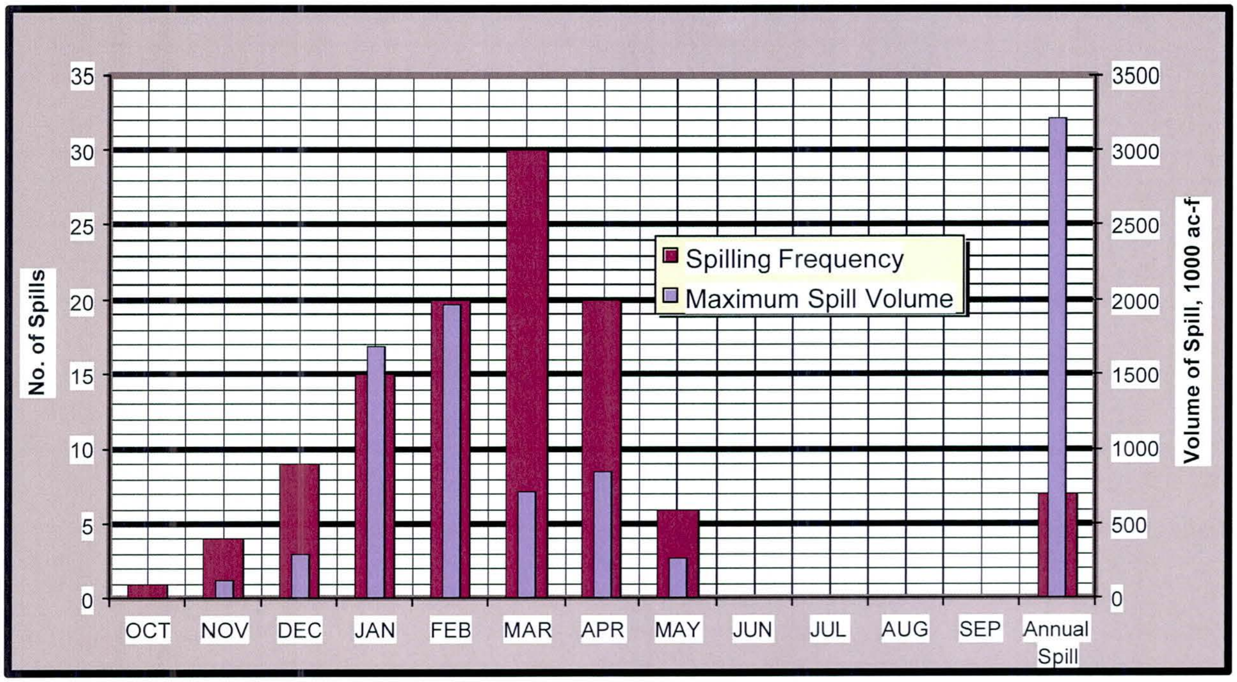

Figure A-1. Simulated Spill History, Salt River below Granite Reef Dam, 1889 – 1993

The largest spills for each year within the flood simulation period were routed from Granite Reef Dam to the confluence with the Gila River. That simulated flood history is summarized in the following table, including peak flow rate, volume-duration values, and relative magnitude (rank) for each event. These results were based upon simulated flood hydrographs developed for each event and are well documented in the "Section 7" report[2] referenced previously. The flood hydrographs were written to a database during that study for further analysis (HEC-DSS, the Hydrologic Engineering Center Data Storage System, U.S. Army Corps of Engineers, Davis, CA.). These same flood hydrographs were subsequently used in this study as the basis for *existing conditions* flow data in the Salt River at the Gila River confluence. The peak discharges provided in the Table A-1 are presented graphically in Figure A-2, which shows the simulated maximum annual spill over Granite Reef Dam routed to the Gila River confluence, as well as the years *without any spill.*

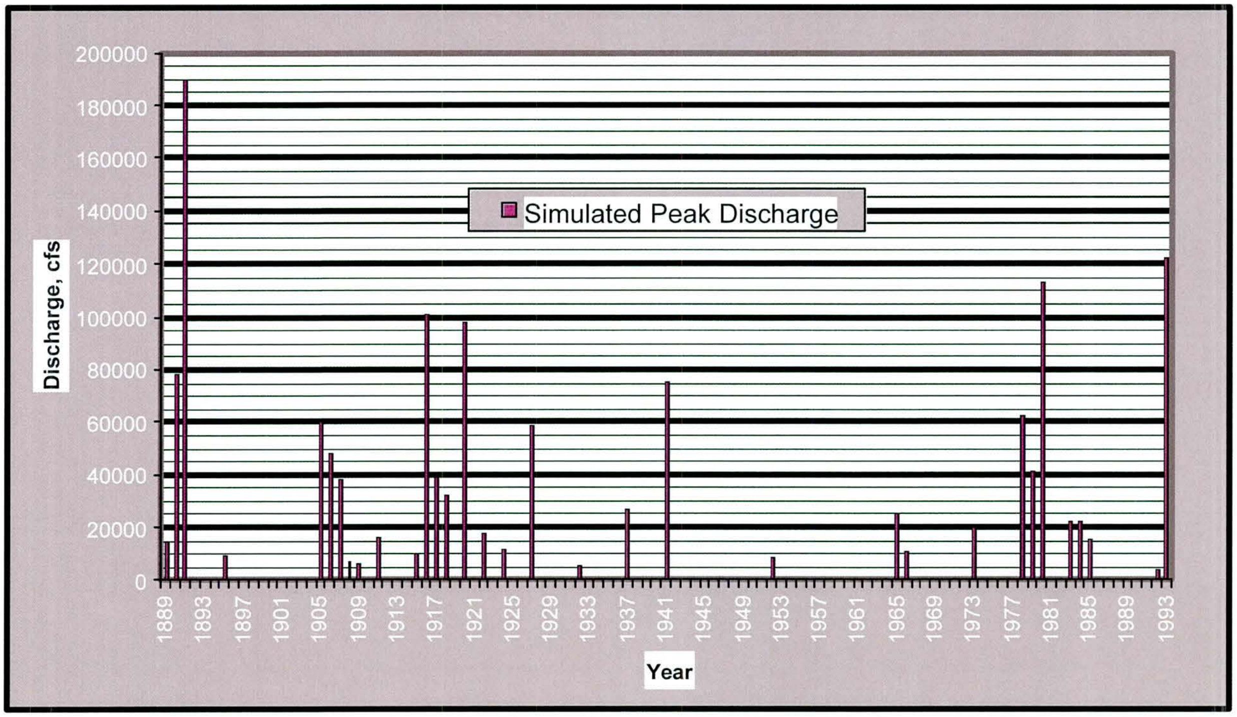

Figure A-2. Salt River at Gila River Confluence: Simulated Flood History, 1889 -1993

