FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

VOLUME 1 OF 2

BULLARD WASH OUTFALL FEASIBILITY STUDY (FCD 94-06)

FINAL DESIGN CONCEPT REPORT FOR RECOMMENDED ALTERNATIVE

PREPARED FOR

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
2801 West Durango Street
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PREPARED BY

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PREPARED SEPTEMBER 1995
SCI #12278

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Note: Exhibits 1, 2, 3 and 4 are included as full size exhibits in Volume 2.

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Revised White Tanks/Agua Fria ADMS HEC-1 Hydrology

Appendix C

Original and Revised White Tanks/Agua Fria ADMS Existing Condition HEC-2 Runs for Bullard Wash

Appendix D

Recommended Alternative HEC-2 Runs for Bullard Wash Channel and East Local Tributary Collector Channel

Appendix E

Design Calculations for Recommended Alternative

Appendix F

Quantity and Cost Estimates for Recommended Alternative

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INTRODUCTION

This design concept report (DCR) has been prepared for the Flood Control District of Maricopa County (District) under contract FCD 94-06 by Stanley Consultants Inc. (SCI). Stanley Consultants is the prime consultant for this project responsible for data collection, survey, hydrology, existing and future condition floodplain hydraulics, development of alternatives, overall coordination, reports and deliverables. Stanley Consultants has enlisted the help of sub-consultant Wood/Patel Associates to address hydraulics and sediment transport/scour analysis of proposed alternatives.

The Bullard Wash Outfall Feasibility Study evaluates preliminary alternatives to alleviate the flooding problems near the downstream end of Bullard Wash. Bullard Wash is approximately 8 miles long and originates just south of Luke Air Force Base near Bethany Home Road. The wash continues south between Estrella Parkway (formerly Reems Road) and Bullard Avenue. The outfall of Bullard Wash has been encroached upon and in some locations almost completely obliterated over the years. The Bullard Wash channel ends near the Maricopa County Highway Route 85 (MC85) - Estrella Parkway intersection with only a minor roadside ditch to convey low flows to the Gila River. Due to various encroachments and the elimination of a positive outfall, the area is subject to substantial flooding as documented in the White Tanks/Agua Fria Area Drainage Master Study (ADMS) prepared by The WLB Group and submitted to the District in October 1992. This study investigates alternatives to re-establish the Bullard Wash outfall to the Gila River.

The study area lies entirely within the incorporated limits of the City of Goodyear between Sarival Road on the west, Bullard Avenue on the East, Yuma Road on the north and the Gila River on the south. The Bullard Wash Floodplain upstream from Yuma Road is relatively free from encroachment, diversions and obstruction and was, therefore, not included in this study.

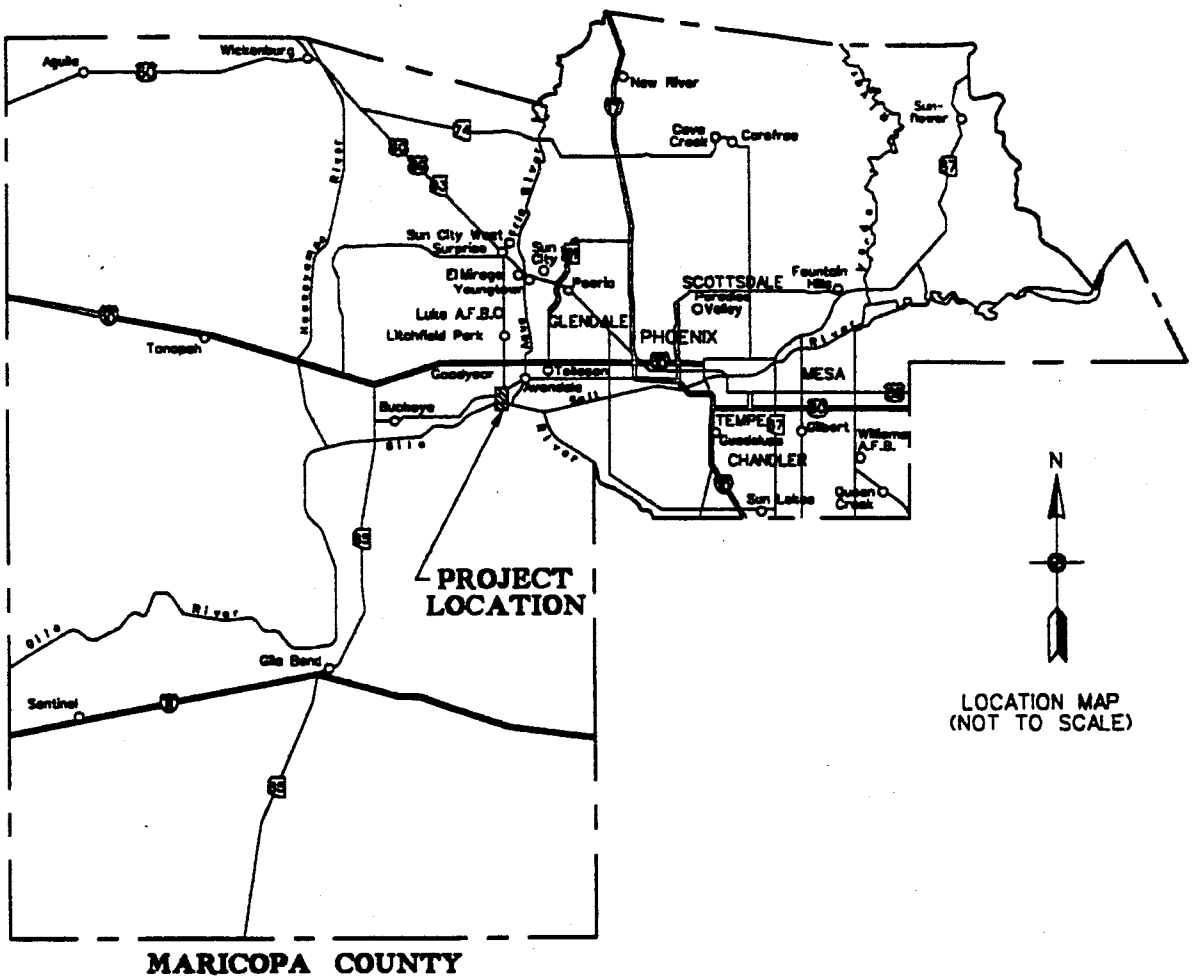
There are major transportation facilities located within the study area involving the jurisdictions of the Maricopa County Department of Transportation (MC 85), the City of Phoenix (Phoenix-Goodyear Municipal Airport), the Southern Pacific Transportation Company (Southern Pacific Railroad) as well as the local roadways within the City of Goodyear right-of-way. The study area also includes jurisdictions of the Buckeye Irrigation District and the Roosevelt Irrigation District. There are also numerous major utilities within the study area. Figures 1 and 2 on the following

pages indicate the location and vicinity of this project. This report serves as the final Recommended Alternative submittal according to the contracted Scope of Work dated April 11, 1994.

Associated with this report is Volume 2 - Technical Data Notebook (TDN). The TDN incorporates a variety of information and serves as reference for this report. The TDN contains names of contact persons and their phone numbers, correspondence records, meeting minutes, contract documents, mapping and survey data, technical data supporting the HEC-1 and HEC-2 models, existing condition hydraulics for structures and the Buckeye Irrigation District Canal, technical data submitted in previous reports, full size exhibits, and diskettes containing all mapping, survey information and drawing files.

Several other reports related to the project are on file with the District. The District has conducted or contracted a Phase I Environmental Site Assessment, an Archeological Inventory and a Vegetation Survey. These reports are under separate cover and are listed on the reference page at the end of this report.

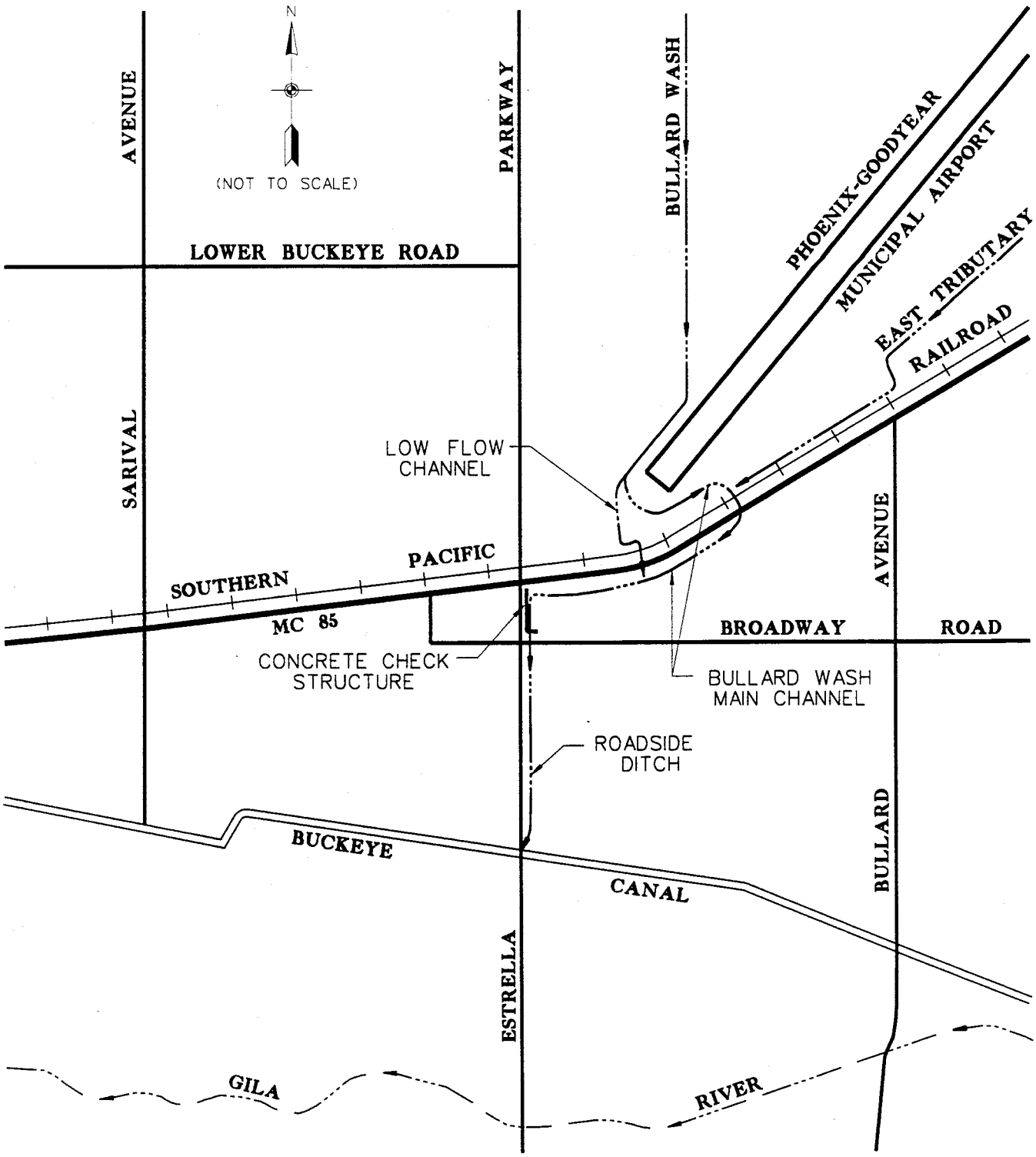
BULLARD WASH OUTFALL FEASIBILITY STUDY
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
(FCD 94-06)



MARICOPA COUNTY
LOCATION MAP

FIGURE 1

BULLARD WASH OUTFALL FEASIBILITY STUDY
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
(FCD 94-06)



VICINITY MAP

FIGURE 2

PURPOSE AND SCOPE

The purpose of this design concept report is to analyze the existing drainage conditions and identify potential improvement alternatives to reduce or eliminate the flooding problems in the study area. This is the final report in a series of reports which have developed, analyzed and selected a recommended alternative.

The Bullard Wash channel essentially ends near the MC85 - Estrella Parkway intersection forcing the wash flows to spread out and sheet flow across the adjacent and downstream agricultural fields. The White Tanks/Agua Fria ADMS identified the study area as being subject to considerable flood hazards including the potential flooding of the MC85 - Estrella Parkway intersection, the Buckeye Irrigation District (BID) canal, and the City of Goodyear Wastewater Treatment Facility. The ADMS HEC-1 hydrology model and HEC-2 backwater model have been provided to SCI for use in evaluating the feasibility and design of proposed improvements.

This final report contains a partial accumulation of information which evolved from previous SCI submittals. The technical analysis for this report was generally conducted on a conceptual level. Considerations for such things as utility conflicts, land ownership, rights-of-entry, cost estimates, existing right-of-way, existing irrigation facilities and the feasibility of alignment locations have been incorporated into the evaluation of each chosen alternative and selection of a recommended alternative.

The following sections contain information related to the existing conditions, the ADMS hydrologic and hydraulic review, the evaluation of each chosen alternative, relative cost comparisons of the alternatives, the conclusion, and selection of a recommended alternative.

EXISTING STUDY AREA AND DRAINAGE CONDITIONS

This section is divided into subsections corresponding to specific reaches of the wash and other major considerations of the study. For more information regarding the Bullard Wash contributing area, hydrology, and hydraulics, refer to the next section titled Existing Hydrology and Hydraulics. Refer to Exhibit 4 on page 35 for the limits of the four segments into which this study has been divided.

Bullard Wash Segment 1

The ADMS delineation of Bullard Wash upstream of the Phoenix-Goodyear Municipal Airport indicates relatively contained flow within an existing 100-year floodplain approximately 1000 feet wide. The existing ADMS 100-year peak flow rate is approximately 4900 cfs. The revised 100-year peak flow rate with proposed upstream flood control projects is approximately 3200 cfs. The wash crosses Yuma Road via a low flow single 36" diameter culvert in combination with a dip crossing. Approximately 1/2 mile south of Yuma Road, the wash crosses an improved but unused roadway called Lower Buckeye Parkway. The crossing consists of a low flow double 54" diameter culvert in combination with a dip crossing. As Bullard Wash enters the airport property, it is forced to make several severe turns due to the encroachment of the existing airport runway. Near the end of Segment 1, the wash experiences divided flow at a low flow turnout used for irrigation purposes. Agricultural fields are located to the west of the wash and the airport runway is located to the east. Future plans of the airport include constructing a new utility runway located parallel to and 1000 feet to the north of the existing runway. The future airport plans include improvements which would further encroach into the Bullard Wash floodplain. The Airport Layout Plan, included in the Technical Data Notebook, is part of the July 1986 Airport Master Plan received from the City of Phoenix by SCI in December 1994. The existing Bullard Wash slope within Segment 1 is approximately 0.0012 ft/ft.

Bullard Wash Segment 2

As mentioned previously, Bullard Wash experiences divided flow at the downstream end of Segment 1. The low flow channel, which splits off to the west, typically conveys irrigation tailwater straight south to the Southern Pacific Railroad. It then makes two 90 degree turns and crosses under the railroad and MC85. The low flow channel continues south a short distance where it rejoins the main Bullard Wash channel. IMSALCO, an aluminum recycling facility, is located to the west of the low flow channel adjacent to the airport property. Between the low flow channel and the main channel is vacant open space within the airport. The low flow channel in Segment 2 has an existing slope that ranges from approximately 0.003 ft/ft to 0.02 ft/ft based on SCI supplemental survey.

Downstream from the main channel/low flow channel split, the main channel is higher than the low flow channel by approximately 1 to 4 feet. The main channel carries the majority of storm flows. Downstream of the flow split, the main channel makes an "S" curve with four approximately 90

degree bends to meander around the end of the airport runway and through the existing railroad and MC85 crossings. Upstream from the railroad and MC85, the wash is wide and shallow. It narrows to pass through the railroad and MC85 bridges. Immediately upstream of the railroad crossing, the main Bullard Wash channel is combined with two local tributaries from the east and north. The tributary from the north is an airport runway drainage channel. Flows typically occur in this channel during rainfall events only. The tributary from the east has been called the East Local Tributary and drains fields adjacent to and north of the airport, local airport drainage, and effluent from the Loral industrial plant adjacent to the southeast side of the airport. The East Local Tributary experiences continuous flow from both the agricultural fields and Loral. The estimated 100-year peak discharge from both of these local tributaries is approximately 850 cfs. Downstream of MC85, the main channel enters an existing irrigation sump. This sump is maintained by the land owner and is used to store tailwater for irrigation. The sump has a single 36" diameter low flow pipe combined with an overflow weir outlet at its west end to convey excess flows west towards the confluence with the low flow channel. The main channel has an existing slope of approximately 0.0034 ft/ft upstream of the irrigation sump.

Significant sediment deposition has taken place upstream of the railroad and MC85 bridge structures. The sediment deposition most likely occurs from the alteration of the flow path resulting in a flatter slope and corresponding lower flow velocities. The existing crossings of the railroad and MC85 do not provide the capacity to pass the 100-year peak discharge. The structures appear to be approximately 70 percent filled with sediment. As the structures have become filled with sediment, flow is restricted further and the amount of flow potentially overtopping the railroad and MC85 has increased. Existing condition HEC-1 and HEC-2 models in Appendices B and C indicate that the 100-year discharge will overtop both the railroad and MC85 for a length of approximately 1500 feet. Along with the increased potential of overtopping the railroad and MC85, the sediment deposition problem results in significant efforts from the airport, the railroad and the private land owners to maintain and clear out the channels.

Bullard Wash Segment 3

Segment 3, as defined for this report, begins downstream of the low flow and main channel confluence south of MC85. The channel continues west from the confluence for about 1500 feet then essentially ends. A portion of the flow will pass to the south after being impounded by a

concrete retaining wall or hydraulic check structure on the east side of Estrella Parkway. The wall has a trapezoidal notch on the south end which directs flow south along Estrella Parkway in a roadside ditch. This ditch has very little capacity when compared to the 100-year peak discharge and, therefore, causes Estrella Parkway to be frequently flooded and often closed. Estrella Parkway is actually depressed with respect to the adjacent agricultural fields and acts as a channel by conveying flows south to the BID canal. This is significant because Estrella Parkway is one of two major access routes to the existing Estrella Ranch residential community south of the Gila River. The majority of the 100-year flow sheets across Estrella Parkway and continues southwest towards the City of Goodyear Wastewater Treatment Facility. There are no major defined flow paths for the flows which reach the Estrella Parkway - MC85 intersection.