TABLE A-1. SIMULATED POR DISCHARGES AT GILA RIVER CONFLUENCE, 1889 - 1993

Date	Peak	Rank	1-day	Rank	2-day	Rank	3-day	Rank	5-day	Rank	10-day	Rank	Order	PP
Mar 1889	14497	24	13613	24	11947	24	10694	22	9991	22	5664	27	1	0.007
Feb 1890	78658	6	73088	6	59560	7	47124	8	29757	10	14890	12	2	0.016
Feb 1891	190090	1	178255	1	155060	1	131818	1	101259	1	85493	1	3	0.026
Mar 1895	9309	28	8692	28	7390	29	6393	30	5282	31	4345	31	4	0.035
Apr-05	60542	9	59176	8	54700	8	49099	7	37115	7	19463	8	5	0.045
Mar-06	48315	11	43725	11	37089	12	32087	12	23116	12	11696	14	6	0.054
Mar-07	38503	14	33750	14	27392	14	22932	14	18073	14	11150	17	7	0.064
Mar-08	7524	30	7480	30	7384	30	7203	28	7121	27	5244	28	8	0.073
Feb-09	6473	31	6281	31	6071	31	5908	31	5477	29	5208	29	9	0.083
Mar-11	16397	22	15020	23	12265	23	10552	23	7675	25	7013	23	10	0.092
Apr-15	9924	27	9714	27	9243	27	8895	27	8556	24	8367	21	11	0.102
Jan-16	100764	4	96146	4	89350	4	81567	2	66833	4	35713	4	12	0.111
Apr-17	39314	13	36841	13	32837	13	29142	13	20069	13	10667	18	13	0.120
Mar-18	32105	15	28493	15	21943	15	17639	17	13765	18	11581	15	14	0.130
Feb-20	97978	5	92885	5	83278	5	74121	5	58557	5	33410	5	15	0.139
Mar-22	18060	21	16062	21	13421	21	11354	21	7515	26	3764	32	16	0.149
Apr-24	11814	25	11413	25	10639	25	9957	25	8733	23	6999	24	17	0.158
Feb-27	58486	10	54350	10	47994	10	42617	9	32467	8	17205	10	18	0.168
Mar-32	5450	32	5363	32	5226	32	5119	32	4899	32	4706	30	19	0.177
Mar-37	27043	16	24097	16	20081	17	16652	19	12293	19	8039	22	20	0.187
Mar-41	75734	7	72948	7	66786	6	61134	6	43903	6	22150	6	21	0_196
Apr-52	8421	29	8352	29	7512	28	6650	29	5700	28	5915*	26	22	0.206
Dec-65	25659	17	21749	18	12869	22	8904	26	5346	30	5996**	25	23	0.215
Mar-66	10947	26	10842	26	10632	26	10474	24	9995	21	8561	20	24	0.225
Apr-73	19952	20	19630	20	18943	19	18236	16	17085	15	15445	11	25	0.234
Mar-78	62314	8	57916	9	50060	9	40210	10	30734	9	18116	9	26	0.244
Jan-79	41444	12	39525	12	37978	11	35819	11	28820	11	21103	7	27	0.253
Feb-80	113094	3	104779	3	90564	3	80575	4	73930	2	68566	2	28	0.263
Mar-83	22455	18	21833	17	20547	16	19251	15	16967	16	12938	13	29	0.272
Dec-83	22326	19	21368	19	19534	18	17541	18	14146	17	8741***	19	30	0.282
Mar-85	15800	23	15072	22	14282	20	13199	20	11879	20	11251	16	31	0.291
Mar-92	3716	33	3627	33	3390	33	3113	33	2597	33	2038	33	32	0.301
Jan-93	122443	2	110052	2	92908	2	80868	3	68662	3	52981	3	33	0.310

* Hydrograph for the period April 1952 only shows half cycle of the entire hydrograph. The period of March 1952 was assumed to be symmetrical with that of April to complete the cycle.

** Periods Dec 1965 and Jan 1966 were merged to obtain the 10-day duration.

***** Hydrograph for this period was extrapolated up to Jan 1984 (Ref. USGS Water Resources Data. AZ 1984)**

A-2.2. Gila River Discharges:

On the other hand, actual streamflow data representing *existing conditions* is available for the component of the inflow to the study reach emanating from the Gila River upstream of the Salt River confluence. Coolidge Dam was closed in 1929, hence all streamflow record since that time can be interpreted as representative of *existing conditions*. For purposes of this study, variability in the operation plan was not considered to have had substantial impact on downstream discharges. (Structural modifications in response to dam safety issues have been recently completed. However, the data developed for the sedimentation analysis did not extend past 1993, the last year of the SRP system simulation.) Two gages operated by the United States Geological Survey (USGS) provide direct information on Gila River inflows at the following locations, both of which are just upstream from the project reach:

- Gila River near Laveen, AZ (# 09479500), DA = 20,615 sq.mi.;
- Santa Cruz River near Laveen, AZ (#09480000), DA = 8581 sq.mi.

Since they are recording gages, both peak and daily flow data are available. Systematic record is available from 1940 to the present, but not for the period prior to 1940. To acquire data for the period (or periods) of time prior to 1941, an abbreviated process was developed. In addition, a process for estimation of peak flows for the period from 1941 – 1993 was also developed. These procedures are discussed in the following text.

A-2.2.a. 1941 – 1993.

Daily flows are directly available from the USGS data base for the 2 gaging stations "near Laveen" (refer to USGS stations noted above). A simple "summation" of the corresponding daily flows provides the total daily inflow from the Gila River upstream of the Salt River confluence. As a consequence, that information, although used in the sediment transport analysis, will not be documented in this report.

To provide sufficient information for the study purpose, i.e. to quantify the variability of sedimentation and long-term trends, and to assess the impact on levee design criteria, the combined daily flows from the 2 component streamflow records were augmented by selecting events within this period that were "significant" in terms of magnitude. Analysis of the daily flow data resulted in an arbitrary selection of 11 flood events for more detailed consideration based upon a dual criteria – if the peak discharge in the Gila River exceeded 10,000 ft^3/s and/or if the peak discharge in the Santa Cruz River exceeded 5000 ft^3/s. Flood hydrographs for these 11 flood events were then developed at 1-hour computation intervals for 3-day time periods.