Historically, peak flows that reach the BID canal have breached the north bank and were conveyed west down the canal until the capacity of the canal was exceeded and the flows broke out over the south canal bank and into the Gila River. The only existing crossing of the BID canal is provided by a single 42" diameter corrugated metal overchute pipe hung underneath the existing Estrella Parkway bridge to convey irrigation tailwater and minor Bullard Wash flows arriving from the roadside ditch along the east side of Estrella Parkway. Runoff which exceeds the overchute pipe's capacity flows directly into the canal damaging the north bank and maintenance road and depositing silt and debris in the canal.

The land use in Segment 3 is primarily agricultural with several residential parcels and the City of Goodyear Wastewater Treatment Facility located west of Estrella Parkway and just north of the BID canal. Extensive irrigation facilities exist throughout Segment 3.

Bullard Wash Segment 4

South of the BID canal, the Bullard Wash flows enter the Gila River. The existing land use is natural river floodplains of the Gila River. There are both Gila River floodplain and Corps 404 Waters of the U.S. Jurisdictional limits south of the BID canal. The Buckeye Water Conservation District owns the parcel directly south of the BID canal and north of the Gila River on both sides of Estrella Parkway. The only major structure in this area is the Estrella Parkway bridge. A spur dike is located approximately 1300 feet south of the BID canal and prevents Gila River flows from impacting the north bridge approach and abutment.

Southern Pacific Railroad and MC85 Crossings

Bullard Wash crosses both the railroad and MC85 in two places and also overtops both during the 100-year event. The railroad has one major bridge located on the main Bullard Wash channel and a smaller bridge located on the low flow channel. Both bridges are wood trestles originally constructed in 1926. The major bridge has been improved by replacing two of the original piers with steel beams. As mentioned previously, the structures are continuously filled with sediment and require extensive maintenance to keep them clear. Preliminary hydraulics of the existing structures indicate that the major bridge has a capacity of approximately 900 cfs. If cleared out, it could pass the design discharge of 3200 cfs. The existing smaller bridge capacity is approximately 250 cfs while, if cleared out, it could pass approximately 375 cfs.

MC85 has a precast concrete girder bridge located on the main Bullard Wash channel and a 5 ft. x 5 ft. concrete box culvert located on the low flow channel. Like the railroad structures, the MC85 structures are continuously filled with sediment and require maintenance to keep them clear. The existing capacity of the box culvert is approximately 225 cfs. The existing condition bridge capacity is approximately 700 cfs. However, MCDOT is currently planning two roadway projects for MC85, one of which replaces the existing bridge in order to meet current highway design standards. The proposed bridge was designed for a flow rate of 4900 cfs which is the current ADMS flow rate. This design flow does not reflect construction of future approved flood control projects in the contributing watershed. It would be placed at the existing bridge location. The bridge plans are currently on hold pending the results developed from this study.

The objective of the second MCDOT project is to raise the Estrella Parkway - MC85 intersection to improve existing sight conditions and general intersection operation. The proposed intersection will be raised approximately 2 feet to an elevation just below the existing railroad elevation. The raised roadway profiles resulting from the improvement will extend in all directions from the intersection and will affect the existing drainage conditions. Preliminary plans indicate that the roadway improvements for the east leg of the intersection will extend approximately 2000 feet to the east towards Bullard Wash. Improvements to Estrella Parkway and its intersection with MC85 are covered in a Construction Staging Report recently completed by Kirkham, Michael and Associates for MCDOT. (See Reference #15.) Both of MCDOT's projects affect and will be affected by the outcome of this study. Coordination with both the Southern Pacific Transportation Company and

MCDOT is required throughout this project. Refer to the TDN for approximate geometry, sketches and hydraulics of the existing bridge and culvert structures.

Buckeye Irrigation District Canal

The BID canal is located at the southern end of Bullard Wash just north of the Gila River. The canal was founded in the late 1890's. The canal conveys flows east to west through the study area and originates at an existing diversion dam. The diversion dam is located approximately 1.5 miles upstream of the project area at the Agua Fria and Gila River confluence. The diversion dam regulates the quantity of flow that reaches the project area. Just upstream of the Bullard Avenue alignment on the canal there is an existing weir used to estimate the flow rate and is usually read twice a day. The normal operating discharge is approximately 325 cfs. The canal varies from about 30 feet to 40 feet in width and from about 3 feet to 5 feet in flow depth. The canal flow line is approximately 16 feet below adjacent fields. The canal crosses under existing bridges at both Bullard Avenue and Estrella Parkway. The Estrella Parkway bridge has several pipes carrying utilities and drainage supported or suspended from the bridge girders which cross the canal above the existing water surface. The low chord of the bridge crossing is the 42" overchute drainage pipe mentioned previously. The low chord is approximately 8 feet above the flow line of the canal. Coordination with the Buckeye Irrigation Company is required throughout this project. Refer to the TDN for approximate geometry, sketches and hydraulics of the Buckeye Irrigation District Canal.

Existing Utilities

There are numerous utilities, both above ground and below ground which exist in the study area. Major below ground utilities include the following:

1. City of Goodyear public water lines ranging in size from 12" to 16" diameter;
2. City of Goodyear public sewer lines ranging in size from 6" to 30" diameter;
3. APS/Palo Verde Nuclear Power Plant 96" diameter re-use water line;
4. U.S. Sprint fiber optic communication line;
5. MCI fiber option communication line;
6. Santa Fe Pacific petroleum pipelines 12" and 20" diameter;
7. El Paso Natural Gas 8" diameter high pressure pipeline;
8. Southwest Gas 2" diameter natural gas pipe;
9. Phoenix - Goodyear Airport EPA Superfund wells and piping;

Major above ground utilities include:

1. Western Area Power Administration 230 KV electrical transmission line (steel pole);
2. Western Area Power Administration 230 KV electrical transmission line (steel lattice tower);
3. Salt River Projects 500 KV electrical transmission line (steel lattice tower);
4. Tucson Electric Power 345 KV electrical transmission line (steel lattice tower);

Potentially significant utility conflicts are anticipated. Some utilities such as water and small diameter natural gas lines can be relocated with relative ease. Other utilities such as sewer and petroleum lines can be relocated but with significant cost and effort. Utilities such as the electrical towers and the 96" diameter APS/Palo Verde pipeline are nearly impossible to relocate. Major utilities and their approximate locations are illustrated on Exhibit 1.

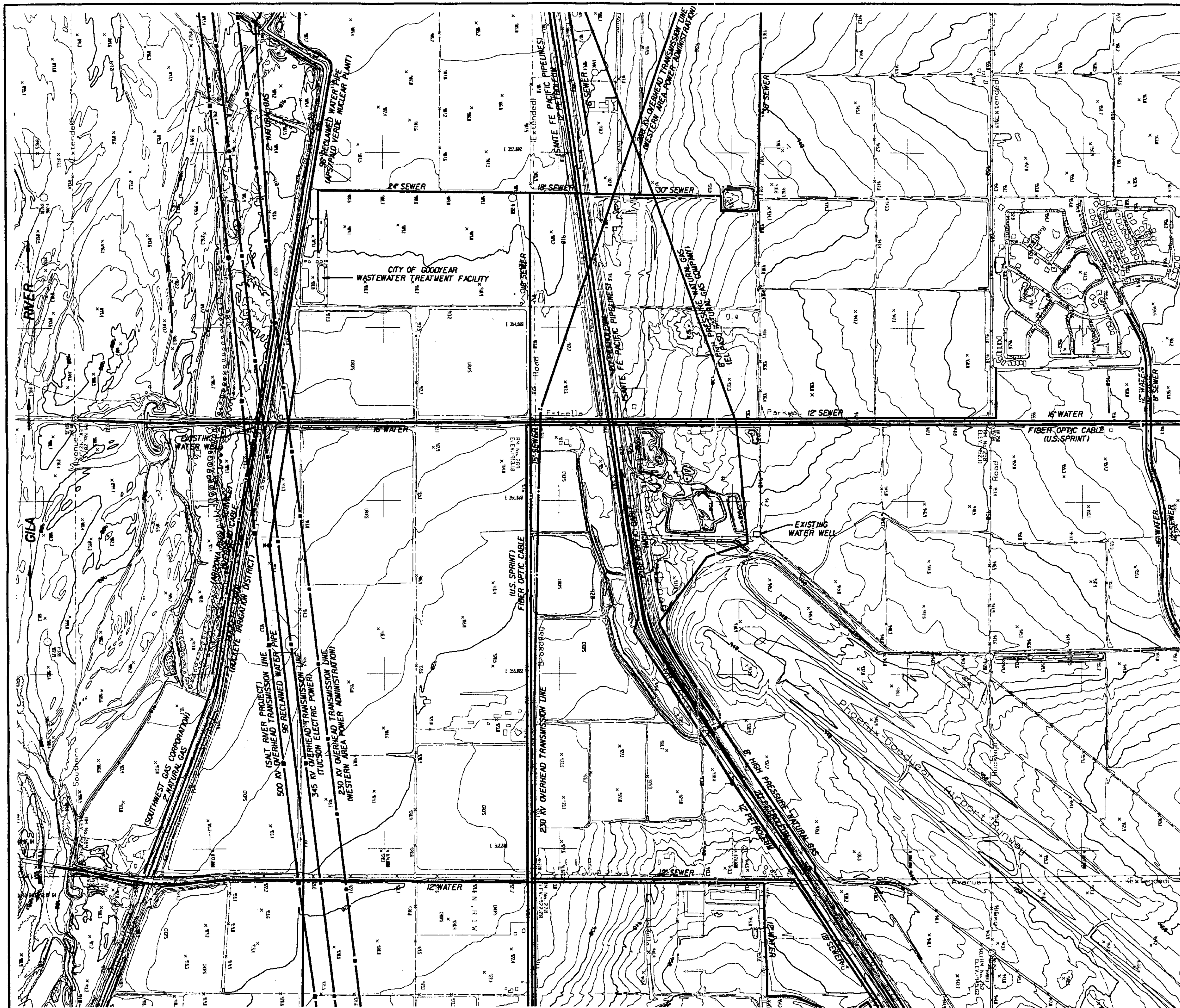
Existing Irrigation Facilities

The land use is primarily agricultural and therefore contains extensive irrigation facilities throughout the study area. Both the East Local Tributary and Bullard Wash convey irrigation tailwater from the fields north of the airport to the fields south of MC85. The fields south of MC85 have the potential and capability to use the tailwater as supply water if desired. There are also several irrigation water wells and pumps located south of MC85 that have the potential to irrigate the fields as well. The overall system consists of various irrigation supply options incorporating wells and tailwater to provide for flexibility in irrigation practices. The facilities consist of a variety of supply and tailwater ditches, pipes, control structures, canals, sumps, and water wells. Exhibit 2 is a schematic representing the irrigation system and some of the facilities in the study area.

Existing Superfund Conditions

Located within the Phoenix-Goodyear Airport (PGA) property is an existing EPA Superfund groundwater remediation site. The groundwater within the PGA Superfund Site is contaminated with trichloroethane (TCE) and aviation fuel. The contaminated groundwater is being remediated. The treatment system includes a series of extraction wells, an air stripper, injection wells, monitoring wells and associated piping. The Recommended Alternative DCR has been reviewed by the Superfund engineers, Bartholomew Engineering and Sharpe & Associates, the City of Phoenix, and the Environmental Protection Agency. These groups are in general agreement with the

Recommended Alternative DCR. Additional review and coordination will be required at the time of design. Photographs 1 through 10 beginning on page 17 illustrate various significant locations and features within the study area.



BULLARD WASH OUTFALL FEASIBILITY STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FDC 94-06)

NOTES:

1. ALL UTILITY LOCATIONS SHOWN ARE APPROXIMATE. ONLY MAJOR UTILITIES HAVING A POTENTIAL CONFLICT WITH THIS PROPOSED PROJECT HAVE BEEN INVESTIGATED. OTHER LOCAL UTILITIES SUCH AS TELEPHONE, ELECTRIC, NATURAL GAS AND CABLE TELEVISION MAY BE PRESENT WITHIN THE PROJECT AREA.
2. ALL WATER AND SEWER UTILITIES SHOWN ARE CITY OF GOODYEAR.
3. THIS EXHIBIT DOES NOT ATTEMPT TO REFLECT THE NUMEROUS AGRICULTURAL IRRIGATION DELIVERY AND TAILWATER DITCHES, PIPE AND CONTROL FACILITIES PRESENT IN THE PROJECT AREA.

LEGEND

OVERHEAD ELECTRIC (WITH SELECTED POLES/TOWERS)

FIBER OPTIC CABLE (U.S. SPRINT) — UTILITY — UTILITY OWNER

N

400 200 0 400 800 1200

SCALE : 1" = 400'

CONTOUR INTERVAL=2'

BASE MAP: WHITE TANKS/AGUA FRIA ADMS (FCD 89-70)

MAPPING COMPANY: COOPER AERIAL OF PHOENIX INC. FLIGHT DATE 12-22-89

BULLARD WASH OUTFALL FEASIBILITY STUDY

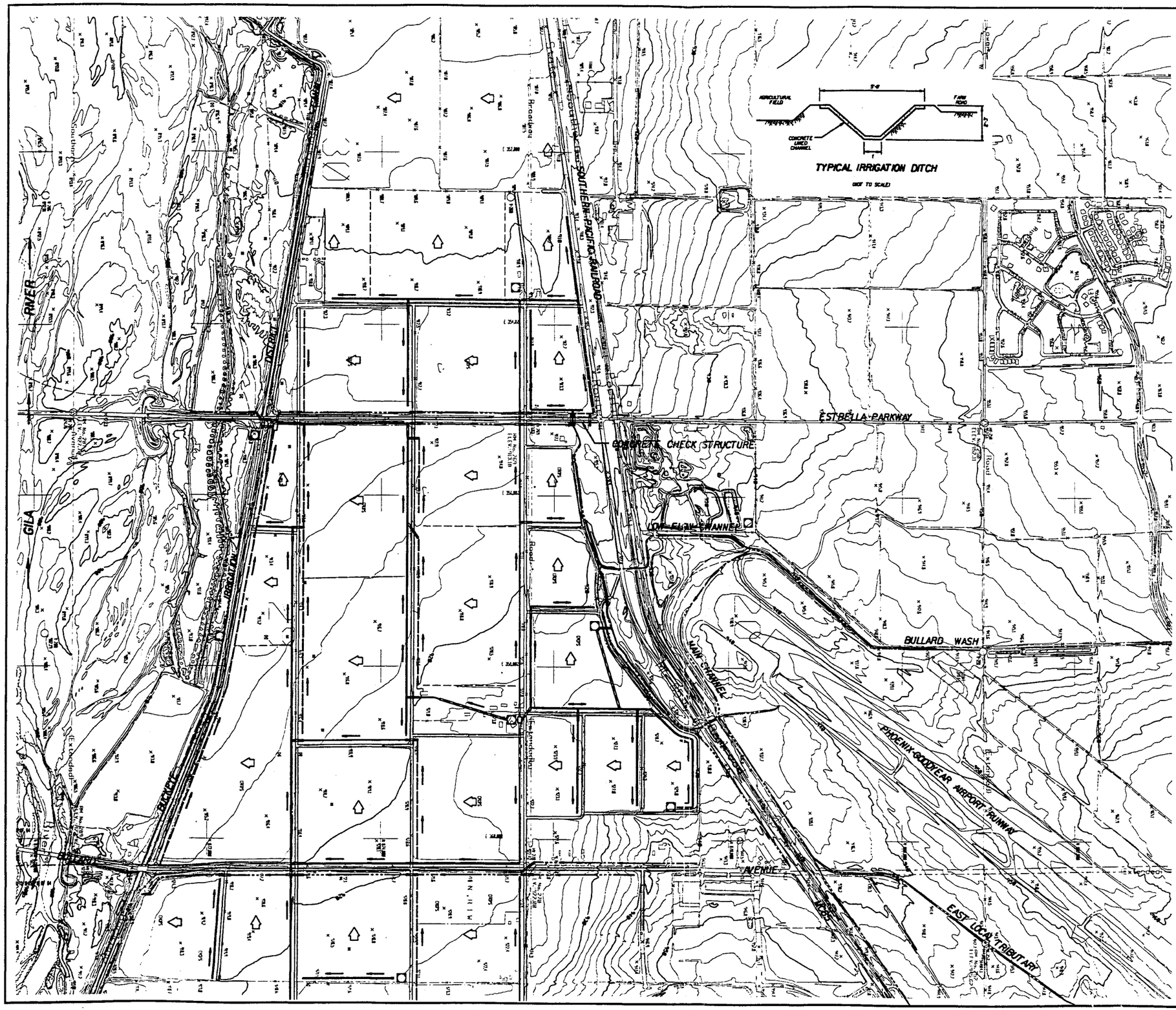
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCD 94-06)

EXHIBIT 1

EXISTING MAJOR UTILITIES

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

DES. S.W.	CKD. G.S.B.
DRN. P.J.P.	APP.
DATE 1-25-95	
SHEET 1 OF 1	
DWG.	
PROJ. NO. 12278	



BULLARD WASH OUTFALL FEASIBILITY STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FDC 94-06)

NOTES:

1. ALL IRRIGATION FACILITIES ARE ILLUSTRATIVE AND DO NOT REPRESENT ACTUAL LOCATIONS. IRRIGATION SYSTEM/PLAN SHOWN IS APPROXIMATE BASED ON FIELD OBSERVATION. VARIOUS ASPECTS MAY BE MISLOCATED, INCORRECT OR MISSING. HEADWALLS, BOX STRUCTURES AND OTHER IRRIGATION CONTROLS ARE NOT SHOWN
2. IRRIGATION FLOW DIRECTIONS ARE BASED ON EXISTING LAND USE AND IRRIGATION PRACTICES. SOME FIELDS AND IRRIGATION DITCHES HAVE NO SLOPE ALLOWING FLOWS IN BOTH DIRECTIONS.

LEGEND

- CONCRETE LINED IRRIGATION DITCH AND DIRECTION
- EARTHEN IRRIGATION DITCH AND DIRECTION
- STORM WATER FLOW PATHS
- FIELD DIVIDE
- PIPE CULVERT OR INVERTED SIPHON
- AGRICULTURAL FIELD IRRIGATION DIRECTION
- WELL AND PUMP

N

400 200 0 400 800 1200

SCALE : 1" = 400'
CONTOUR INTERVAL-2'

BASE MAP: WHITE TANKS/AGUA FRIA ADMS (PCD 89-70)

MAPPING COMPANY: COOPER AERIAL OF PHOENIX INC. FLIGHT DATE 12-22-89

BULLARD WASH OUTFALL FEASIBILITY STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCD 94-06)

EXHIBIT 2

EXISTING IRRIGATION

STANLEY CONSULTANTS, INC.
7020 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85018 • (602) 945-8508

DES. S.W.	CKD. G.S.B.
DRN. P.J.P.	APP.
DATE 1-25-95	
SHEET 1 OF 1	
DWG.	
PROJ. NO. 12278	

Photo #1 Bullard Wash upstream from the airport looking south (downstream) as Bullard Wash enters the airport property. The existing floodplain at this location is approximately 1000 feet wide.

Photo #2 Bullard Wash low flow channel upstream of the Southern Pacific Railroad looking north (upstream) at the low flow channel of Bullard Wash. Fenced area directly north and to the east is the Phoenix-Goodyear Municipal Airport. To the west is IMSALCO, an aluminum recycling plant.

Photo #3 Southern Pacific Railroad low flow bridge crossing looking north (upstream) at the low flow irrigation ditch crossing the railroad. It appears that the channel has recently been cleared of vegetation and sediment.

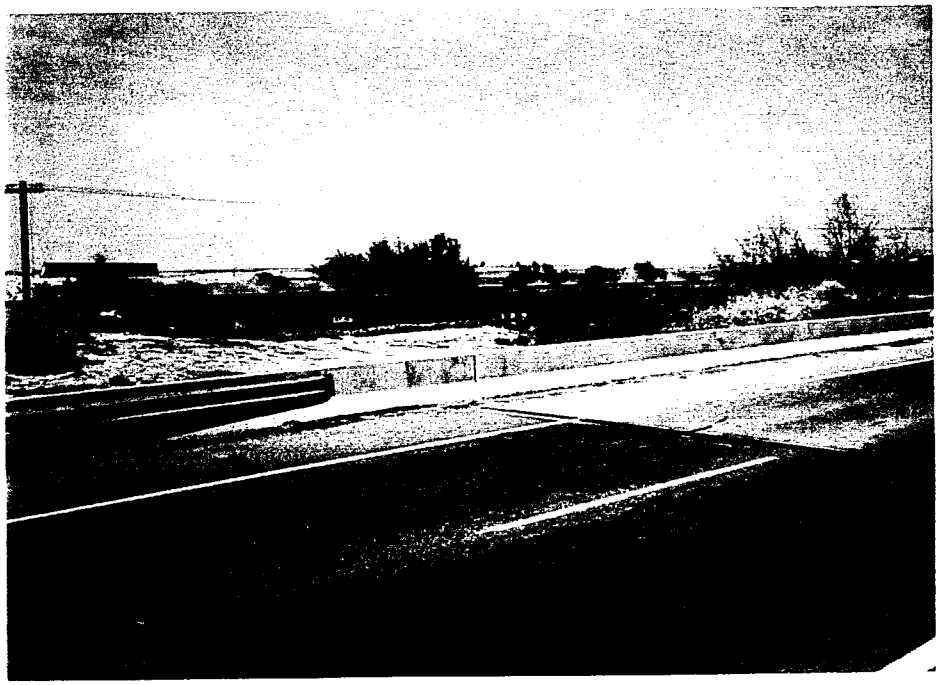


Photo #4 Southern Pacific Railroad main bridge crossing looking northeast from the downstream side of the MC 85 crossing. Four of the six cells at the left are filled with sediment.

Photo #5 MC85 box culvert crossing looking south (downstream) at the low flow irrigation ditch crossing of MC85. Just downstream and south of the culvert, the low flows are combined with the main Bullard Wash flows from the left of the photograph.

Photo #6 MC85 bridged crossing looking northeast at the main bridge structure. Vegetation and sediment deposition restrict Bullard Wash flows.

Photo #7 Bullard Wash at Estrella Parkway looking directly north at the concrete retaining wall check dam along the east side of Estrella Parkway. Bullard Wash flows enter from the right side of the photograph.

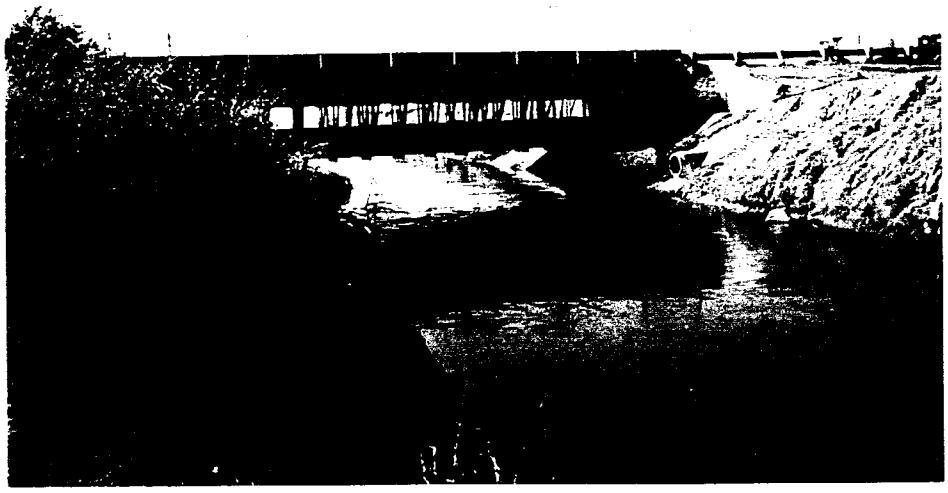


Photo #8 The BID Canal and Estrella Parkway bridge crossing. The 42" pipe overchute suspended under the bridge conveys minor Bullard Wash flows to the Gila River located to the left of the photograph.

Photo #9 Proposed Detention Basin No. 1 site looking directly east from Estrella Parkway at the most southern boundary of the proposed basin. IMSALCO is located to the right in the photograph.

Photo #10 Proposed Detention Basin No. 2 site looking northeast across the airport property from the railroad. An existing EPA Superfund remediation facility is located on the left side of the photograph.

Note: Refer to Detention Basin section on page 56 for evaluation of detention basin alternatives.

EXISTING HYDROLOGY AND HYDRAULICS

The existing condition hydrology and hydraulics for the Bullard Wash Outfall Feasibility Study are based on the White Tanks/Agua Fria ADMS conducted by The WLB Group for the District and dated October, 1992. The ADMS was reviewed and updated by SCI based on proposed flood control improvements located in the northern portions of the ADMS. The Bullard Wash contributing area, after reflecting these flood control improvements, comprises approximately one quarter of the ADMS's total study area.

The ADMS utilizes both HEC-1 hydrologic modeling and HEC-2 hydraulic modeling. The methodology and basic model input parameters, as accepted and approved by the District and the Federal Emergency Management Agency (FEMA), will not be altered except where specifically addressed and documented. In general, the ADMS hydrology and hydraulics have remained essentially unchanged in the Bullard Wash Outfall Feasibility Study. The following sections discuss in more detail the existing hydrology and hydraulics for the Bullard Wash Outfall Feasibility Study.

Hydrology

The ADMS HEC-1 model uses a 100-year, 24-hour event and an SCS Type II rainfall distribution. Depth-Area reduction values are from the NOAA Atlas 2, Volume VIII-Arizona. Green-Ampt and Phoenix Valley S-Graphs are used for the loss rate and unit hydrograph options, respectively. The watershed consists of primarily agricultural land with some residential and industrial development. The current Bullard Wash contributing area includes sub-basins located as far north as Cactus Road, as far west as Jackrabbit Trail and as far east as Dysart Road. The contributing area which will be used for Bullard Wash is approximately 51 square miles. The contributing area prior to reflecting the flood control improvements of Dysart Drain and White Tanks #3 was approximately 120 square miles. The total ADMS study area is approximately 220 square miles.

The HEC-1 methodology was reviewed and several items were specifically addressed. A 24-hour storm distribution was used in the ADMS instead of a 6-hour storm distribution as recommended in the Maricopa County Drainage Design Manual, Volume I Hydrology. The primary reason for this is that the 24-hour storm produced a greater peak discharge and volume than the 6-hour event. For the Bullard Wash Outfall Feasibility Study, the contributing area is significantly less than it was in

the ADMS. However, the 24-hour event still produced a greater peak discharge and volume than the 6-hour event. Also, the use of the 24-hour storm maintains consistency with the original ADMS.

The Depth-Area reduction factors used in the ADMS were from the NOAA Atlas 2. The factors shown in the District's hydrology manual reduce the rainfall amount more than the NOAA Atlas 2 factors. Again, the use of the ADMS reduction factors results in a greater peak discharge and volume for the study area and also maintain consistency with the ADMS. Although not utilized further in this report, an input file of the HEC-1 model for the 6-hour distribution and the District's Depth-Area reduction factors is located on disk in Appendix A. The peak discharges, times to peak, and volumes generated by all models are included in Table 1 at the end of this section.

The SCI revised HEC-1 model represents only those sub-areas which contribute directly to Bullard Wash. The Bullard Wash contributing area has essentially been cut out of the ADMS model. The cumulative area, TAREA in field 2, used in the combination of hydrographs, HC record, is adjusted to reflect the actual areas contributing to Bullard Wash for the existing condition model.

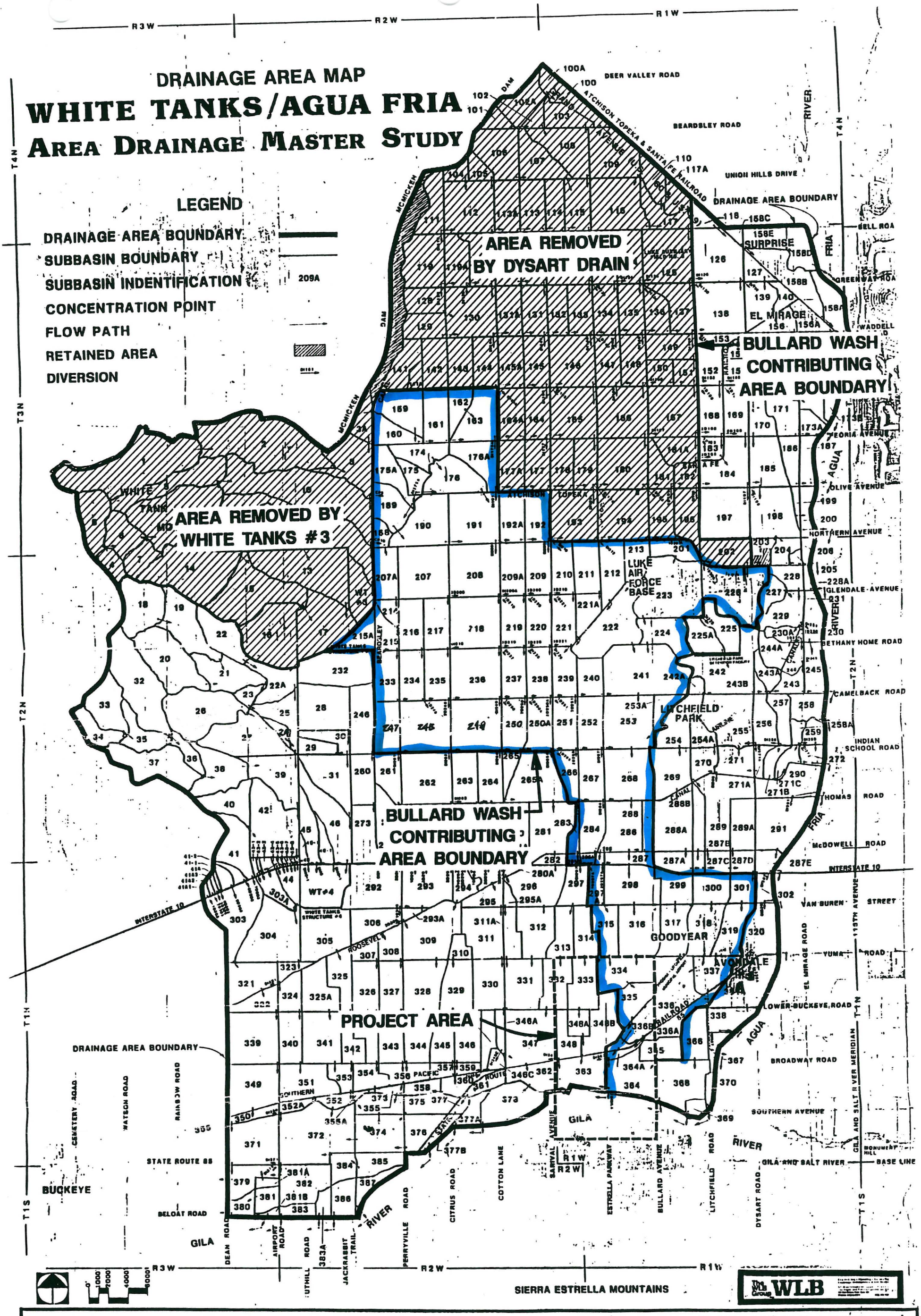
Runoff occurs predominantly as sheet flow across agricultural fields and generally collects at the southeast corner of each sub-basin. It is common for these concentration points to yield two-way or three-way flow splits. The flow splits which were within the Bullard Wash contributing area were investigated. Specifically, those points at which flow was diverted out of the contributing area were reviewed in order to correctly assess the nature of the flow split. This review was coordinated with District Hydrology staff. No changes to the original ADMS flow splits resulted from this review.

The Bullard Wash Outfall Feasibility Study is concerned with flows at the southern end of the wash. Specifically, concentration points of sub-basins 335 and 364A will be used to estimate design flow rates for the development of the design concept alternatives. The flow rate at CP335 is used as the design inflow for the detention basin alternative on the main channel of Bullard Wash which was initially considered. (The detention basin alternative was later dropped.).

The flow rate at CP364A is used to estimate the design flow rate for the proposed channel design. The flow split which occurs at CP364A was altered depending on the alignment being considered downstream. For example, the alignments east of Estrella Parkway will require the entire flow at

CP364A to continue to the south instead of a portion being diverted to the west as in the original ADMS model. For similar reasons, the alignment west of Estrella Parkway will require the entire flow at CP364A to continue to the west instead of a portion flowing south. The procedure mentioned above does not increase the design flow rate obtained from CP364A. Therefore, the design flow rate for the channel is developed from CP364A of the SCI revised HEC-1 model.

Hydrology for the ADMS sub-basins which contribute to the local tributary joining the Bullard Wash main channel from the east at the main railroad bridge remains unchanged from the ADMS. Refer to Figure 3 for the delineation of the contributing area of Bullard Wash and the effect of the proposed flood control improvements on the ADMS study area. Refer to Table 1 for a comparison of the ADMS flow rates and the modified Bullard Wash flow rates for the concentration points mentioned above. Refer to Figure 4 for a comparison of ADMS and SCI revised hydrographs at CP364A.



ORIGINAL WHITE TANKS/AGUA FRIA ADMS DRAINAGE AREA

BULLARD WASH OUTFALL FEASIBILITY STUDY CONTRIBUTING AREA

BULLARD WASH OUTFALL FEASIBILITY STUDY PROJECT AREA

FIGURE 3

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FCD 94-06

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(602) 912-6500

TABLE 1

COMPARISON OF HEC-1 RESULTS

	NORTH OF AIRPORT CP 335			SE CORNER OF ESTRELLA PARKWAY-MC85 INTERSECTION CP 364A		
	DISCHARGE	TIME TO PEAK	VOLUME	DISCHARGE	TIME TO PEAK	VOLUME
	Q	T	V	Q	T	V
MODEL	(CFS)	(HR)	(AC FT)	(CFS)	(HR)	(AC FT)
ORIGINAL WHITE TANK/AGUA FRIA ADMS 100-YR 24-HR STORM FILENAME: ADMS_H1	4906	20.58	3534	4895	20.92	3730
SCI REVISED FOR BULLARD WASH REFLECTS PROPOSED FLOOD CONTROL IMPROVEMENTS UPSTREAM AND REVISED DRAINAGE AREAS. 100-YR 24-HR STORM FILENAME: 12278H1A	3168	19.67	2230	3175	19.92	2430
SCI REVISED FOR BULLARD WASH REFLECTS PROPOSED FLOOD CONTROL IMPROVEMENTS UPSTREAM AND REVISED DRAINAGE AREAS. 100-YR 6-HR STORM FILENAME: 12278H1B	2481	8.92	1814	2488	9.50	1955
ALTERNATIVE DETENTION BASIN. 100-YR 24-HR STORM FILENAME: 12278H1C	1351	22.83	2230	1355	22.92	2430

BULLARD WASH OUTFALL FEASIBILITY STUDY

CP364A HYDROGRAPH COMPARISON

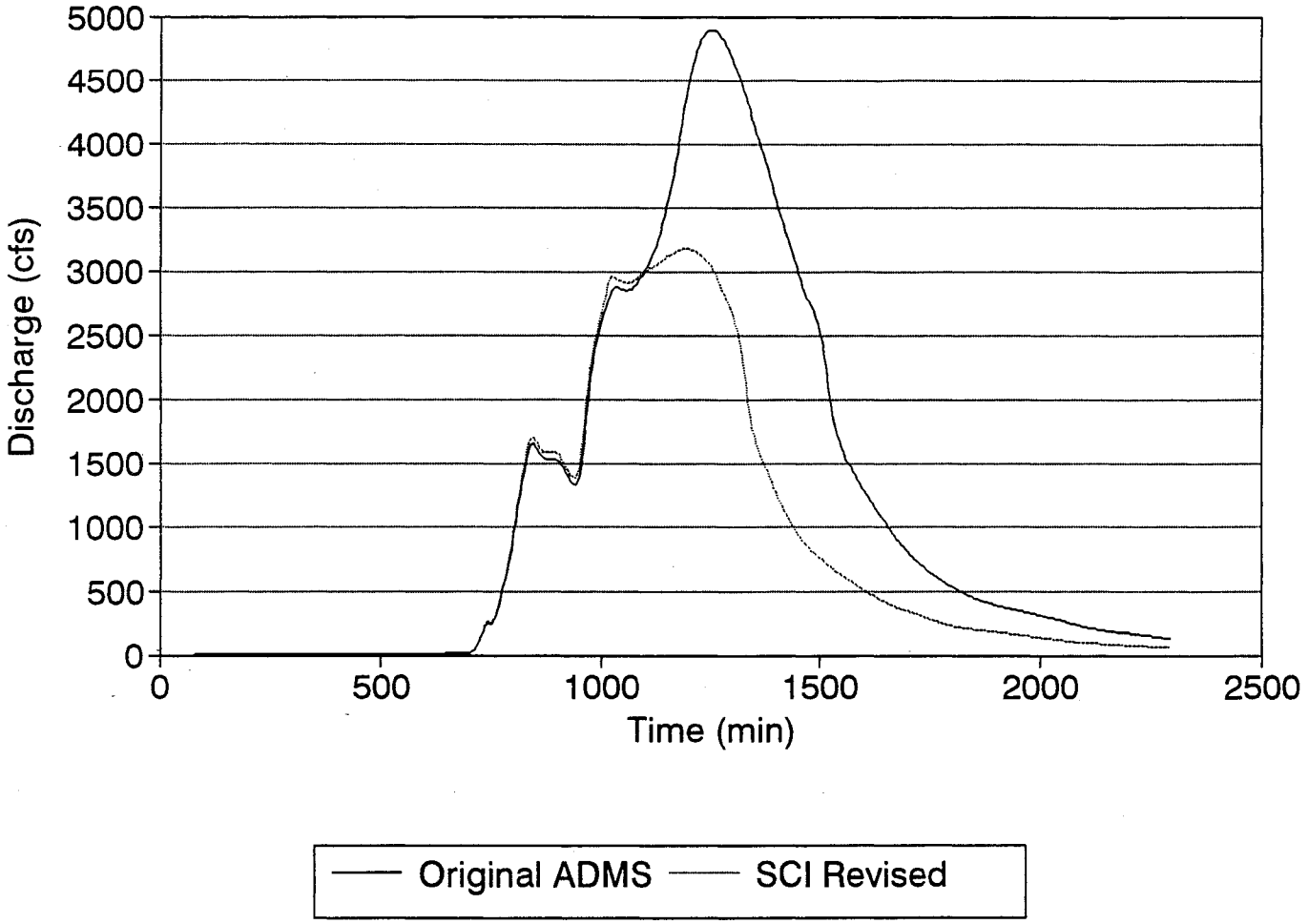


FIGURE 4

Hydraulics

The ADMS hydraulic analysis and floodplain delineation uses both HEC-2 modeling and approximate methods to evaluate the existing floodplain of Bullard Wash. The ADMS floodplain limits for Bullard Wash extend from Northern Avenue to the BID canal. This floodplain was studied in detail upstream from the end of the Phoenix-Goodyear Airport runway. Downstream from the end of the runway, a combination of detailed and approximate methods were used. The Bullard Wash Outfall Feasibility Study considers only those portions of the wash located from Yuma Road downstream to the outfall into the Gila River. The hydraulics for the lower reaches of Bullard Wash, from the airport runway to the south, are rather complex and incorporate a great deal of engineering judgement.