A-2.2.a.2 Development of Synthesized Flood Hydrographs. The HEC-1 Flood Hydrograph Package contains an automated procedure for *adjusting* an input or "pattern" flood hydrograph to conform to a set of instantaneous and volumetric discharge criteria. (The "HB-card" allows the user to input these criteria or boundary conditions for automatic processing; when linked to a set of initial conditions, i.e. a "pattern" input hydrograph – in this case the October 1983 flood was utilized - there is sufficient hydrologic information to compute hydrograph ordinates for each event). Required input includes the computation interval (1-hour was selected) and duration of flow (72-hours was selected since the difference between the recession or rising limb discharge and the daily average for the preceding and following days was typically small), along with the aforementioned pattern hydrograph and boundary conditions. Use of the HEC-1 package allows easy graphical depiction of the resulting *Synthetic Flood Hydrograph* through use of the HEC-DSS (data storage system). *Synthetic Flood Hydrographs* for each of the runoff events described are provided in Exhibits A-1 through A-8; each synthetic flood hydrograph is compared to the "pattern hydrograph" for informational purposes.

A-2.2.a.1.1 *Initial Conditions* were established by developing a 3-day flood hydrograph for the Gila River above the Salt River confluence based upon measured streamflow during the October 1983 flood event. Recorded hydrographs for the USGS streamgages on the Gila River below Gillespie Dam (#09519500, DA = 49,650 mi^2) and the Salt River at 24th Street at Phoenix (#09512190, DA = 13,263 mi^2 – **Please note:** this includes some non-contributing area upstream of the Verde River dams and area cutoff due to Phoenix flood control projects.) were available in the publication FLOODS OF OCTOBER 1983 IN SOUTHEASTERN ARIZONA, USGS Water Resources Investigations Report 85-4225-C, dated March 1989 (Please refer to Fig.. A-3; data shown is at unequal time intervals as provided in the 1983 flood report). Since there was no record of significant inflow to the Gila River downstream of the Salt River confluence from sources other than the upstream Gila River, the additional runoff at the gage below the Gillespie Dam was assigned to the Gila River upstream of the Salt River. The Salt River flood hydrograph was "shifted" to account for translation due to flood routing and aligned with the downstream flood hydrograph (re: Fig.. A-3). The difference between the observed downstream flow and shifted upstream flow was computed and is also show in Figure A-3.

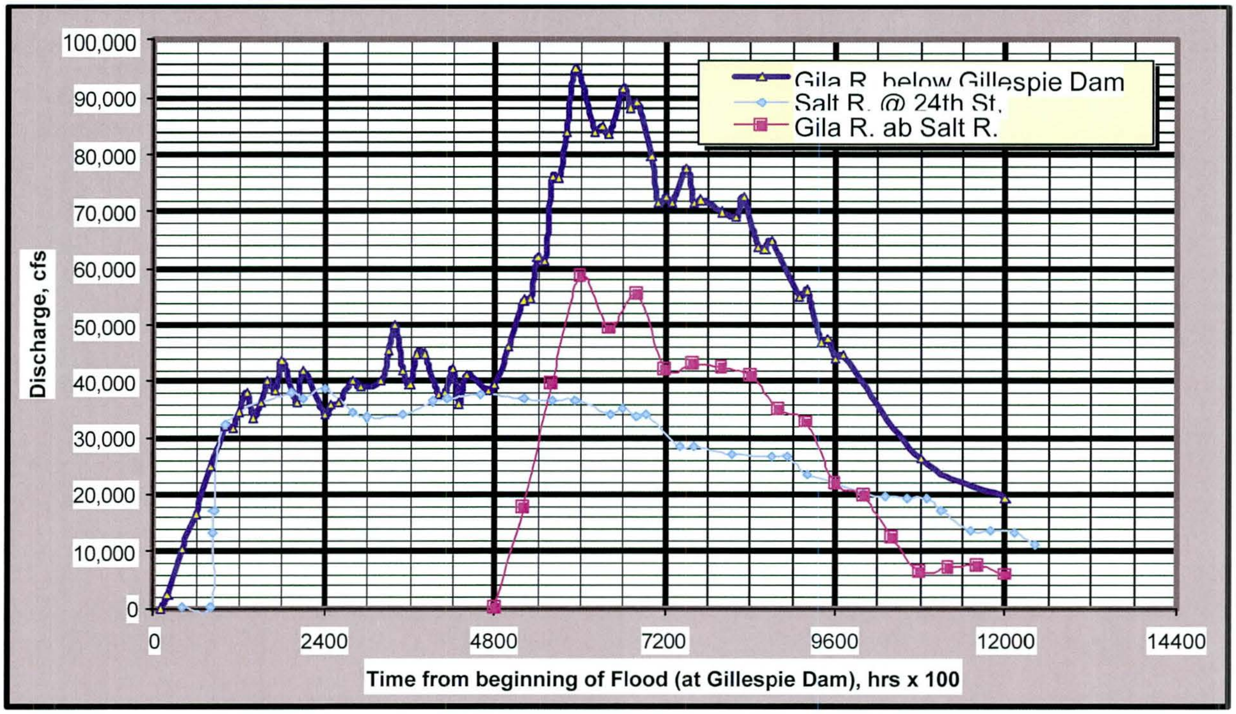

Figure A-3. PATTERN HYDROGRAPH DEVELOPMENT: Gila River above Salt River, October 1983 Flood

The resultant flood hydrograph for the Gila River above the Salt was developed in a "spreadsheet" environment, and 6-hour, equal time- interval ordinates were manually extracted from the hydrograph over a 72-hour period. Finally, the 6-hour values were enhanced through interpolation to produce a 72- hour "pattern hydrograph " with 1-hour time interval discharges. The "pattern hydrograph", i.e. the <u>initial conditions</u> is displayed graphically in Figure A-4, below.

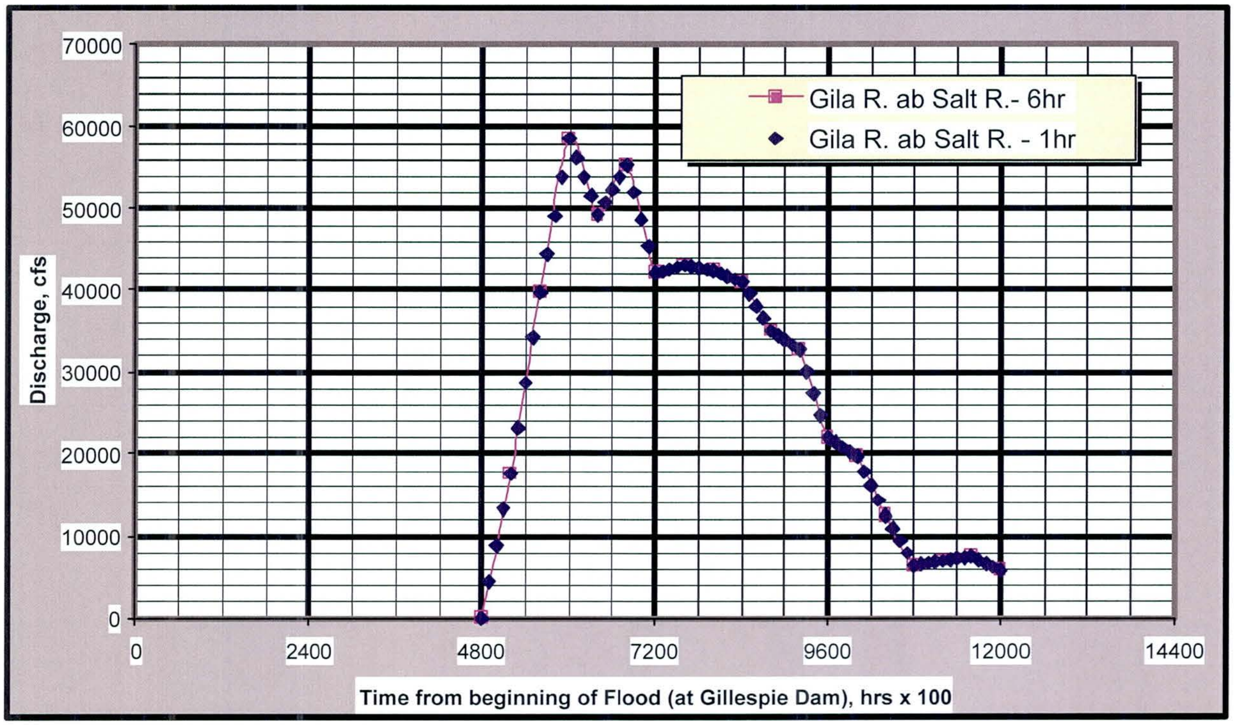

Figure A-4. PATTERN HYDROGRAPH: Gila River above Salt River, October 1983 Flood

A-2.2.a.2 _Boundary Conditions_. Coupled with the initial conditions, i.e. "pattern hydrograph", the boundary conditions enable development/modification of a flood hydrograph within the HEC-1 environment . Boundary conditions considered sufficient to adequately define flood hydrographs for sedimentation analysis were the peak, 1- and 3-day values. The information for selected flood events described earlier is provided in the following table. Peak discharges displayed in Table A-2 were estimated using an estimation process in lieu of actual data. This process is described below (**Note: there is <u>no gage</u> at the location of interest, the Gila River at the Salt River Confluence)**:

- Since peak discharges are available for the 2 upstream component gages, for data above the base (refer to record for each gage), it is obvious that the peak discharge just below the confluence must be = the greater of the 2 peak discharges. The peak may include contemporaneous runoff in the adjacent stream. In lieu of reconstructing flow data from recorded stage data, a reasonable shortcut is to assume that the peak discharge below the confluence of 2 streams may be approximated by combining the peak in one stream with the contemporaneous average daily flow in the other. To provide a better estimate, this approximation procedure is conducted in "both directions", i.e. using the peak in the Gila + 1-day in the Santa Cruz and comparing that to the sum of the peak in the Santa Cruz + 1-day in the Gila. The greater of these 2 summations is a good approximation of the peak flow downstream of the confluence of 2 streams. Table A-2 contains a summary of the peak, 1-, and 3-day values for the 11 selected events during the 1941 – 1993 period. The 1- and 3-day discharges are the linear sum of the contemporaneous average daily flows for the period indicated. The peak flow is the greater value of the summation procedure just described.

TABLE A-2. GILA RIVER ABOVE CONFLUENCE WITH SALT RIVER
DRAINAGE AREA = 29,200 sq.mi.
(Discharges in ft^3/s)

1941 – 1993

Date	Peak	1-Day	3-Day
2-Jan-41	13050	9850	5173
21-Sep-46	5330	5270	5008
28-Aug-51	5812	4142	3259
29-Sep-62	9200	5820	2844
26-Dec-65	13630	9770	5630
23-Dec-67	8580	6540	4379
13-Oct-77	8140	4720	2808
21-Dec-78	10860	9670	6426
22-Jan-79	8450	8020	5933
4-Oct-83	61000	46000	34500
21-Jan-93	44300	42760	37520

Winter Summer	Computed as the > sum of single-station peak + coincident 1-day flow in other stream. (Gila/Santa Cruz Rivers near Laveen)	Computed as the sum of the coincident 1-day maximum average flows for selected flood event.	Computed as the sum of the coincident 3-day maximum average daily flows for selected flood event.

The data was separated according to season (warm vs. cold weather) to establish whether there was some persistent difference between peak and volume relationships due to nature of the storm type or antecedent moisture conditions in the basin and/or channel. Subsequently, the tabulated data for the 11 selected events was plotted on a log-log chart with the 1-day flow as the independent variable and the peak and 3-day flow as independent variables. *The purpose in portraying the information in this manner was to provide a means for estimating peak and 3-day discharges for events prior to 1941 for which only daily flow data is available. This transformation process will be discussed in more detail for the period 1921 – 1940 in a separate* *section within this report.*