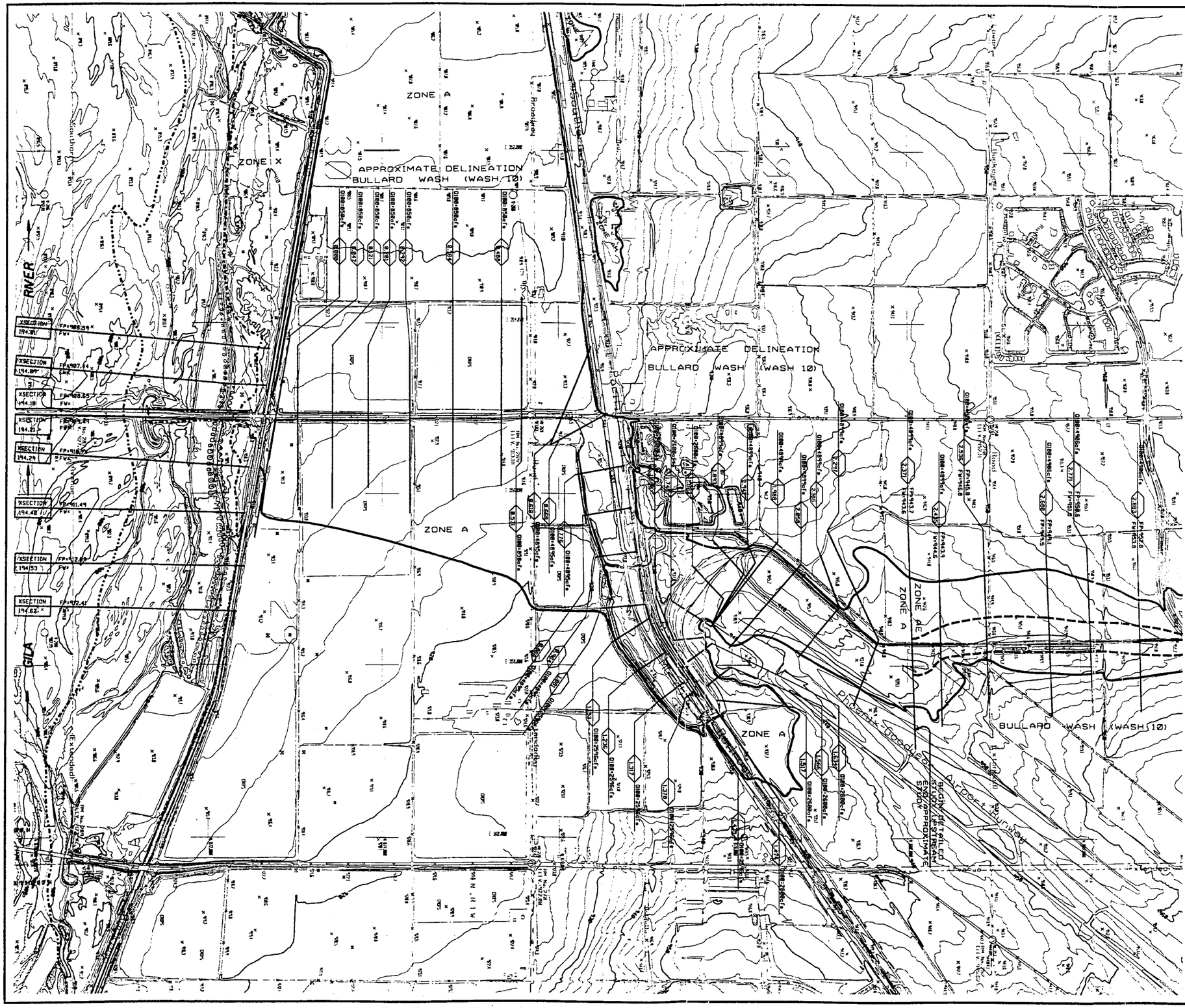
In general, the hydraulic review for this feasibility study was concerned with details or elements of the ADMS which might have changed due to the revised hydrology. The purpose of this feasibility study is to update the floodplain limits (Exhibit 3) within the study area based on revised hydrology to compare to and evaluate the proposed outfall alternatives. The revised floodplain limits are not intended to be submitted to FEMA or used for floodplain management.

The hydrology has been revised to incorporate flood protection projects being constructed in the contributing watershed subsequent to the completion of the ADMS HEC-1 model. These projects reduce the peak discharge in Bullard Wash. The hydraulic review of the ADMS is intended to assess the effects of the reduced flow rate. However, several reaches in the ADMS were analyzed by defining the flow rate as "the channel capacity plus a maximum of 1 foot over the top where capacity is exceeded" instead of the peak discharge as estimated from the ADMS HEC-1 model. This methodology appears to be appropriate for defining a continuous HEC-2 model through an area that is basically submerged and delineated as approximate floodplains. For the reaches where this occurred, the HEC-2 output does not change significantly because the flow rate does not change. The Technical Data Notebook contains a detailed cross section by cross section analysis of the differences between the ADMS delineation and the updated delineation. Each cross section is analyzed based on a comparison of the HEC-2 models. As in the ADMS, engineering judgement and approximate methods were applied to aid in the analysis.

In conclusion, the hydraulics and floodplain delineation documented in the White Tanks/Agua Fria ADMS as prepared by The WLB Group and on file with the District has been re-analyzed based on the reduced flow rate that will result from future flood control projects in the contributing watershed. Although there is a significant reduction in discharge, there is generally only a slight reduction in flow depths. The corresponding reduction in floodplain limits is essentially insignificant.

The ultimate outfall of Bullard Wash is the Gila River under both existing and proposed conditions. The Gila River floodplain will potentially impact the proposed Bullard Wash outfall since there is no well defined channel bank on the north side of the Gila River. The proposed Bullard Wash outfall channel will need to traverse the Gila River Fringe District in order to provide a positive outfall grade. The current Gila River floodplain delineation and HEC-2 back water model which were prepared by Dames and More are in the process of revision to reflect new topographic mapping and slightly reduced post-Roosevelt Dam reconstruction hydrology. This revised floodplain analysis is being conducted by Michael Baker Jr., Inc. for the District. A preliminary floodplain limit and HEC-2 floodplain model dated July 1994 have been provided to SCI by the District. The District has also provided SCI with limits of the Corps of Engineers 404 Waters of the U.S. jurisdiction for the Gila River.

Refer to Exhibit 3 for the ADMS floodplain delineation and cross section locations, the approximate preliminary Gila River floodplain limits from Michael Baker Jr. Inc. dated July 1994, and the Corps 404 Waters of the U.S. Jurisdictional limits from the District dated August 1994.



BULLARD WASH OUTFALL FEASIBILITY STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FDC 94-06)

NOTES:

1. BULLARD WASH AND LOCALIZED FLOODPLAIN LIMITS ARE BASED ON WHITE TANKS/AGUA FRIA ADMS (FCD 89-70) PREPARED BY THE WLB GROUP. LIMITS AND Q100 DISCHARGES DO NOT REFLECT FUTURE DYSART DRAIN AND WHITE TANKS #2 FLOOD CONTROL PROJECTS.
2. GILA RIVER FLOODPLAIN LIMITS AND HEC-2 CROSS SECTIONS SHOWN ARE APPROXIMATE BASED ON PRELIMINARY STUDY BY MICHAEL BAKER JR. INC. (FCD 90-69 AND 92-61). PRELIMINARY INFORMATION DATED JULY 1994 WAS PROVIDED BY FCDMC. FLOODWAY ELEVATIONS (FW) NOT YET AVAILABLE. FLOODPLAIN ELEVATIONS FROM BAKER'S STUDY HAVE BEEN ADJUSTED TO WHITE TANKS/AGUA FRIA ADMS TOPOGRAPHIC DATUM BY THE FOLLOWING EQUATION:
   BAKER + 6.71 FT = WHITE TANKS/AGUA FRIA
3. CORPS 404 WATERS OF THE U.S. JURISDICTIONAL LIMITS SHOWN ARE APPROXIMATE. LIMITS ARE BASED ON INFORMATION DATED AUGUST 1994 PROVIDED BY FCDMC.

LEGEND

- BULLARD WASH OR LOCALIZED FLOODPLAIN LIMIT
- BULLARD WASH FLOODWAY LIMIT
- CORPS 404 WATERS OF THE U.S. JURISDICTIONAL LIMIT
- GILA RIVER FLOODPLAIN LIMIT
- ZONE A — FLOOD INSURANCE ZONE

N

400 200 0 400 800 1200

SCALE : 1" = 400'
CONTOUR INTERVAL = 2'

BASE MAP: WHITE TANKS/AGUA FRIA ADMS (FCD 89-70)

MAPPING COMPANY: COOPER AERIAL OF PHOENIX INC. FLIGHT DATE 12-22-89

BULLARD WASH OUTFALL FEASIBILITY STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCD 94-06)

EXHIBIT 3

EXISTING FLOODPLAIN AND CORPS 404 LIMITS

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DES. S.W.	CKD. G.S.B.
DRN. P.J.P.	APP.
DATE 1-25-95	
SHEET 1 OF 1	
DWG.	
PROJ. NO. 12278	

APPROACH

The alternatives developed and considered for this study incorporated several channel alignments, cross section geometrics and lining concepts. The concept of incorporating detention basins with these channels was also considered. While all the channel alignments have a similar objective and have the same estimated design flow rate, 3200 cfs, they present unique considerations and differ in effectiveness, design requirements and costs. The concept of a detention basin is based on the ability to reduce the design flow rate of the channel, thus, reducing the costs of the channelization and to provide sediment control. However, the effectiveness of the basin and its construction costs will be weighed against the cost savings for the channel and the need for sediment control.

All design analyses for the alternatives were conducted in a conceptual manner and intended for the use of eliminating alternatives which appear to be not feasible or which are too costly. Those alternatives which resulted in potentially advantageous design solutions and were considered constructable were chosen for further development in the Recommended Alternative phase of this study.

A number of general considerations were incorporated into the selection process for the chosen alternatives. The major considerations are as follows:

1. constructibility
2. operations and maintenance
3. hydraulic reliability
4. land, construction, and maintenance costs
5. aesthetics
6. potential joint use
7. existing utilities and surrounding land improvements

The above considerations are not presented in any particular order of importance. In addition to the above general considerations, specific concerns may be present that are unique to a particular alternative.

Hydraulic analyses of alternative channels were performed by normal depth methods. The design flow rate for all channels, estimated from the revised ADMS HEC-1 hydrology model, is 3200 cfs. Although the alternative alignments have minor differences of contributing areas and location, the peak discharge varies only slightly. The only change to the peak discharge occurs with the use of a detention facility. At best, the peak discharge used for the main channel design flow can only be reduced to approximately 850 cfs with the construction of a main channel detention basin. 850 cfs is the discharge produced by the East Local Tributary without any contribution from the Bullard Wash main channel upstream from their confluence.

The channel concept is divided into four segments and issues for each reach will be discussed independently. Each segment may have one or more possible alignment locations along with one or more typical channel cross sections. Four basic channel cross section concepts are analyzed. These concepts are illustrated in Figures 5, 6 and 7 on the following pages. The cross section names and descriptions are as follows:

1. Earth - an unlined earth channel;

2. Composite - a composite channel consisting of protected channel sides and a protected low flow channel but generally unlined bottom;

3. Riprap - a fully lined channel of grouted riprap;

4. Concrete - a fully lined channel of Gunite, Shotcrete, or reinforced concrete.

V:/941022/BULWASH2.DGN

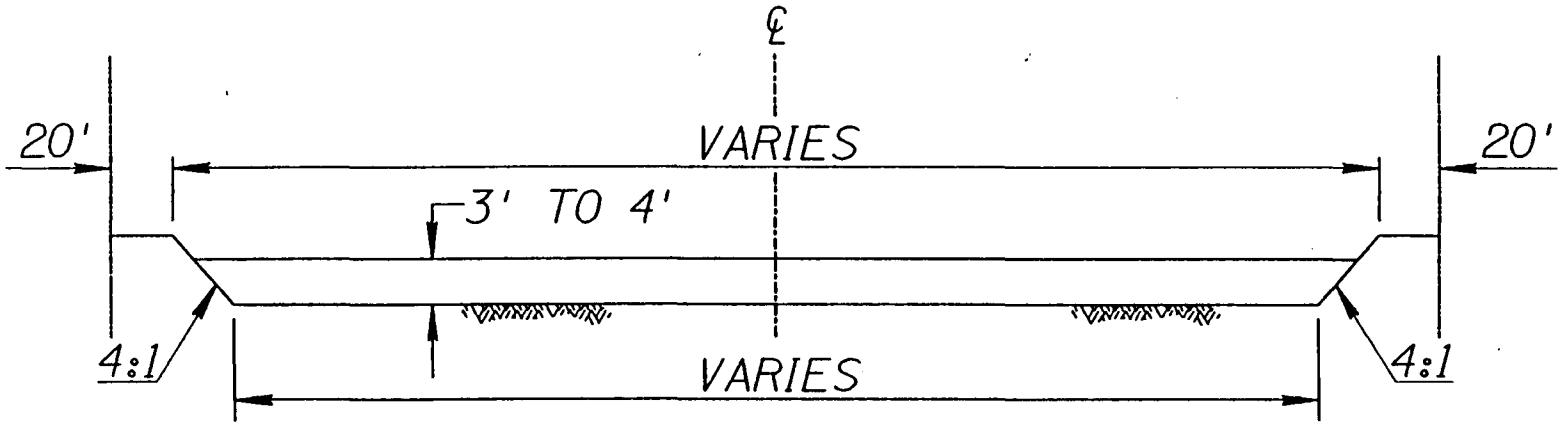


FIGURE 5

BULLARD WASH
OUTFALL STUDY

UNLINED
CHANNEL

WOOD/PATEL
ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344

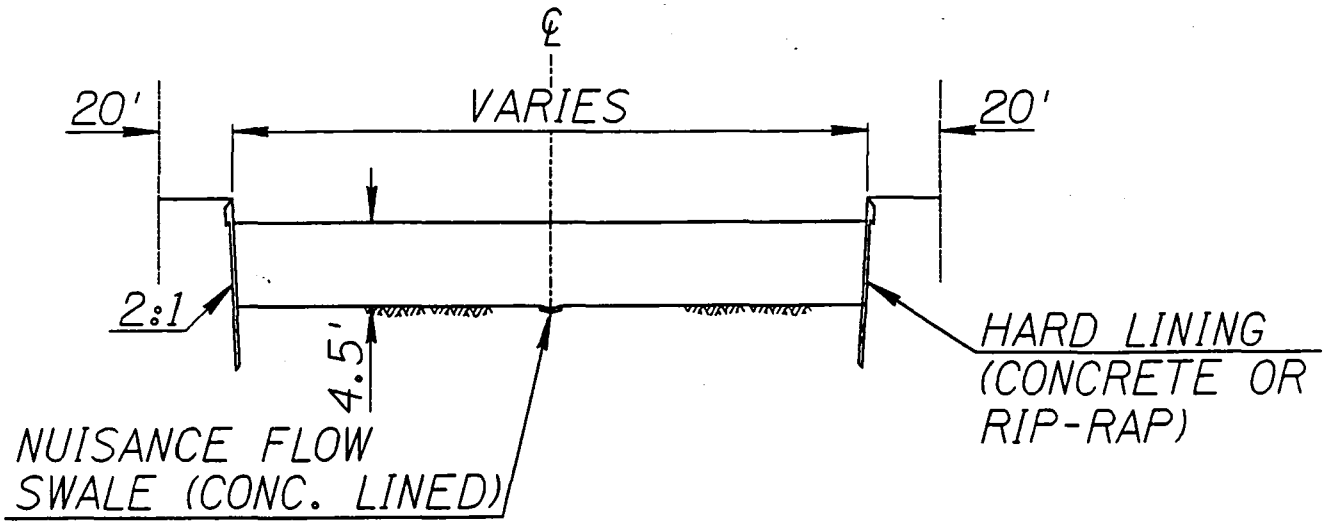


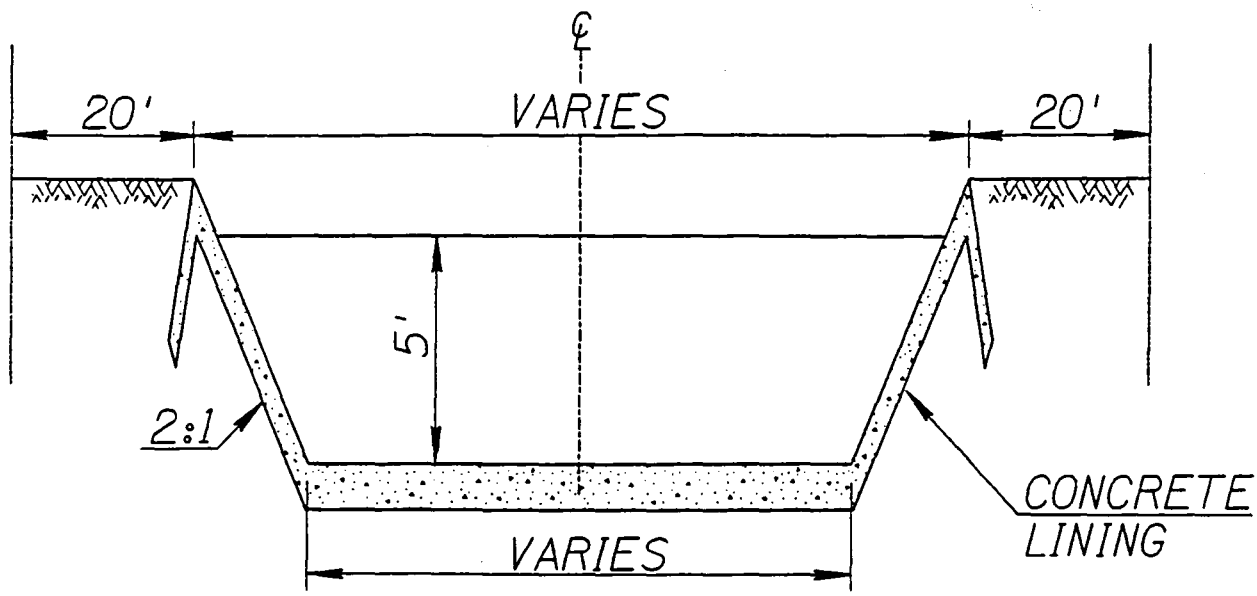
FIGURE 6

BULLARD WASH
OUTFALL STUDY

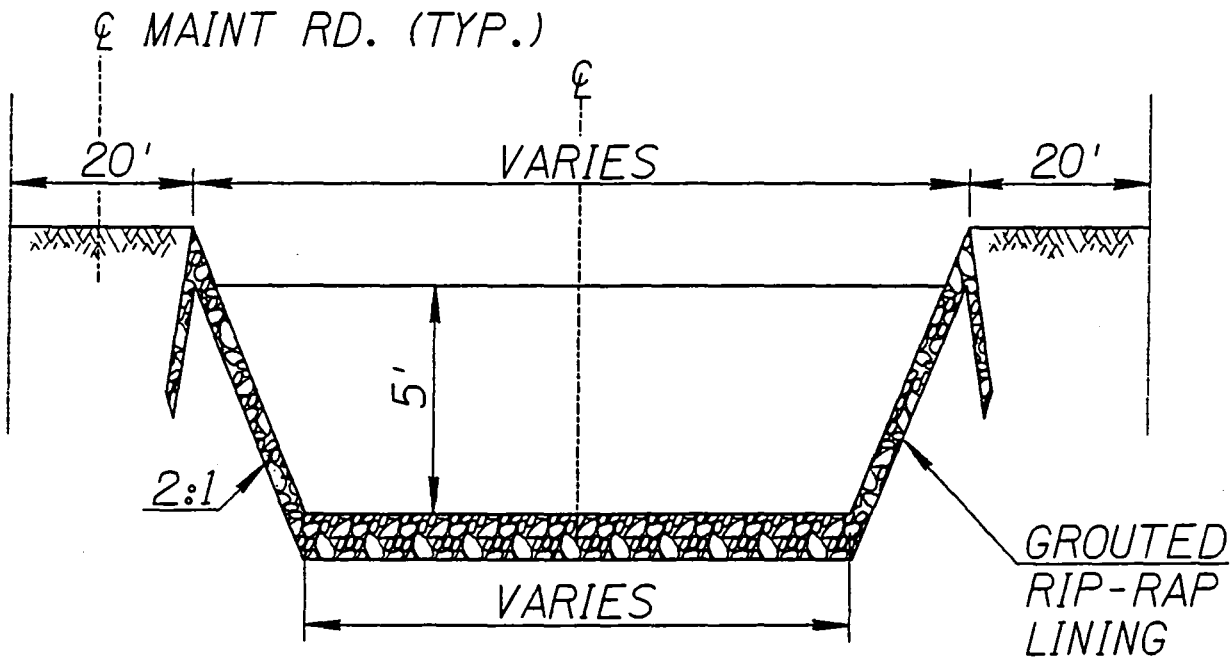
COMPOSITE
CHANNEL

WOOD/PATEL
ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344

V:/941022/BULWASH2.DGN



CONCRETE CHANNEL



GROUTED RIP-RAP CHANNEL

FIGURE 7

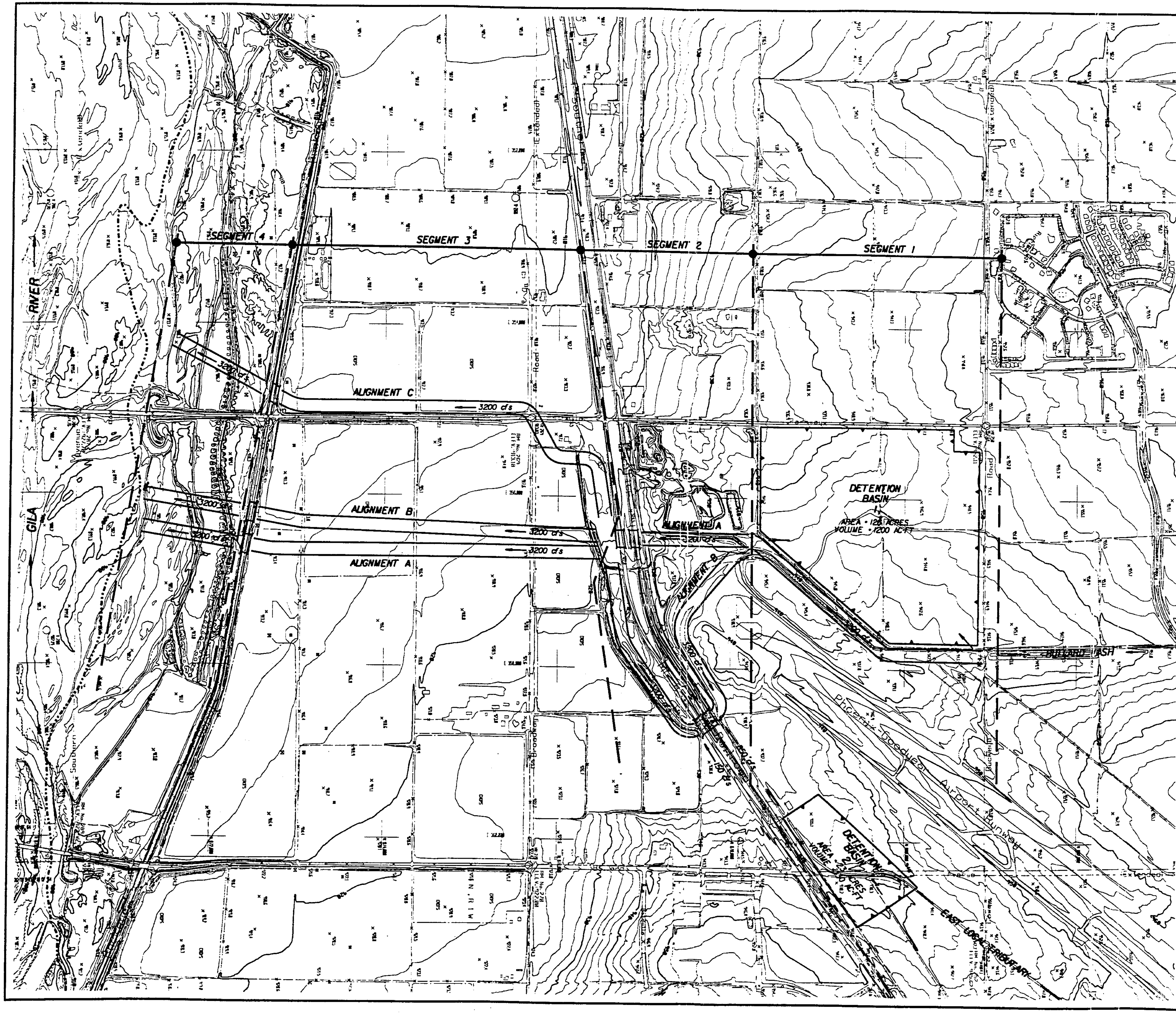
BULLARD WASH
OUTFALL STUDY

WOOD/PATEL
ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344

V:/941022/BULWASH2.DGN

The predominant existing slopes were used for preliminary design and adjusted thereafter to accommodate design criteria, the different channel cross sections, and the various utility conflicts in the study area. The upstream limit of all alternative alignments is Lower Buckeye Road. The collection of floodplain flows entering the proposed channel will be discussed in the next phase of this study. For now, it is assumed that the entire flow can and will be collected at or near Lower Buckeye Road.

The alternatives of each segment were not connected to form a continuous alignment at this point in the study process allowing for a variety of combinations to be considered. Quantity and cost estimates are preliminary and references made to relative cost comparisons are based on such things as estimated dimensions, approximate unit costs, alignment locations and estimated land requirements. Table 2 lists the majority of the unit costs used in the cost estimates reported in Table 3. Refer to Exhibit 4 on the following page for the locations of the four segments and the conceptual alternatives. Refer to Table 3 at the end of this section for a summary of costs for each segment and for the detention basin alternatives. The detention basin summary costs in Table 3 include an outfall channel based on a reduced flow rate generated from the basin operation. The configuration and costs of the smaller outfall channel associated with reduced detention basin flow rates can be found in the TDN cost estimates for the chosen alternatives.



BULLARD WASH OUTFALL FEASIBILITY STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FDC 94-06)

NOTES:

1. CHANNEL ALIGNMENTS ARE ILLUSTRATIVE AND DO NOT REPRESENT ACTUAL WIDTH.
2. DESIGN DISCHARGES ARE BASED ON WHITE TANKS/AGUA FRIA ADMS HEC-1 MODEL BY THE WLB GROUP REVISED BY STANLEY CONSULTANTS TO REFLECT FUTURE DYSART DRAIN AND WHITE TANKS #3 FLOOD CONTROL PROJECTS.

LEGEND

- ALTERNATIVE CHANNEL ALIGNMENT LOCATIONS
- CULVERT OR BRIDGE
- DETENTION BASIN
- 850 cfs — DESIGN DISCHARGE AND FLOW DIRECTION
- SEGMENT LIMITS
- CORPS 404 WATERS OF THE U.S. JURISDICTIONAL LIMIT

N

400 200 0 400 800 1200

SCALE : 1" = 400'
CONTOUR INTERVAL-2'

BASE MAP: WHITE TANKS/AGUA FRIA ADMS (FCD 89-70)

MAPPING COMPANY: COOPER AERIAL OF PHOENIX INC. FLIGHT DATE 12-22-89

BULLARD WASH OUTFALL FEASIBILITY STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCD 94-06)

EXHIBIT 4

CONCEPT ALTERNATIVES

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DES. S.W.	CKD. G.S.B.
DRN. P.J.P.	APP.
DATE 1-25-95	
SHEET 1 OF 1	
DWG.	
PROJ. NO. 12278	

TABLE 2
UNIT COSTS

The following unit costs are used for all cost estimates.

DESCRIPTION	UNIT	UNIT COST
Excavation	C.Y.	$ 3.00
Structural Concrete (including reinforced steel)	C.Y.	$ 250.00
Rip Rap (hand placed - grouted)	S.Y.	$ 30.00
Wire Enclosed Rock	S.Y.	$ 50.00
Crushed Granite	C.Y.	$ 25.00
Fencing (6' chain link - gates)	L.F.	$ 8.00
Highway Bridge	S.F.	$ 50.00
Highway Culvert	S.F.	$ 25.00
Railroad Bridge	S.F.	$ 75.00
Railroad Culvert	S.F.	$ 45.00
Right of Way (Land Purchased)		
Agricultural	AC	$ 9,000.00
Frontage	AC	$ 14,000.00

Notes:

1. Excavation is assumed to be of level ground with minor overexcavation for structural needs.

2. Structural concrete is estimated from ADOT Standards where available and estimated from general dimensions elsewhere.

3. All dimensions are approximate and may vary around bends, over or through structures, and for non-uniform flow conditions.

4. Floodplain status is assumed to not affect right-of-way costs. Right-of-way needs within the Phoenix-Goodyear Airport are assumed to be no cost (donated).

TABLE 3
SUMMARY OF COSTS FOR CHOSEN ALTERNATIVES

Location		Description	Total Cost
Segment 1		Concrete Channel	$ 1,775,600
		Riprap Channel	$ 2,923,400
Segment 2	Alignment A	Concrete Channel	$ 2,013,000
		Riprap Channel	$ 1,928,500
	Alignment B	Concrete Channel	$ 3,633,300
		Riprap Channel	$ 3,536,300
Segment 3	Alignment A	Concrete	$ 2,944,100
		Riprap	$ 4,943,400
		Composite Section	$ 2,084,000
		Earth Section	$ 2,143,200
	Alignment B	Concrete	$ 2,944,100
		Riprap	$ 4,943,400
		Composite Section	$ 2,084,000
		Earth Section	$ 2,143,200
	Alignment C	Concrete	$ 5,277,000
		Earth Section	$ 3,594,300
Segment 4	Alignment A, B and C	Concrete Pilot Channel	$ 408,600
		Earth Dredged Channel	$ 155,600
Detention Basin 1		Main Bullard Wash	$ 12,932,200
Detention Basin 2		East Local Tributary	$ 2,132,200

Note: Costs include construction cost, construction contingency and right of way for channelization, major structures and land requirements. Minor utility relocation and protection, irrigation structures, and other special conditions such as potential costs associated with the superfund site are not included in this report because they represent similar costs for each alignment and do not contribute to the comparison of alternatives. Costs reflect the option of a bridge structure for the railroad and a culvert structure for MC85 and the BID canal instead of a clear span bridge structure.

BULLARD WASH SEGMENT 1

This segment begins at Lower Buckeye Road and continues southwesterly to the Phoenix-Goodyear Municipal Airport. Because the airport runway encroached into the natural channel of Bullard Wash and because of other downstream design constraints, alignment alternatives were limited. In addition, the natural ground through this reach has a local high point that may require significant cut for channel construction.

As mentioned previously, collecting the flow from the Bullard Wash floodplain will be a significant consideration. The Bullard Wash floodplain upstream from Segment 1 is on the order of 1000 feet in width. The widest channel alternative within Segment 1 will be bout 200 feet wide. At this point, the following concept is anticipated to transition flows from the upstream floodplain to the channel in Segment 1:

1. The proposed channel will be aligned with the existing Bullard Wash channel and will receive approximately 50% of the total discharge directly into the new channel.

2. The remaining overbank flows will continue in a southerly direction and enter the proposed channel for a distance of perhaps 1/4 mile south of Lower Buckeye Road. Both the east and west overbanks will have hydraulic gradients that will direct flow to the proposed channel. Proposed bank lining in Segment 1 will provide protection from inflow scour. Upon review of the affected floodplain limits, additional berms may be required to assure that the design flows reach the proposed channel.

3. Future development upstream from Lower Buckeye Road will be allowed to continue the channelization of Bullard Wash upstream, if desired.

The concept design for this reach utilized a narrow channel section with a flat longitudinal slope to minimize right-of-way and earthwork. The sediments (silts) deposited in the ancient Gila River overbanks are easily transported by stormwater runoff. Preliminary analyses indicate that the allowable velocity for an earth lined channel is between 2 fps and 4 fps. The velocity constraint and limited right-of-way may require the channel to be protected. Two types of protection (concrete lining and grouted riprap) were evaluated for this segment. Due to the previously mentioned constraints, only one alignment was considered in Segment 1.

Concrete Lined

The concrete lined channel through this section will have a bottom width and longitudinal slope of 60 feet and 0.0011 ft/ft, respectively. The total width of the drainage corridor will be approximately 130 feet. This includes 20 feet on each side of the channel for maintenance access. Additional joint use facilities (trails, parks, etc.) may require additional right-of-way. The 100-year event (3200 cfs) will have a velocity and depth of 9.15 fps and 5 feet, respectively. Additional normal depth hydraulic parameters are provide in the TDN.

Pros:

1) Contained channel;
2) Increased sediment transport rate;
3) No ponding or vegetation problems around the airport;
4) Minimum right-of-way requirement.

Cons:

1) Increased capital cost;
2) Aesthetics;
3) Limited joint use opportunities.

Grouted Riprap

The grouted riprap channel performs the same function as the concrete lined channel. Due to the increased roughness (assume Manning's "n" = 0.038), the width will be increased. The grouted riprap channel will have a bottom width and longitudinal slope of 168 feet and 0.0011 ft/ft, respectively. The total width of the drainage corridor will be approximately 235 feet. This includes 20 feet on each side of the channel for maintenance access. The 100-year event will have a velocity and depth of 3.59 fps and 5 feet, respectively. Additional normal depth hydraulic parameters are provided in the TDN.

Pros:

1) Contained channel;
2) No ponding or vegetation problems around the airport;

Cons:

1) Increased capital cost;
2) Aesthetics;
3) Limited joint-use opportunities;
4) Lower sediment transport rate than concrete lined;
5) Potentially higher maintenance requirements than concrete lined.

A small channel parallel to the Bullard Wash improvements will be constructed to route irrigation runoff to the existing irrigation ditch south of MC85. This tailwater or irrigation ditch will be utilized to irrigate agricultural fields to the south and west. This system would maintain the existing irrigation pattern in the area.

A detention basin was evaluated as part of the segment 1 analyses. The basin reduced the 100-year peak discharge of Bullard Wash from 3200 cfs to 1400 cfs. This alternative reduced the channel size downstream of Segment 1. A detailed discussion of the detention basin alternative is provided in a later section of this report.