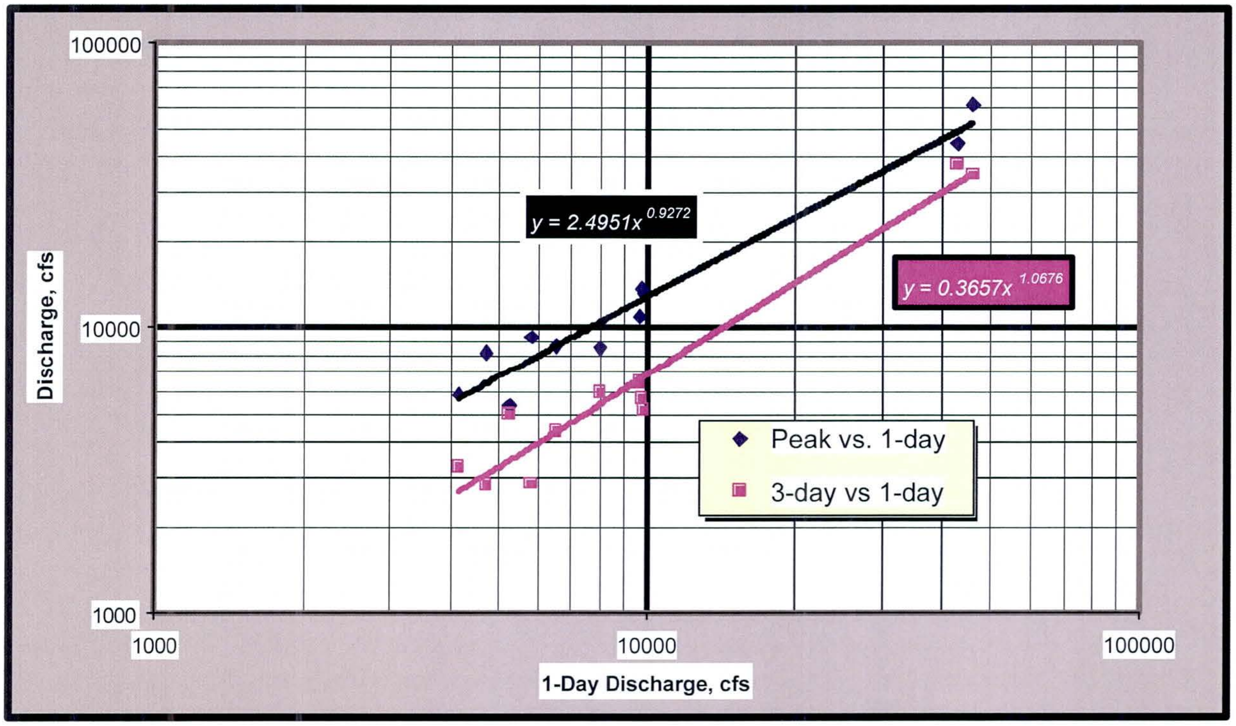

Figure A-5. Gila River above Salt River Confluence, Flow Regression Curves, 1940 – 1993. Drainage Area = 29,200 sq. mi.

A-2.2.b. <u>1921 – 1940.</u>

The only streamflow record available for the Gila River in the vicinity of the project reach for this time period is from the USGS gage on the Gila River below Gillespie Dam (#09519500, DA = 49,650 mi^2). Since the flow record at this gage includes contributions from the entire upstream watershed, it is not a valid reflection of streamflow in the Gila River above the Salt River confluence. The major sources of streamflow measured at this gage (Gila below Gillespie Dam) are the Salt River, the Gila River above the Salt River, the Agua Fria, Hassayampa Wash, and Centennial Wash. The intial portion of this time period (1921 – 1929) did not include either Coolidge Dam on the "upper" Gila River, nor the *existing* Salt River Project in its entirety.

In order to extend the length of record of this data for the project reach to include this time period, attempts were made to correlate the streamflow data for the Gila below Gillespie with the

Gila above the Salt for the overlapping period (1941 – 1993) when data was available. Initially, the streamflow data for the Gila River below Gillespie Dam was adjusted to *discount the runoff from the Salt River*. This approach was quite reasonable since the upstream data, which measured releases/spills from the SRP dams, and the downstream data reflected identical or contemporaneous basin conditions. Hence, differential runoff, i.e. the difference between the Gila River below Gillespie and upstream Salt River "spills" could be attributed to flows emanating from the upstream Gila River (at the Salt River confluence) or the 3 major tributaries downstream of the confluence. However, there were numerous problems inherent in this data *reduction* procedure, a few of which are listed below:

- Due to "dry" antecedent channel conditions during some portions of the year and for extended durations on occasion, the channel requires "wetting" before upstream floods reach the downstream gage. Dependent upon the magnitude and duration of the "spill", the rate and volume of flow reaching the downstream gage is highly variable, hence it is difficult to determine how much measured runoff is from the SRP system and how much is from the Gila River and tributaries other than the Salt River.
- Oftentimes, the downstream flow is < the upstream (the Salt River "spills") flow in both peak and volume. There may be flow from the Gila, above the Salt, but it cannot be readily estimated if the incremental component[3] is already negative. This "type" of situation can be seen in the following diagram (Fig A-6), summarizing the *overlapping* flow record for the period 1941 – 1993 for the "combined" daily flow in the Gila River at the Salt River Confluence (the sum of the Gila and Santa Cruz River near Laveen daily discharges) versus the daily discharge in the Gila River below Gillespie Dam. The 45 degree line in the picture represents the case when upstream flow = downstream flow. Data to the right of the diagonal line maps flows augmented by tributary runoff as they travel downstream; data to the left of the diagonal line maps flows that diminish as they travel downstream. If the difference between observed downstream runoff and observed upstream runoff is negative (the latter case), then there is no easy direct mechanism for estimating tributary runoff.

Please note: average daily flows plotted in the diagram account for translation (i.e. travel time). However, data shown correlates discharge in a single direction only – upstream (Gila River at the Salt) to downstream (Gila River below Gillespie). The upstream sample presents the *maximum daily flow* associated with partial record peaks (flows above the base for both Laveen stations), while the downstream sample presents the correlated discharge for the same event (including gains from tributary inflow and losses due to channel routing and percolation). As a consequence, the relationship always indicates a positive upstream flow since the sample included only upstream events of a prescribed magnitude or greater. Had the sample been selected in the other direction, i.e. using prescribed magnitude events at the downstream location correlated with associated

[3] The calculated difference between Gila River below Gillespie Dam discharge and Salt River "spills".

upstream events, there might have been more low or zero flows in the upstream sample. Finally, for purposes of display, all zero flow events for the downstream station (Gila below Gillespie) were assigned a value of 1 for display purposes.

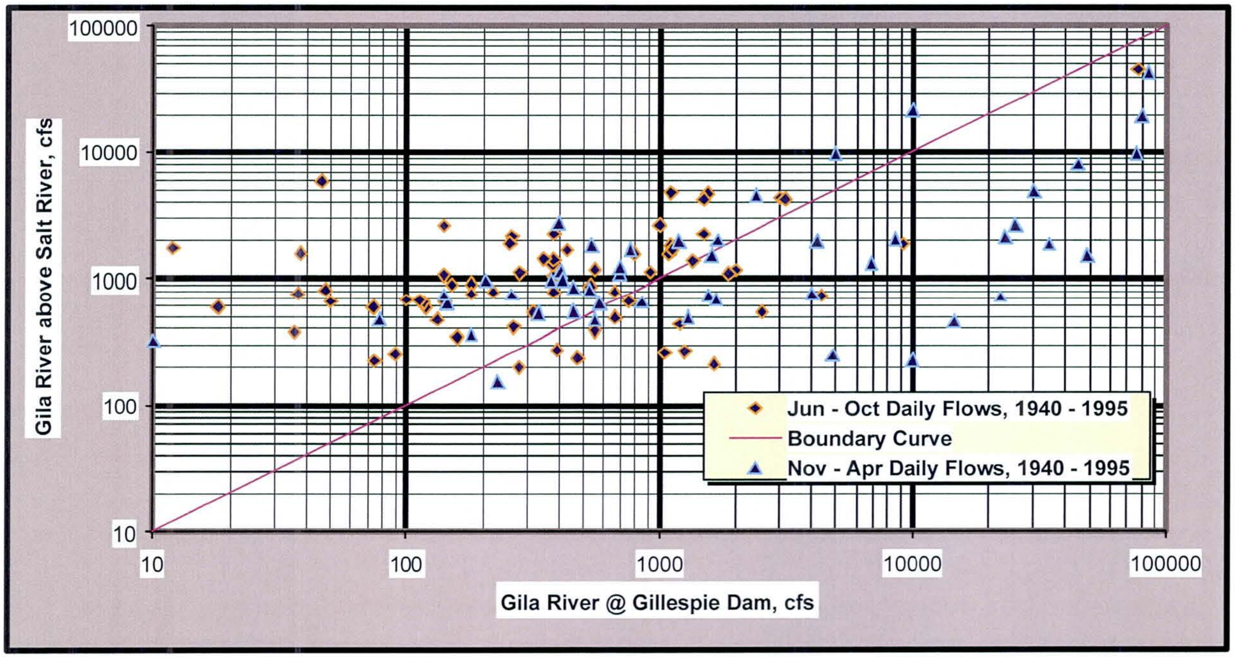

Figure A-6. DAILY FLOW COMPARISON: Gila River above Salt River Confluence vs Gila River below Gillespie Dam - Seasonal Series ("summer" vs. "winter")

Seasonality of flows was considered as a guide for making adjustments to the observed recorded flows. The *hypothesis* is that since there are no summer/warm weather "spills" from the SRP dams, and since summer events typically result from local thunderstorms and often are accompanied by "dry" channel conditions, summer flows from the upstream Gila would diminish as they traveled downstream. On the contrary, "spills" from SRP dams are almost always during the winter/cold weather (please refer to earlier discussion and graphics summary of monthly SRP "spills"). In addition, the nature of the meteorological events which occur during the winter include less intense precipitation but for longer durations, increased areal extent, and often abetted by snowmelt. This type of precipitation creates greater volume flows and higher peaks in large basins, as well as "wet" channel conditions. Hence, it is more likely that winter storms will include tributary inflow from the larger basins. These characteristics are evidenced in Figure A-6. The winter daily flows (Nov – Apr in the diagram) dominate the right side of the chart, while summer daily flows dominate the left side, consistent with the hypothesis. Of course, there are exceptions, such as a winter runoff emanating from the upper Gila when the

SRP dams do not spill; or a general warm weather storm resulting from a dissipating tropical cyclone (typically occurring in late summer or early fall) which may encompass a large areal extent and include prolonged precipitation with periods of high intensity. Some of the summer data mapped onto the right side of the chart resulted from the latter type of meteorological event. To evaluate this approach, then, the following steps were taken:

- Data segregation into 2 simplistic classes – summer and winter, using the boundaries mentioned above (summer: Jun – Oct, winter: Nov – Apr).
- Reducing the observed flow at the Gila below Gillespie to account for winter "spills" from the SRP dams, and any other tributary inflow other than the upper Gila for all seasons (tributary inflow other than SRP "spills" is very difficult to find).
- Correlation analysis between upper Gila daily flows and "adjusted" Gila below Gillespie flows.

The results were inconclusive, but yielded a reasonable fit for summer data which was more reasonably predictable since the observed downstream flows were more likely to have resulted from the contemporaneous upper Gila contribution. The winter data proved extremely difficult to adjust, since the entire process, i.e. translation, attenuation, percolation, and tributary inflow often masked any/all contribution that might have emanated from the upper Gila. Eventually so many of the larger winter events were discarded that the adjustment process was discontinued.

As a consequence the hypothesis was altered to include all of the winter events, including SRP "spills". Under this scenario the investigator assumed that large general winter storms affect the contributing drainage areas in a variable manner, but on-average can be dealt with in a deterministic manner. In other words, by observation of the runoff in the lower Gila (below Gillespie), the long-term component contributions can be estimated on an "average" basis. Large flows in the lower Gila will typically result from SRP "spills" in a directly variable manner, as well as include other tributary inflow[4]. The variability (the stochastic component of this process) will thus be included within the data sets. For analysis of long-term impact on sediment transport and event-to-event variability, a best- ft regression curve, constructed to fit the data, should provide a reasonable tool for recreation of the upper Gila River flows. It is understood that some of the flows will exceed the actual flow, while others will be less than actual. The purpose of this procedure is to provide a data set that reasonably captures the long-term runoff contributions from the upper Gila River to the project reach, and further, reflects the variability of flow over that time period (1921 –1940). The regression curve developed from the correlation analysis, includes seasonal aspects discussed above, and is a hybrid curve that knits together what can be conceptually referred to as summer and winter flows at their point of

[4] Larger downstream flows will result from larger upstream spills; in a similar manner, larger downstream flows will generally include an increasing contribution from the upper Gila River and tributaries. Hence, based upon the sample of observations from the 1941 – 1993 record, it is reasonable to project a similar relationship for the earlier record set.

intersection (a daily flow in the lower Gila of approximately 4000 ft^3/s). Figure A-7 depicts the data set with the best-fit hybrid curve. This relationship was subsequently used to estimate daily flows for the period 1921 – 1940 for the Gila River above the Salt River confluence. The estimated daily flows are included in Exhibit A-2.