BULLARD WASH SEGMENT 2

The segment begins just north of the airport runway and continues to a point slightly south of MC85. This section includes some extremely narrow right-of-way and some steep longitudinal slopes. The existing channel flows between the airport runway and the IMSALCO aluminum recycling facility. Downstream of the runway, the channel alignment includes several severe bends prior to crossing MC85. South of MC85, the channel turns 90 degrees and flows west toward Estrella Parkway. Because the Bullard Wash channel has been altered for irrigation purposes, the hydraulic capacity of the channel is greatly reduced. The existing condition flow pattern changes from channelized flow in Segment 2 to shallow sheet flow in Segment 3.

The two channel alignments investigated for segment 2 included the following: A) directly south to MC85 along the airport west boundary, or B) the existing main channel alignment around the end of the runway through the existing bridge at MC85. The following paragraphs describe each alignment alternative.

Alignment "A"

The alignment follows an existing irrigation tailwater channel south to MC85. This alignment will significantly improve the horizontal configuration and minimize the length of the channel. This alignment traverses a wide range of longitudinal slopes form dead flat to about 2%.

This alignment will require new structures at the railroad and at MC85. The existing bridge structures to the east could be used to maintain conveyance of low flows generated from local sub-basins (east local tributary) or replaced with significantly smaller culvert crossings. If the existing structures are abandoned, a channel would be required to route runoff from the existing bridge structures to the new crossing. The irrigation tailwater which is conveyed from the east local tributary to the existing tailwater pond must be maintained for irrigation practices. This location also requires the relocation of several significant utilities in the area. The 8" natural gas line and both the 12" and 20" petroleum lines will be relocated.

The 100-year runoff through this reach is in the super critical flow regime. Therefore, a fully protected channel section (concrete lined or grouted riprap) is required. Several drops and/or energy dissipation structures may be required upstream of Segment 3. In addition, the lined channel options will reduce the width of the channel section and may reduce the cost of bridge/culvert structures.

Concrete Lined

The concrete lined channel through this section will have a bottom width and longitudinal slope of 25 feet and 0.0186 ft/ft, respectively. The available right-of-way limits the maintenance access and joint-use opportunity in this reach. The 100-year event (3200 cfs) will have a velocity and depth of 28.48 fps and 3.51 feet, respectively. Additional normal depth hydraulic parameters are provided in the TDN.

Pros

1) Straight alignment;
2) Reduced length of channel;
3) Minimizes right-of-way.

Cons

1) Super critical flow with very high channel velocity;
2) New crossing location for railroad and MC85;
3) Coordination with railroad;
4) Aesthetics;
5) Limited joint-use opportunity;
6) Utility conflicts.

Grouted Riprap

The grouted riprap channel performs the same function as the concrete lined channel. Due to the increased roughness (assume Manning's "n" = 0.038), the width will be increased. The grouted riprap channel will have a bottom width and longitudinal slope of 40 feet and 0.0186 ft/ft, respectively. The 100-year event will have a velocity and depth of 13.24 fps and 4.86 feet, respectively. Additional normal depth hydraulic parameters are provided in the TDN.

Pros

1) Straight alignment;
2) Reduced length of channel;

Cons

1) Supercritical flow (although manageable velocities);
2) New crossing location for railroad and MC85;
3) Coordination with railroad;
4) Aesthetics;
5) Limited joint-use opportunity;
6) Utility conflicts;
7) Greater right of way needs than concrete channel.

Alignment "B"

This alignment follows the existing flow path of Bullard Wash. Therefore, it utilizes the recent (post-airport) historical flow path in an established channel. Discussions with representatives of MCDOT indicate that the existing MC85 bridge structure will be replaced and that preliminary design has been completed. Further design efforts will not be performed until the District has completed the Bullard Wash Outfall Feasibility Study.

The existing flow path is a long winding path that includes several bends prior to MC85. This configuration contains inherent problems regarding horizontal alignment. The existing curves are much more severe than normally desired in design. Therefore, these sections will require bank protection and additional freeboard allowances to ensure acceptable hydraulic operation of the channel. Potential utility conflicts may exist, however, it is assumed that the utilities have been installed with regard to the existing wash crossing and that there will not be any extensive utility relocation for this alignment.

Two types of protection, concrete lining and grouted riprap, were evaluated for this segment.

Concrete Lined

The concrete lined channel through this section will have a bottom width and longitudinal slope of 50 feet and 0.0034 ft/ft, respectively. The available right-of-way limits the maintenance access and joint-use opportunity in this reach. The 100-year event (3200 cfs) will have a velocity and depth of 14.02 fps and 3.94 feet, respectively. Additional normal depth hydraulic parameters are provided in the TDN.

Pros

1) Utilize existing channel alignment;
2) Utilize existing bridge locations;
3) Minimum right-of-way width;
4) Less coordination with the railroad;
5) No need for channel to serve east tributary.

Cons

1) Longer length of channel than Alignment A;
2) Increased capital cost;
3) Horizontal alignment (sharp bends);
4) Aesthetics.

Grouted Riprap

The grouted riprap channel performs the same function as the concrete lined channel. Due to the increased roughness (assume Manning's "n" = 0.038), the width will be increased. The grouted riprap channel will have a bottom width and longitudinal slope of 100 feet and 0.0034 ft/ft, respectively. The 100-year event will have a velocity and depth of 6.10 fps and 4.79 feet, respectively. Additional normal depth hydraulic parameters are provided in the TDN.

Pros

1) Utilize existing channel alignment;
2) Utilize existing bridge locations;
3) Maintain subcritical flow;
4) No need for channel to serve east tributary.

Cons

1) Longer length of channel than Alignment A;
2) Right-of-way limitations;
3) Horizontal alignment (sharp bends);
4) Aesthetics.

The railroad crossing will be evaluated to determine its hydraulic capacity. The calculations will utilize both the field survey conducted for this study and the railroad as-builts when obtained from the railroad. If the structure is found to be inadequate, the District will be notified so that coordination can begin for design of a new crossing. The railroad crossing will have the same hydraulic requirements as the MC85 crossing, but will be designed for structural live loads associated with a railroad.

The new structures will have capacity to pass the 100-year discharge of 3200 cfs. The existing bridge structure at MC85 will be replaced with either a bridge or multi-barrel culvert. The culvert is anticipated to be composed of at least 6 - 10' X 6' RCBC's. The bridge structure option would clear span the typical channel section. Final sizing and location of the crossing is included in the Recommended Alternative section of this report.

BULLARD WASH SEGMENT 3

Segment 3 begins at MC85 and continues south to the BID canal. Bullard Wash has been obliterated by the development of agricultural fields in this reach. Runoff is characterized by wide shallow sheet flow flooding. Initially, runoff flows across the fields and/or down Estrella Parkway to the BID canal, then it overtops the canal and outfalls to the Gila River.

This segment has numerous utility concerns that need to be addressed during the preliminary design phase. A few of the major utilities include:

1) Palo Verde 96" diameter gravity waterline;
2) Buckeye Irrigation District canal;
3) Agricultural irrigation;
4) City of Goodyear 15" diameter sewer line (Broadway Road);
5) Overhead power lines.

Three alignments were analyzed for Segment 3. Alignments "A" and "B" flow south from MC85 to the BID canal. These alternatives have similar hydraulic characteristics. Impact to utilities will dictate the final alignment. Also, a combination of the alignments may be considered. Alignment "C" routes flows west then south along Estrella Parkway to the Gila River. The primary objective of Alignment C was to provide an outfall that would be capable of collecting all of the flow that would pass over the railroad and MC85 per existing conditions if no Segment 1 or 2 flood control improvements could be established.

Alignments "A" & "B"

Because alignments "A" and "B" are very similar they will be discussed jointly. These alignments route flows from MC85 directly south to the Gila River. The primary constraints limiting design alternatives are: 1) geometry of the crossing at MC85; 2) elevation of the existing sewer line at Broadway Road; 3) elevation of the Palo Verde water line near the BID canal; 4) location of overhead power structures; and 5) hydraulic requirements of the BID canal.

Several types of channels were evaluated. These included 1) earth; 2) composite channel section; 3) concrete lined; 4) grouted riprap.

Earth

The earth channel was initially considered because it would allow the City of Goodyear flexibility in developing joint use facilities in the future. The sediments (silts) deposited in the historic Gila River overbanks are easily transported by stormwater runoff. Preliminary analyses indicate that the allowable velocity for a earth lined channel is between 2 fps and 4 fps. Because of the velocity constraint, the earth channel must be extremely wide to pass the 100-year event. The earth channel will have a bottom width and longitudinal slope of 355 feet and 0.0012 ft/ft, respectively. Also, the low allowable velocity may cause aggradation in the channel and increase maintenance. The earth channel will not prevent lateral migration of Bullard Wash. Therefore, setbacks (easements) will need to be established as part of the maintenance program of the drainage facility. The earth channel width requires substantial amounts of rights-of way/easements and is difficult to align through the electrical power structures. In addition, the wide channel geometry requires the BID canal crossing structure options to be significantly larger than for lined channels.

Pros:

1) Joint use opportunity;
2) Aesthetics.

Cons:

1) Land requirements;
2) Operation and maintenance;
3) Increased crossing structure cost;
4) Horizontal alignment concerns.

Composite Section

The composite section is composed of stable bank protection (concrete, grouted riprap or soil cement) with an earth bottom. This section incorporates the protection of a lined channel with the aesthetics of an unlined channel. The sides of the channel are protected to prevent lateral migration and/or failure due to vertical scour, and the bottom of the channel is earth to allow joint-use opportunities such as parks, trails, etc.. The bottom width and longitudinal slope are 150 feet and 0.0012 ft/ft, respectively. The velocity through this reach is approximately 4.4 fps. This velocity is slightly higher than the 2 fps - 4 fps value indicated in the preliminary allowable velocity analyses. This appears to be acceptable because the channel will have four "hard points" (BID canal overchute, Palo Verde pipeline, Broadway Road sewer line, and the MC85 crossing structure). These hard points will involve concrete lining of the channel bottom at the upstream and downstream ends of Segment 3 and at the utility crossings to protect them from potential scour. It is general practice to design channels for slight degradation to ensure that no significant deposition occurs.

Pros:

1) Contained channel;
2) Joint-use opportunities;
3) Aesthetics;
4) Least expensive alternative.

Cons:

1) Operation and Maintenance costs;
2) Increased structure cost compared to concrete lined channel.

Concrete Lined

This alternative minimizes the right-of-way required for the channel. The concrete lined channel through this section will have a bottom width and longitudinal slope of 70 feet and 0.0012 ft/ft, respectively. The total width of the drainage corridor will be approximately 130 feet. This includes 20 feet on each side of the channel for maintenance access. Additional joint-use facilities (trails, parks, etc.) may require additional right-of-way. The 100-year event (3200 cfs) will have a velocity and depth of 9.12 fps and 4.45 feet, respectively. Additional normal depth hydraulic parameters are provided in the TDN.

Pros:

1) Contained channel;
2) Minimize right-of-way;
3) Minimize structure cost;
4) Minimize operation and maintenance cost;
5) Minimize horizontal alignment concerns.

Cons:

1) Cost;
2) Aesthetics;
3) Reduced joint-use opportunities.

Grouted Riprap

The grouted riprap channel performs the same function as the concrete lined channel. Due to the increased roughness (assume Manning's "n" = 0.038), the width will be increased. The grouted riprap channel will have a bottom width and longitudinal slope of 190 feet and 0.0012 ft/ft, respectively. The total width of the drainage corridor will be approximately 250 feet. This includes 20 feet on each side of the channel for maintenance access. The 100-year event will have a velocity and depth of 3.57 fps and 4.51 feet, respectively. Additional normal depth hydraulic parameters are provided in the TDN.

Pros:

1) Contained channel;
2) Reduce right-of-way (compared to earth);
3) Reduce structure cost;
4) Reduce operation and maintenance cost;
5) Reduce horizontal alignment concerns.

Cons:

1) Cost;
2) Aesthetics;
3) Reduced joint use opportunities.

Alignment "C"

This alignment possesses several problems that may eliminate it from further consideration. First, the slope of the natural ground along the proposed channel is extremely flat (0.0004 ft/ft) south of Broadway Road. This will require the channel to be very wide to pass the 100-year event. For example, the concrete lined channel alternative in this section will have a bottom width of 150 feet and the earth lined channel will have a bottom width of 600 feet. Second, the channel alignment is adjacent to Estrella Parkway. This will be some of the most expensive right-of-way in the area. Also, access structures across the wide channel appears to be cost prohibitive.

For these reasons, the project team eliminated this option from consideration. Detailed hydraulic analyses will not be performed unless requested by the District for further justification.

Pros:

1) Outfall downstream of Estrella Parkway.

Cons:

1) Expensive right-of-way;
2) Expensive access structures;
3) Additional roadway crossing;
4) Inefficient hydraulics.

Segment 3 will require some type of culvert/overchute structure at the BID canal and an energy dissipation structure just downstream from the BID canal. Preliminary analysis indicates that the two most promising methods of crossing the BID canal with the proposed channel involve the following:

1. Construct a standard concrete box culvert within the canal to convey canal flows and then construct a concrete lined channel with reinforced concrete sides over the box culvert to carry the storm flows. The box culvert would be a three or four barrel structure the full width of the existing canal with a clear opening height of 6 to 8 feet and a length corresponding to the full width of the proposed channel plus enough additional length to provide for maintenance access of the canal.

2. Construct a clear span overchute of the canal with pre-fabricated reinforced concrete girders or slab bridge and reinforced concrete sides.

The concrete box option would be constructed at the approximate existing grade of the canal bottom and, under normal delivery flows would have a freeboard "headroom" of between 2 to 4 feet. Based on preliminary channel elevations, the clear span option may not be capable of provided as much headroom between the normal canal water surface and the underside of the concrete girders as compared to the concrete box option.

Due to potential difference in grade between the canal overchute and Segment 4 downstream, an energy dissipation structure or deep may be necessary immediately downstream of the overchute. A structure similar to the one in Photo #11 may be appropriate. Photo #12 illustrates a typical box culvert application for an irrigation canal. At this point in time, an inverted siphon option to convey flows over the BID canal does not appear warranted.

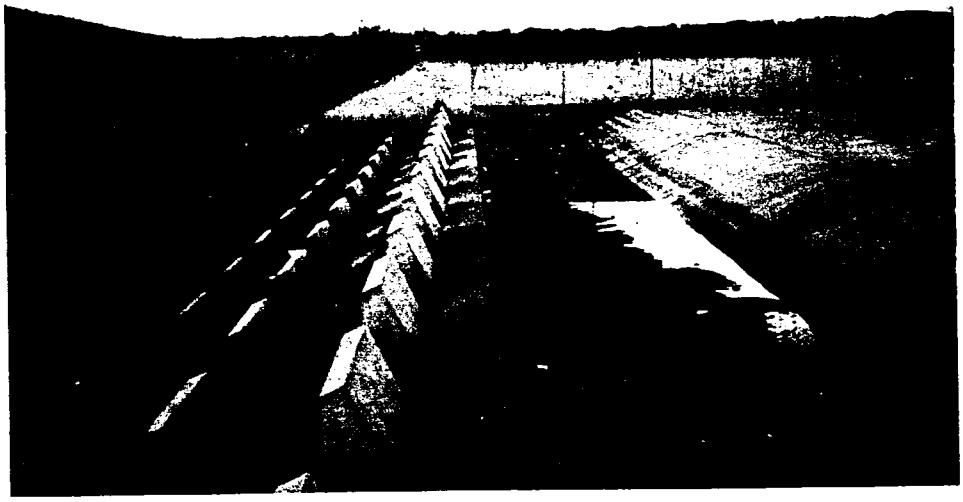


Photo #11 Baffle chute energy dissipator structure located on downstream side of Cave Creek overchute structure at the Central Arizona Project Canal.

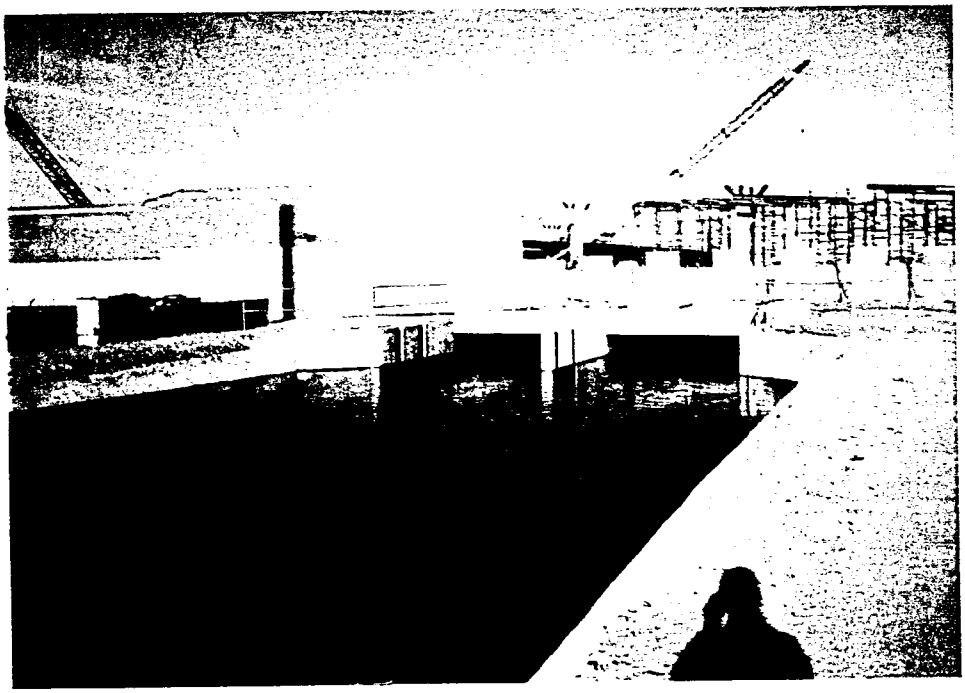


Photo #12 Concrete box culvert for the Western Canal under Interstate 10 in Tempe, Arizona. Structure is a double 14' wide by 5' high by several hundred foot long reinforced concrete box with a trash rack at the upstream end. Normal irrigation delivery flows for the Western Canal are on the order of 300 cfs.

BULLARD WASH SEGMENT 4

Segment 4 extends from the BID canal overchute to the Gila River. Segment 3 Alignments A and B would result in a Segment 4 outfall that is situated upstream in the Gila River from the existing Estrella Parkway Bridge. Segment 3 Alignment C results in a Gila River outfall that is downstream from the existing bridge. All three alignments are situated within the fringe district of the Gila River according to the current Dames and Moore floodplain delineation. All three alignments are subject to transverse flows and potential ponding from the Gila River.

Alignment C is somewhat protected from Gila River flows because it is positioned downstream from the Estrella Parkway bridge approach. Because of this bridge approach, all three Segment 4 alignments are located in an area that may be considered hydraulically ineffective. The north abutment of the Estrella Parkway bridge is situated approximately 1/4 mile south of the BID canal. A hardened spur dike has been constructed at this abutment to protect it from Gila River flows.

Segment 4 needs to provide a positive outfall from the BID canal overchute to a location in the Gila River that will recognize the following concerns:

1) potential occasional Gila River flooding;
2) existing Estrella Parkway road, bridge and spur dike improvements;
3) Gila River low flow channel grades;
4) maintenance requirements;
5) existing utilities;
6) right-of-way requirements;
7) Corps 404 waters of the U.S.;
8) and sediment transport.

At this point in the study process, the following alternative design concepts have been considered:

1) A channel that would be capable of conveying the full 3200 cfs design flow with continuous bottom and sides to an existing Gila river low flow channel that flows adjacent to the existing spur dike.

2) Same channel as in 1) above except design flow rate would be for a 10-year discharge of approximately 1300 cfs.

3) Pilot channel with the same extent, alignment end point and design flow as in 2) above except only the bottom would have a continuous grade; the sides would be discontinuous and follow the existing grades found along the alignment. These grades vary significantly.

All three channel concepts would be subject to transverse flows from the Gila River. An additional design concept that could be considered with any of the three channels would be to place fill material on the downstream (west side) of the outfall channel to protect it from Gila River flows. This fill material should be readily available from proposed channel excavation. Another design concept that could be considered with any of the three channel concepts would be to provide a lined low flow channel within the Segment 4 outfall channel in order to maintain flow velocities capable of transporting sediment (silt) loads.

At this point, it appears that an end point for Segment 4 can be found within the Gila River that would provide a workable grade for channel design and also minimize or eliminate construction within the Corps' jurisdictional waters. Maintenance costs may potentially be higher in Segment 4 than any of the other segments because of the Gila River. Any Segment 4 channel alternative concepts which do not convey the full 3200 cfs may involve the need for flowage easements for that area within the Gila River fringe district that would be subject to Bullard Wash overflow. Hydraulic analysis for Segment 4 will be presented in the Recommended Alternative section of this report.

SEDIMENT TRANSPORT

Existing Condition

Bullard Wash currently experiences severe aggradation within the proposed study reach. The primary reason for this aggradation is the development of agricultural fields and the encroachment of the airport runway into the wash.

Development of the agricultural fields south of MC85 may have the most severe impact on the sediment transport capacity of Bullard Wash. Construction of agricultural fields have obliterated the wash channel. The section of Bullard Wash from MC85 to Estrella Parkway has been blocked to create a tailwater pond for irrigation of adjacent fields.

The runway encroachment significantly altered the horizontal alignment of the wash. Specifically, three 90° bends were introduced to route flows around the runway and through the existing crossings. These curves were not designed in accordance with current design procedures. Therefore, they are not hydraulically efficient.

Runoff from the wash transitions from a hydraulically efficient channelized section to an inefficient ponded/shallow sheet flow section. The flow velocity in the sheet flow section is substantially less than in the channelized section. Therefore, the sediment transport capacity is reduced and aggradation occurs.

This process is responsible for the deposition of sediments in the channel downstream of MC85 and for the deposition within the structures. Field investigations indicate that the MC85 structure is approximately 70 percent filled.

The reduced hydraulic capacity of the structures and ineffective horizontal alignment of the upstream channel cause ponding to occur at MC85 and the Southern Pacific Railroad. This ponding (reduced velocity) produces additional sediment deposition in this portion of the wash.

The study area will continue to have aggradation and shallow flooding problems until the hydraulic and sediment transport capacities are improved.

Design Condition

The goal of the proposed drainage improvements is to match or exceed the sediment transport capacity rate of the upstream sediment supply section. Theoretically, if the sediment transport capacity of the supply section and the design section are equivalent, the system is in equilibrium and deposition/aggradation will not occur.

The potential for the development of local scour and/or long term degradation in the design section is minimal. There are numerous check structures located throughout the project that limit scour. These features and the relatively flat design slopes minimize the scour potential. Features that inhibit scour and/or long term degradation include the following:

1) Bridge and drop structure over the BID canal - This structure (and its associated cutoff walls and transition) forms a hard point that defines the invert of the protected channel.

2) 96" Palo Verde reclaimed water line - The structure lies approximately 1.5 feet below the invert of the channel. A concrete cap will be constructed across the channel to minimize the potential for damage due to scour.

3) 15" sewer line - The structure lies approximately 1.5 feet below the invert of the channel. A concrete cap will be constructed across the channel to minimize the potential for damage due to scour.

4) MC 85 culvert crossing - The proposed 6 - 10' X 6' RCBC and associated cutoff walls form a hard point to prevent undermining of the structure.

5) Southern Pacific Railroad culvert crossing - The proposed 6 - 10' X 6' RCBC and associated cutoff walls form a hard point to prevent undermining of the structure.

6) Sloping Drop Structures - There are four drop structures located in segments 1 and 2. These structures and their associated cutoff walls serve as hard points and minimize the potential for degradation and/or migration of headcuts.

The potential for lateral migration of Bullard Wash is minimized by the construction of hardbank channel lining. The toedown of the proposed channel lining will extend below the channel invert approximately 8 feet.

The potential of sediment deposition in the channel is very minor. The adjacent agricultural watershed is composed of fine-grained sandy clay soils (d_{75} < # 200 mesh) that are easily transported. The design velocities for the larger storm events are sufficient to transport these soil particles through the facilities to the Gila River (see HEC-2 analyses in Appendix D). In addition, the majority of the sediment particles are small enough that they are transported in the wash load rather than the bed load. Therefore, they tend to remain suspended in the water and are routed to the Gila River.

The remaining sediment transport concern is for small flows in the channel. These flows are characterized by wide shallow runoff through the channel. In order to model the potential for sediment deposition during small flow events, an analysis using the Zeller-Fullerton equation for sediment transport in sand bed channels was performed. The results of this analysis are found in Appendix E.

The Zeller-Fullerton analysis shows that the sediment transport capacity of the channel increases steadily from about 19 cfs in the supply reach upstream of the proposed channel improvements to 26 cfs in segment 1 to 34 cfs in Segment 3. Within the concrete-lined Segment 2, the potential for deposition is even less because velocities are greater and depths of flow are smaller. In Segment 4, an analysis was not performed because the entire segment lies within the Gila River floodplain and, as discussed in the Recommended Alternative section, deposition from Gila River flows can be expected during major flows in the Gila River.

The reduced velocity may caused some localized deposition, but will not impact the operation of the flood control system. The project team will investigate opportunities to confine low flows to one portion of the channel (increase the conveyance). Utility constraints severely limit the design alternatives in Segment 3.

DETENTION BASIN ALTERNATIVE

The previously discussed channelization alternatives may be modified by the inclusion of detention facilities on Bullard Wash upstream of the airport runway and along the local east tributary north and east of the existing MC85 bridge. The Bullard Wash basin is referred to as Basin 1. The East Local Tributary basin is referred to as Basin 2. The intent of this concept alternative was to reduce

the size of channels required to route the flow from Bullard Wash to the Gila River and provide sediment control. As stated previously, the best reduction of peak discharge, using Basin 1 alone, results in a local peak discharge of approximately 850 cfs. Therefore, the use of Basin 2 is only beneficial if Basin 1 is capable of reducing the peak discharge in the main Bullard Wash below 850 cfs. The input model on the disk in Appendix A for Basin 1 on Bullard Wash only reduced the peak discharge to approximately 1400 cfs.

The basin presented as Basin 1 on Exhibit 4 is essentially the largest practical basin that has been modeled. Smaller basins will have less of an effect on reducing the peak discharge. This basin is used for identifying the possible reduction of channel size due to the lower design flow rate and the cost savings associated with the smaller channel. Based on the results of Basin 1, it appears that Basin 2 would not provide any additional benefit because the downstream channel of Basin 1 would be designed for 1400 cfs which is greater than the total peak discharge, 850 cfs, from the East Local Tributary. As Figure 8 illustrates, the East Local Tributary flow occurs and passes well before the Bullard Wash peak flow occurs. The detention basins are evaluated by hypothetical basin characteristics being input into the revised HEC-1 model. This will help determine if a detention basin can provide adequate or desired results. All assumptions are anticipated to be hydraulically and hydrologically feasible. The basins will be in-line or "flow through" basins in order to reduce the number of assumptions to be made and provide the greatest net reduction in peak flow downstream. The basins were initially modelled as off line basins to try to "skim" the peak of the hydrographs more efficiently thus reducing the land required. However, this would have required that the Bullard Wash channel be lined through Segments 1 and 2. Also, the net reduction of the peak discharge downstream was less significant. The basic basin characteristics are an unlined sloped basin bottom, unlined 4:1 basin sideslopes, basin water surface elevations restricted to the estimated water surface elevation estimated from the revised ADMS hydraulics for the adjacent wash, multiple outlet pipes assuming inlet control and all flows into and out of the basin are estimated based on current SCI revised hydrology and channel alignment assumptions.

Approximate cost estimates and general design assumptions are provided in the TDN for the hypothetical basins. Refer to Table 3 in the conclusion section for a summary of the estimated costs of Basin 1 and Basin 2. The costs reported for the detention basins in Table 3 include the smaller outfall channel construction cost. Hydrographs in Figures 8 and 9 associated with the detention basin operation are found at the end of this section.

The potential advantages associated with the detention basin alternatives are:

1. reduction in peak discharge, therefore, a reduction in channel size, right-of-way, drainage structure sizes, and overall construction costs of channel;

2. potential groundwater recharge;

3. open space available for multi-use facilities such as parks, recreation, or athletic fields;

4. provides buffer between airport and other potential land uses;

5. defined, effective location for sediment deposition.

The potential disadvantages associated with the detention basin alternatives are:

1. requires very large land area, therefore, increased right-of-way costs for basin area;

2. tremendous quantity of excavation which will require a disposal site;

3. potentially high maintenance cost;

4. requires regular removal of sediment;

5. potential for increased bird population due to the sediment deposition and vegetation growth which may have adverse impact on airport operations;

6. safety concerns due to the flood pool created during runoff events;

7. increased scour potential in downstream channel due to the clear water releases;

8. potential conflict with Superfund environmental cleanup.

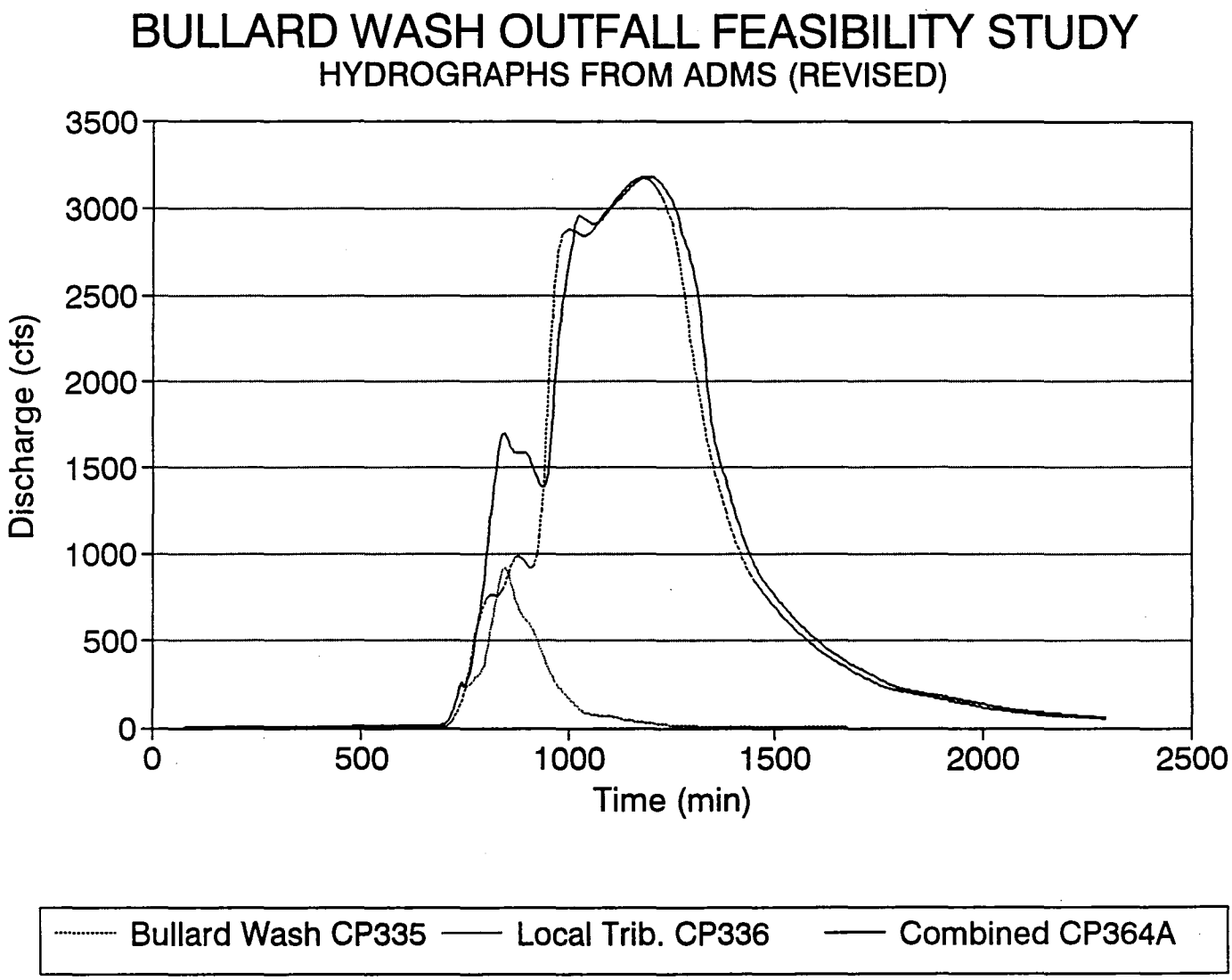

BULLARD WASH OUTFALL FEASIBILITY STUDY
HYDROGRAPHS FROM ADMS (REVISED)
Discharge (cfs)
3500
3000
2500
2000
1500
1000
500
0
0
500
1000
1500
2000
2500
Time (min)
Bullard Wash CP335
Local Trib. CP336
Combined CP364A

FIGURE 8

BULLARD WASH OUTFALL FEASIBILITY STUDY

CP335 HYDROGRAPHS FROM ADMS (REVISED)

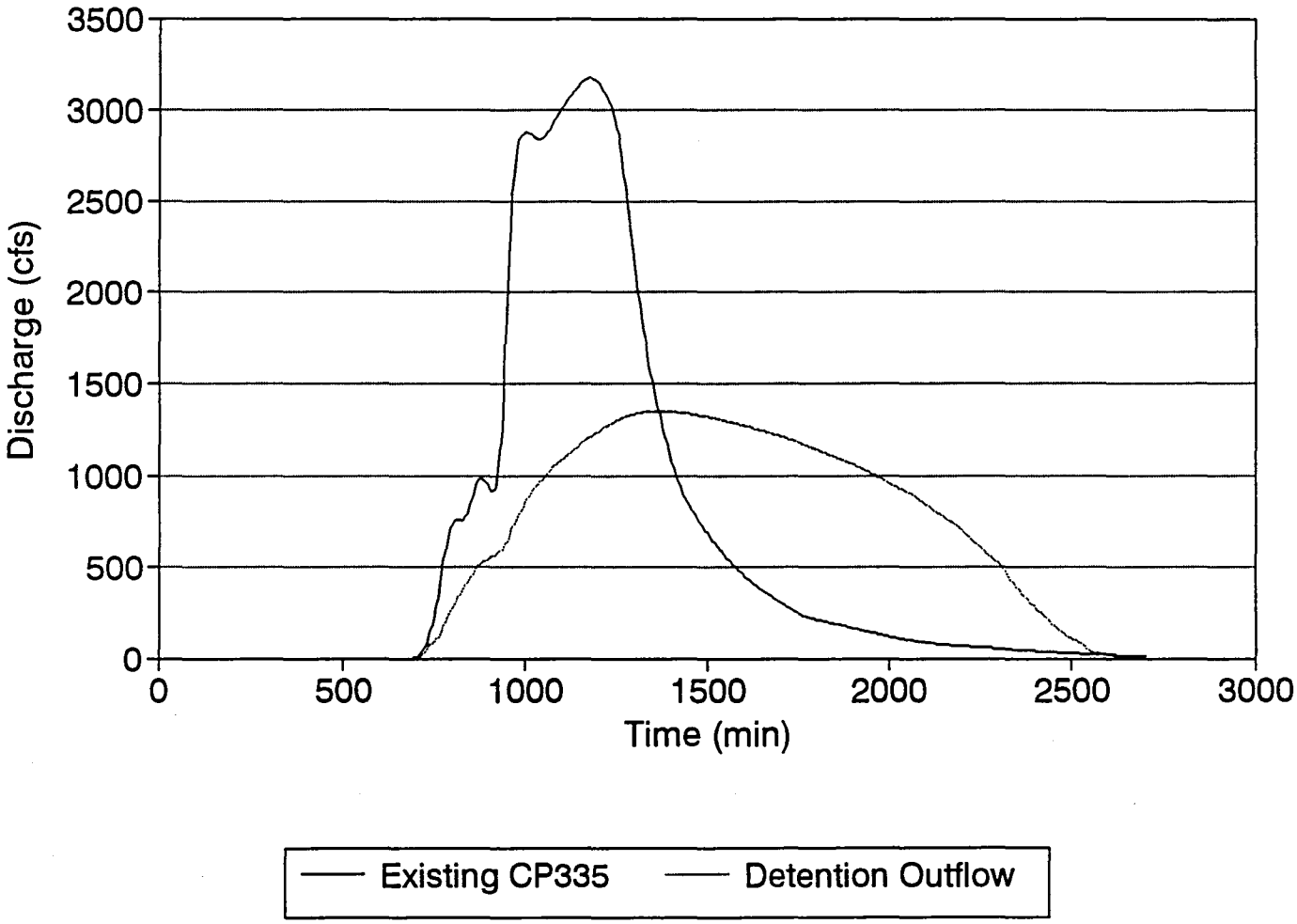


FIGURE 9

CONCLUSIONS

This section of the report primarily contains documentation and new information pertaining to the selection of a recommended alternative based on the chosen alternatives. General conclusions of the individual chosen alternatives have been included in the "pros" and "cons" sections of each respective alignment and channel configuration alternative presented in previous sections of this report. The following sections correspond to the specific segments of Bullard Wash. All information used in the conceptual design and decision process for this report can be found within this report, Volume 1 - Design Concept Report, or in Volume 2 - Technical Data Notebook. The result of this section will be a singular and continuous recommended alignment location for which to proceed into the final phase of this design concept report. The discussion of the technical data developed for the recommended alternative(s) is located in the next section of this report. Technical documentation and calculations are located in the corresponding Appendices of this report.