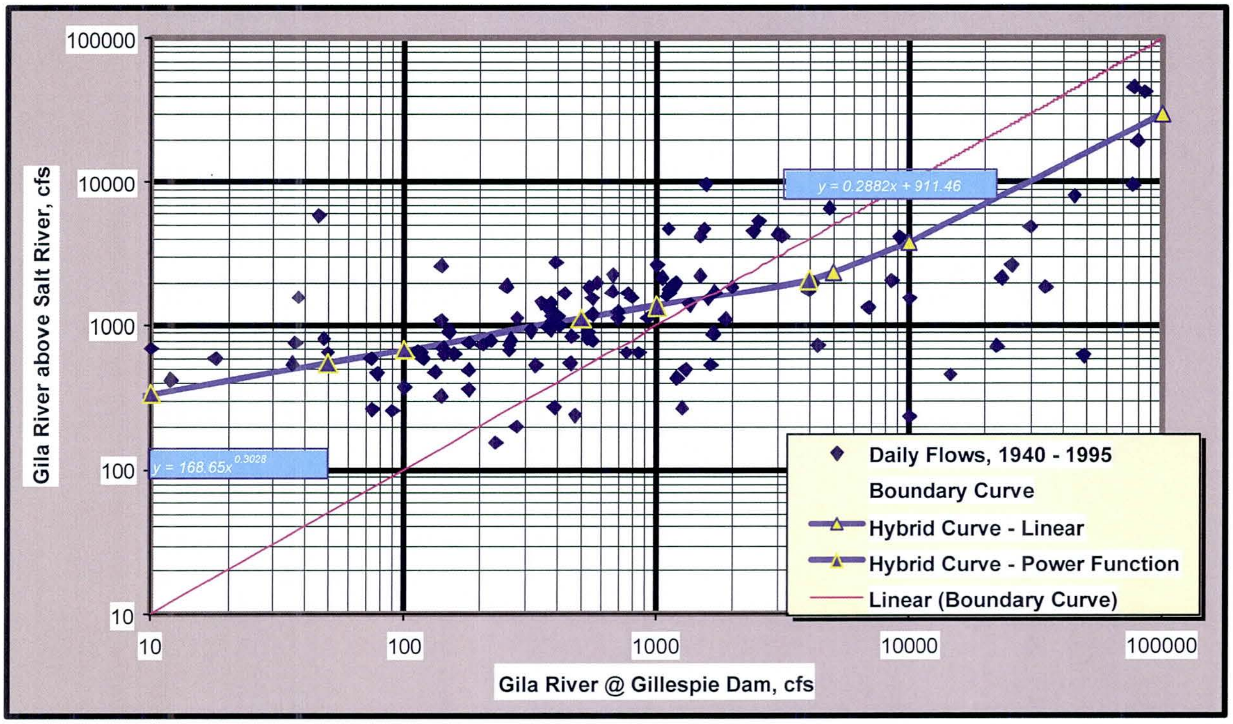

Figure A-8. DAILY FLOW COMPARISON: Gila River above Salt River Confluence vs Gila River below Gillespie Dam.

Finally, as was done for the upper Gila River inflow to the project reach for the 1941 – 1993 data set, significant hypothetical events were selected for more in-depth analysis within the sediment transport simulation model. Daily flows exceeding an arbitrary base were tabulated; subsequently, peak discharges were estimated using the previously described relationship for the upper Gila River inflow to the project reach (Fig. A-5) that regressed peak discharges upon daily flow. Seventy-two hour duration, 1-hour computation interval hydrographs were developed for each event based upon the "pattern hydrograph" previously developed and "boundary conditions" computed for the selected events (peak discharges from the regression of peak on 1-day discharge, Fig. A-5; 1- and 3-day discharges from the regression of upper Gila River daily flows on lower Gila River daily flows, Fig. A-8). Table A-3 summarizes the boundary conditions.

TABLE A-3. Gila River above Salt River Confluence, 1921-1940
(DA = 29,200 sq.mi.)
Source Data: Gila River below Gillespie Dam

Date	1-Day Q	Peak	3-Day Q	3-Day Q
21-Aug-21	5638			
22-Aug-21	8635	11138	6723	5827
23-Aug-21	5897			
28-Dec-21	3727			
29-Dec-21	4917	6607	3794	3194
30-Dec-21	2739			
3-Jan-22	3632			
4-Jan-22	10336	13158	5940	7061
5-Jan-22	3851			
11-Feb-22	2396			
12-Feb-22	4053	5524	3212	2599
13-Feb-22	3188			
17-Mar-22	7194	9403		
18-Mar-22	3727		4851	4795
19-Mar-22	3632			
3-Sep-22	4255	5778		
4-Sep-22	1739		2420	2737
5-Sep-22	1267			
7-Aug-23	1267			
8-Aug-23	4255	5778	2083	2737
9-Aug-23	728			
19-Sep-23	4485			
20-Sep-23	4687	6320	3910	3035
21-Sep-23	2557			
11-Nov-23	2906			
12-Nov-23	4687	6320	3303	3035
13-Nov-23	2315			
28-Dec-23	21085	25485		

TABLE A-3. Gila River above Salt River Confluence, 1921-1940

(DA = 29,200 sq.mi.)

Source Data: Gila River below Gillespie Dam

Date	1-Day Q	Peak	3-Day Q	3-Day Q
29-Dec-23	7713		12170	15115
30-Dec-23	7713			
19-Sep-25	3938			
20-Sep-25	4514	6104	3995	2916
21-Sep-25	3534			
7-Apr-26	6791			
8-Apr-26	8174	10585	7137	5496
9-Apr-26	6445			
28-Sep-26	3159			
29-Sep-26	4975		5052	4672
30-Sep-26	7021	9193		
17-Feb-27	15667			
18-Feb-27	18203	22238	15312	12920
19-Feb-27	12065			
13-Sep-27	7281	9508		
14-Sep-27	4226		4727	4857
15-Sep-27	2675			
6-Apr-29	5494	7323		
7-Apr-29	3295		3541	3596
8-Apr-29	1833			
9-Aug-30	2361			
10-Aug-30	4110	5596	2777	2638
11-Aug-30	1859			
15-Feb-31	4831			
16-Feb-31	5667	7537	5129	3717
17-Feb-31	4889			
11-Feb-32	9673			
12-Feb-32	10249	13055	8414	6997
13-Feb-32	5321			

TABLE A-3. Gila River above Salt River Confluence, 1921-1940 (DA = 29,200 sq.mi.) *Source Data: Gila River below Gillespie Dam*				
Date	1-Day Q	Peak	3-Day Q	3-Day Q
9-Feb-37	7972	10342		
10-Feb-37	7742		6512	5351
11-Feb-37	3822			
19-Mar-37	5984	7927		
20-Mar-37	4543		4523	3940
21-Mar-37	3041			
5-Mar-38	11229	14209		
6-Mar-38	8981		8030	7714
7-Mar-38	3880			

Computed using regression equation developed from 1940 -1993 data, $Q_{peak} = 2.4951Q1\text{-}day^{0.9272}$

Computed using regression equation developed from 1940 -1993 data, $Q_{peak} = 0.3657Q1\text{-}day^{1.0676}$

Computed using "fictional" flow data developed from 1921 -1940 data (see Gila River ab Salt); this data was used to develop discrete flood hydrographs.

Source Data: Gila River below Gillespie Dam Daily Flow Data, Regression Analysis - 1940 -1995

A-2.2.c. 1889 - 1921.

There is no streamflow record for the Gila River in the project vicinity for the period *prior* to 1921. However, during the analysis of Salt-Gila River historic flows conducted for the development of the Flood Control Plan for operation of Modified Theodore Roosevelt Dam[5], estimates of *historic* peak discharges for the Gila River below the confluence with the Salt River were developed. These discharges, including the effects of the Modified Theodore Roosevelt Dam flood operation, are provided in the following table.

[5] SECTION 7 STUDY FOR MODIFIED ROOSEVELT DAM, ARIZONA (THEODORE ROOSEVELT DAM), HYDROLOGIC EVALUATION OF WATER CONTROL PLANS, SALT RIVER PROJECT TO GILA RIVER AT GILLESPIE DAM, U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT, MARCH 1996

TABLE A-4. GILA RIVER BELOW SALT RIVER CONFLUENCE SIMULATED POR DISCHARGES, 1889 – 1993 w/wo MODIFIED THEODORE ROOSEVELT DAM

(Discharge in ft^3/s)

DATE[a]	PEAK w/PROJECT	RANK	Plotting Position	PEAK w/o PROJECT[b,c]
Mar 1889	14,500	28	.263	32,300
Feb 1890	78,700	7	.064	122,900
Feb 1891	235,000	1	.007	300,000
Mar 1895	9300	34	.320	3800
Apr 1905	60,500	10	.092	103,800
Nov 1905	50,000[(1),(2),d]			160,000
Mar 1906	48,300	12	.111	
Mar 1907	38,500	15	.139	41,400
Feb 1908	7520	36	.339	30,600
Dec 1908	[(1)]			78,000
Feb 1909	6470	37	.348	NA
Mar 1911	16,400	25	.234	NA
Feb 1914	[(1)]			16,300
Jan 1915	[(1)]			22,200
Apr 1915	9920	33	.310	NA
Jan 1916	121,000	4	.035	150,000
Apr 1917	39,300	14	.130	47,300
Mar 1918	32,100	17	.158	28,500
Feb 1920	98,000	5	.045	126,300
Aug 1921	15,500[(1),(2)]	27	.253	15,500
Mar 1922	18,100	24	.225	24,700
Sep 1923	1800[(1),(2)]	53	.500	1800
Dec 1923	[(1)]			75,500
Apr 1924	11,800	29	.272	NA
Sep 1925	3600[(1),(2)]	47	.443	3600
Sep 1926	36,600[(1),(2)]	16	.149	36,600
Feb 1927	58,500	11	.102	74,400
Aug 1928	5400[(1),(2)]	41	.386	5400
Sep 1929	5400[(1),(2)]	40	.377	5400
Aug 1930	18,400[(1),(2)]	23	.215	18,400
Aug 1931	6400[(1),(2)]	38	.358	6400
Feb 1932	NA			81,000

DATE[a]	PEAK w/PROJECT	RANK	Plotting Position	PEAK w/o PROJECT[b,c]
Mar 1932	5450	39	.367	NA
Oct 1932	300[(1),(2)]	65	.614	300
Aug 1934	1400[(1),(2)]	55	.519	1400
Aug 1935	4800[(1),(2)]	44	.415	4800
Jul 1936	2600[(1),(2)]	48	.453	2600
Mar 1937	27,000	18	.168	43,100
Mar 1938	[(1)]			59,000
Sep 1939	900[(1),(2)]	58	.547	900
Aug 1940	11,100[(1),(2)]	30	.282	11,100
Mar 1941	75,700	8	.073	117,000
Apr 1942	[(1)]			3500
Aug 1943	1900[(1),(2)]	52	.491	1900
Aug 1945	5200[(1),(2)]	42	.396	5200
Sep 1946	500[(1),(2) (1),(2)]	60	.566	500
Aug 1947	2600[(1),(2)]	49	.462	2600
Oct 1949	200[(1),(2)]	69	.652	200
Aug 1951	2000[(1),(2)]	51	.481	2000
Apr 1952	8420	35	.329	6500
Aug 1954	800[(1),(2)]	59	.557	800
Aug 1955	2300[(1),(2)]	50	.472	2300
Apr 1965	4100			5200
Dec 1965	25,700	19	.177	40,800
Mar 1966	10,900	32	.301	NA
Dec 1967	[(1)]			20,600
Mar 1968	[(1)]			11,500
Apr 1969	[(1)]			3700
Sep 1970	1200[(1),(2)]	56	.528	1200
Aug 1971	200[(1),(2)]	68	.642	200
Mar 1973	NA			21,100
Apr 1973	20,000	22	.206	NA
Sep 1976	400[(1),(2)]	61	.576	400
Mar 1978	62,300	9	.083	93,900
Dec 1978	NA			136,000
Jan 1979	41,400	13	.120	NA
Feb 1980	130,000	3	.026	194,000
Sep 1981	217[(1),(2)]	67	.633	217
Sep 1982	143[(1),(2)]	70	.661	143

DATE[a]	PEAK w/PROJECT	RANK	Plotting Position	PEAK w/o PROJECT[b,c]
Mar 1983	22,500	20	.187	NA
Oct 1983	95,200[(1),(2)]	6	.054	95,200
Sep 1984	3930[(1),(2)]	45	.424	3930
Mar 1985	15,800	26	.244	NA
Jul 1986	346	63	.595	NA
Jul 1987	346	64	.604	346
Sep 1988	1135[(1),(2)]	57	.538	1135
Oct 1989	370[(1),(2)]	62	.585	370
Aug 1990	1438[(1),(2)]	54	.509	1438
Sep 1991	270[(1),(2)]	66	.623	270
Mar 1992	3720	46	.434	NA
Aug 1992	11,100[(1),(2)]	31	.291	11,100
Jan 1993	150,000	2	.016	NA

[a] W/O Project Discharges for the Salt River above the Gila River unavailable after 1980, since no analysis of data post-1982 CAWCS Hydrology Report was done.
[b] Source: Table 3-6 of 1982 CAWCS Hydrology Report
[c] Tributary inflow to the Gila from sources other than Salt River derived from USGS Water Supply Papers for the period since 1980.
[d] Estimated value for the flow in the Gila River resulting from a "spill" from Coolidge Dam. The value for the March 1906 event was used instead, since it was more reliable, and nearly identical.
[(1)] No "spill" from SRP system w/ project
[(2)] Discharge resulted from tributary inflow to the Gila from source other than Salt River. Estimated based upon recorded discharges for the Gila River at Gillespie Dam.
NA = Not Applicable.
Indicates a significant runoff contribution from the Gila River at Salt River confluence prior to 1921.
Indicates the most significant historical runoff contribution from the Gila River at Salt River confluence prior to 1891.

No simulated flood hydrographs representative of the runoff conditions alluded to in Table A-4 had been generated. However, such hydrographs could be constructed for purposes of this sedimentation evaluation by simply applying the ratio of the peak w/project discharge to the "pattern" flood hydrograph or some other representative flood hydrograph. Further detailed development of simulated flood hydrographs for the upper Gila River (at the Salt confluence) for the period prior to 1921 is beyond the scope of this evaluation.

EXHIBITS

No Exhibit Available

No Exhibit Available

No Exhibit Available

Exhibit III

PED Hydraulic Design of Tres Rios North Levee, Pre-Final Project Analysis (90 Percent) Report