A general consideration throughout the Bullard Wash Outfall Feasibility Study was the potential co-use of the project alignment by the City of Goodyear for recreational facilities or a linear park. Initial discussions with Goodyear involved the potential for both pedestrian and possibly equestrian traffic. However, upon the receipt of the City of Goodyear Community Planning Program and City Center Area Plan, it is evident that there are no plans to provide pedestrian or any other access to the project corridor. The land use plan contained within the area plan document indicates an open space or green belt corridor west of the existing Bullard Wash alignment and north of MC85. This open space corridor does not extend south of MC85 to the Gila River. The Goodyear Area Plan indicates future light industrial land use for the existing agricultural area south of MC85. The City of Goodyear has indicated that there is no intention to combine open space or pedestrian access with the Bullard Wash Outfall project within the study area.

Bullard Wash Segment 1

Segment 1 involves several basic design features and considerations. The first consideration is the updated airport property line as illustrated in the Airport Master Plan dated July 1986. The original topographic mapping used for the chosen alternatives displayed a fence line just west of Bullard Wash which was assumed to be the airport property line. However, upon receipt of the current Airport Master Plan which includes an Airport Layout Plan, it was found that the actual airport property line extends southwest from the fence line on the topographic mapping. The additional

property is intended to be used for a proposed utility runway located parallel to and approximately 1000 feet north of the existing runway.

The proposed runway also has an area associated with it called the Runway Safety Area. This area, not to be confused with the Clear Zone, prohibits any depressions as well as above ground obstructions. This area is defined by FAA regulations for specific aircraft and types of landing instruments. This particular runway requires an area extending from the end of the runway centerline that is 300 feet wide and 600 feet long. The proposed runway and corresponding safety area force the proposed channel alignment to be located outside the airport property for approximately 1000 feet and navigate two additional bends. The proposed channel turns back into the airport property just outside the safety zone and then makes another turn within the airport property back to the existing flow path to reduce the amount of required right-of-way. The extent of the property line and the affects on the alignment location can be seen on Exhibit 5.

The adjusted alignment actually aids in the collection of flow at the upstream end of the study area. As shown on Exhibit 5, the proposed channel alignment diagonally traverses almost the entire existing floodplain width. West overbank flows will enter the channel along the northern or upstream channel bank. The proposed bank lining will protect the channel from inflow scour. The amount of additional berming to direct flow to the channel will be minimized due to the existing hydraulic gradients of the adjacent fields. Final hydraulics and floodplain analyses required in the final design will determine the potential need for additional berming.

Based on the chosen alternatives, there were two potential channel configurations and one potential alignment location as revised above. However, with the new information contained within the Airport Layout Plan and the associated Runway Safety Areas, there has been another channel configuration considered. The use of fully lined channels in the original submittal was intended to reduce the channel width and conserve land area thought to be required for airport runway operations. With the new information and as a method of reducing total project costs a composite channel section was investigated as a potential channel configuration for Segment 1. The composite section investigated consisted of a total project width of approximately 150 feet which includes freeboard and 20 foot wide maintenance corridors on both sides of the proposed channel. The hydraulics for the composite channel are acceptable and are presented in the Recommended

Alternative section. The cost estimates for the three types of channels are $1,775,600, $2,923,400 and $1,231,800 for the concrete, riprap, and composite section, respectively. The limited amount of right-of-way, existing and proposed runway encroachments, and the corresponding safety zones were considered in the decision process. The recommended channel configuration is the composite channel.

The alternative of utilizing detention basins is not economically beneficial and has several potentially negative impacts on other facilities in the study area. The initial concept was to reduce the peak discharge downstream of the basin(s), therefore, reducing all costs associated with the channelization. The best reduction in peak discharge was from 3200 cfs without detention basins to 1400 cfs with. The reduced discharge reduces the cost of channelization. However, the total cost of the basin plus the reduced channel was greater than the total cost of the 100-year channel alone. Table 3 reports the costs as $12,932,200 for the detention basin with reduced channel option and $6,083,200 for the 100-year channel option without detention basin.. For comparison purposes, the detention basin cost includes a preliminary composite outfall channel through Segment 3 and an earth dredged channel through Segment 4. The number reported above for the 100-year channel combines the concrete lined channels for Segments 1 and 2, the composite channel for Segment 3, and the earth dredged channel for Segment 4.

Other problems associated with the detention basin(s) were listed previously in this report. Potentially adverse impacts to the PGA Superfund Site subunit A groundwater treatment system might result from the use of detention basin(s). The comments received from the airport and Superfund review were not supportive of the detention basin alternative(s) for various reasons. The increase in bird population was a common comment received from airport and the City of Phoenix personnel. The potential for groundwater affects and contaminated soil disposal were comments received from Bartholomew Engineering and the City of Phoenix. The preliminary costs reported above along with the potential problems associated with a detention basin(s) in Segment 1 have eliminated the detention basin alternative from further consideration.

Bullard Wash Segment 2

Based on the chosen alternatives, there are two potential channel configurations and two potential alignment locations. First, upon review of the Airport Layout Plan and the FAA regulations regarding the type of aircraft and landing instruments for the existing runway, the proposed Alignment B in Segment 2 would interfere with the Runway Safety Zone and would need to be routed around the outside limits of this zone. The safety zone is 500 feet wide and 1000 feet long extending from the centerline of the existing runway. Although the safety zone forces the alignment location further to the west, lengthens the channel segment, and potentially interferes with the 8" natural gas line, this does not preclude Alignment B. The original Alignment B represented in the chosen alternatives is still used for comparison with Alignment A. Alignment A is the recommended alignment for Segment 2 and the new information regarding the safety zone would only tend to support the selection by increasing the necessary length of channelization for Alignment B. The following sections relate the recommendation and several design considerations for Alignment A.

The recommendation was made based on hydraulic and economic comparisons between the two alignments. The existing wash was forced to make several severe bends to reach the historical crossing of the railroad and MC85. The bends increased the length thus reducing the longitudinal slope and increasing sediment deposition potential. These problems associated with the existing wash were discussed more extensively in the Existing Study Area and Drainage Conditions section of this report. Alignment B follows the existing wash main channel alignment and is subjected to the bends and additional length. Alignment A does not contain any bends and lines up with both Segment 1 and Segment 3 providing the shortest length channel between the segments. The other channelization associated with Alignment A is a minor collector channel required from the existing bridge crossings to the proposed channel along the north side of MC85 to convey local tributary flow. The straight south alignment appears to be the best hydraulic design. However, the costs associated with existing utilities and the potential use of the existing crossing structures need to be addressed.

The cost estimates prepared for each of the alternatives show that Alignment A is less expensive than Alignment B. Table 3 reports the costs for the concrete lined section as $2,013,000 and $3,633,300 for Alignment A and Alignment B, respectively. The difference in cost is attributed to the difference in lengths of the two alternatives. Alignment B, approximately 5350 feet, is almost three times as long as Alignment A, approximately 1800 feet. However, the cost of Alignment B is

not three times as large as Alignment A. This is primarily because Alignment A involves the relocation of several major utilities, two new crossing structures, and the local tributary flow collector channel. Initial response indicated that all utilities can be relocated and that the railroad supports the project and the location of the recommended alignment. It is anticipated that the cost of Alignment B could not be reduced and that the cost of Alignment A could not be increased enough to alter the cost comparison results.

Other important factors in the selection process were the comments and direction received from the local jurisdictions represented in the area. Throughout the development of this project there has been continuous coordination with the City of Phoenix for the Phoenix-Goodyear Municipal Airport, the Southern Pacific Transportation Company for the railroad, MCDOT for MC85, Bartholomew Engineering for the Superfund site, and the City of Goodyear. Most of the above parties preferred the straight south alignment. Only MCDOT had reservations concerning the alignment not following the existing route. MCDOT, as mentioned previously, currently has plans for a new bridge located at the existing MC85 bridge. The plans are on hold and waiting for the results of this study. Their concern involved the bridge replacement and location of the new bridge. However, after discussing the potential of relocating the new bridge to the proposed location, MCDOT appeared to be receptive to the best hydraulic solution. The final arrangements and funding for the bridge portion of this study that need to be addressed are outside the scope of this report. The other parties have expressed, either by telephone conversations or written review comments, that Alignment A is the preferred alignment. The reasons for the preferences are not given here. For a detailed report of the telephone or written comments refer to the Technical Data Notebook.

The concrete lined channel is the recommended channel configuration in Segment 2. Alignment A has a very steep existing slope and produced undesirable hydraulics in the preliminary analyses of the concrete lined channel. However, the recommended alternative involving the concrete lined channel includes three drop structures to reduce the slope and produce subcritical flow with manageable flow velocities and depths. The original cost estimates for Segment 2 reported in Table 3 are $2,013,000 and $1,928,500 for the concrete and riprap lined sections, respectively. Although the riprap lined channel appears to be less expensive, the concrete lining provides a better material for constructing the drop structures than the riprap. Also, evidence of available rock in the near vicinity was not found. Soil cement, as mentioned previously, is also not practical due to the

natural soils in the area. For maintenance purposes, the concrete lined channel will be the most efficient and, therefore, require the least amount of maintenance effort. Furthermore, the difference in the original cost estimates may change because the drop structures, at some increase in cost, will reduce the required thickness of the concrete from 8" for supercritical flow to 6" for subcritical flow, for a decrease in cost.

The proposed channel alignment in Segment 2 provides a buffer of about 150 feet from the IMSALCO aluminum plant. The IMSALCO plant was evaluated as part of the (*Phase I Environmental Assessment*) conducted at the District's request. This assessment did not include any soil samples along the channel alignment adjacent to IMSALCO and no conclusions were made regarding the presence of any contamination associated with the IMSALCO plant that would impact the cost or feasibility of the Bullard Wash Outfall project. The Phase I Environmental Assessment did, however, recommend that soil tests be performed prior to design.

The East Local Tributary flow will be conveyed to the main channel via a collector channel placed on the north side of MC85. The design flow rate is 850 cfs and arrives from two drainage channels. The collector channel will be concrete lined producing subcritical flow and manageable flow velocities and depths. The collector channel will collect flow just upstream of the existing railroad and MC85 bridges. The collector channel will enter the main channel approximately 3 feet above the main channel flow line. This drop into the main channel will help ensure that larger flows are not allowed to back up into the lateral channel from the main channel. As mentioned previously, the two estimated hydrograph peaks do not occur at the same time. Refer to the existing condition section of this report for a description of the local tributary inflow. The HEC-2 models for both the main channel and the collector channel are located in Appendix D.

The existing EPA Superfund groundwater remediation effort has various facilities located throughout Segments 1 and 2. Information regarding the Superfund operations was received on January 27, 1995 and March 20, 1995 and is provided in the TDN. The recommended alignment is located near the far southwest corner of the airport where the Superfund activities are a minimum. The effects of the channelization of Bullard Wash are unlikely to impact the existing groundwater tables in the area. The alternative detention basins analyzed in Segment 1 were the primary concern of the City of Phoenix and Bartholomew Engineering regarding the Superfund operations. The alternative of

detention basins in Segment 1 has been eliminated for reasons stated in the previous section. Locations of wells and piping associated with the Superfund site have been reflected on the Recommended Alternative Exhibit 5. Several wells are in close proximity to both the main channel and the collector channel. Precise survey is recommended to locate the wells prior to final design. A thorough review by the responsible Superfund personnel will be necessary at all stages of the development and design of the project.

Bullard Wash Segment 3

Based on the chosen alternatives, there are four potential channel configurations and three potential alignment locations. Alignment A and B are approximately the same alignment but recognize different design constraints within Segment 3. Alignment C provided the one alternative which was located at the low point of the existing Bullard Wash channel. Alignment C is not preferred because the hydraulic concerns encountered along the west side of Estrella Parkway. The preliminary profile of existing ground and preliminary hydraulic grades of the alternative channel indicated that a very wide channel section would be required in this reach, approximately 150 feet for the concrete channel and 600 feet for the earth channel. Also, the property adjacent to Estrella Parkway will most likely be the frontage property of future light industrial development. A major channel along Estrella Parkway would be an obstacle to the future land development of this area. Continuing the channel further to the west only increases the length and therefore the costs of the channel. Alignment C is eliminated based on hydraulic inefficiency, high costs, and the potential to hinder future development along Estrella Parkway.

An alignment in the vicinity of Alignments A and B has been delineated as the recommended alignment. Actually, due to the Segment 2 alignment adjustment for the potential hazardous soil contamination, Alignment A is essentially the recommended alignment. This is the shortest route to the Bullard Wash outfall in the Gila River. The proposed alignment avoids the major utilities in the area including the transmission towers, sewer line and water re-use line and manholes, small utility poles, and various irrigation facilities. Alignment A and the recommended alignment in Segment 2 form a continuous channel without the need for a bend. The alignment has a slight bend just upstream of the BID canal to cross the canal at 90 degrees and connect with the recommended alignment in Segment 4. Alignment A also meets an existing low point in the south bank of the BID

canal believed to be a historical overflow point. This low point provides an excellent location at which to enter the Gila River floodplain.

The potential channel configurations included an earth lined channel, a composite channel, a concrete lined channel and a grouted riprap lined channel. The earth channel was eliminated based on the type of soil in the area and the anticipated flow velocities in the channel. Also, the earth channel was very wide and therefore increased the amount of right-of-way required and added length to the crossing structures and utility relocation and/or protection efforts. The cost comparison in Table 3 shows the earth lined section and the composite section to be essentially the same, however, the geometry and hydraulics of the composite channel are more stable.

The grouted riprap section was eliminated based on the availability of rock in the area and the width of the channel section. The riprap lined channel was potentially wider than the composite section and much more expensive than the other alternatives.

The concrete channel was eliminated based on economic comparisons. Table 3 reports the costs for Segment 3 as $ 2,944,100 and $ 2,084,000 for the concrete lined channel and the composite channel, respectively. Also, the aesthetics of a composite section are typically more favorable to the general public than a concrete lined section. The composite section produces manageable flow velocities and depths considering the predominant soil characteristics in the study area. Actually, it appears that a slightly degrading flow condition for the channel is preferred based on the potential sediment deposition. The potential for scour and erosion are reduced in this area because of the location of several defined "hard points". The BID canal, the Palo Verde pipeline, the City of Goodyear sewer, and the MC85 culvert will be protected and thus provide channel bottom stability in Segment 3. Based on the economic and hydraulic comparisons above, the recommended channel configuration in Segment 3 is the composite section.

Bullard Wash Segment 4

There is only one potential alignment in Segment 4 corresponding to the recommended alignment in Segment 3. The basic channel alignment extends the proposed channel from the end of Segment 3 and downstream of the drop structure approximately 1000 feet into the Gila River. The proposed wash channel is essentially perpendicular to the BID canal. Segment 4 lies entirely within the 100-

year Gila River floodplain limit and has a portion within the 100-year floodway limit. The proposed outfall ends outside the Corps 404 Waters of the U.S. limit. Refer to Exhibit 5 Sheet 1 of 2 for the recommended alignment location and the jurisdictional limits in Segment 4.

The proposed channel is an earth lined channel designed for the 100-year design discharge. The existing land profile indicates several localized low points and uneven terrain which will require fill material up to at least the 100-year Bullard Wash flow depth. The channel banks may require considerable maintenance due to the Gila River flows and potentially erosive Bullard Wash flow velocities. The Segment 4 channel will require the greatest maintenance consideration due to the sediment load anticipated in Bullard Wash and the location within the Gila River floodplain. Concrete, or other permanent lining is not recommended based on the potential of Gila River flood flows to undermine or destroy the channel. The costs associated with permanent lining in Segment 4 are not considered acceptable, if subject to overflow and damage by Gila River flooding.

Provisions are recommended to protect the proposed Segment 4 channel from overbank flows in the Gila River by placing fill on both sides of the channel. A potential benefit could be achieved for both the District and BID if the excavated material from the channelization could be placed along the Segment 4 channel. The fill would not only protect the proposed channel but also provide BID with necessary fill material to help elevate the land out of the 100-year Gila River floodplain. Placing fill in Segment 4 provides the District with a suitable disposal site for excavated earth. These options should be addressed by BID personnel and District staff and do not dictate the feasibility of this project. All cost estimates assume a 100 foot wide fill area along both sides of the Segment 4 channel. This concept is developed a little further in the Recommended Alternative section of this report.

Access in Segment 4 was mentioned by BID as a potential problem. A system of fences and/or gates along the proposed Bullard Wash channel will be utilized to restrict access to the adjacent lands. The drop structure at the downstream side of the canal overchute will prevent access between Segment 3 and Segment 4 within the proposed channel. The access allowed from the canal roads and farm roads in the study area will need to be determined by the individual user. The District has considered not fencing the entire project. However, fencing is typically used for flood control projects and will need to be addressed in the final design of this project. At this time and for the

purpose of developing cost estimates, it is assumed that there will be fencing along the length of the project and gates will be installed at each major access point.

Southern Pacific Railroad and MC85 Crossings

The recommended alignment for Segment 2 requires new crossing structures to be constructed for the railroad and MC85. The location is pre-determined by the alignment location illustrated on Exhibit 5 Sheet 1 of 2. There are two potential structures considered for the railroad crossing. The first structure is a trestle bridge similar to the existing major bridge on the main channel and other wash crossings in the area. The second is a multiple barrel concrete box culvert structurally capable of railroad loading. The recommended crossing is a multi-barrel concrete box culvert. It is anticipated that the cost associated with the railroad culvert would be significantly less than with the railroad bridge as is typically the case with highway culverts and bridges. The estimated unit costs are $75 and $45 per square foot for the bridge and culvert, respectively. The total costs are $100,500 and $61,200 for the bridge and culvert, respectively. This recommendation is contingent upon the acceptance by the railroad for a culvert structure as opposed to a standard railroad trestle bridge. If the culvert alternative is not acceptable, there is sufficient depth available to construct the standard trestle bridge. The culvert structure consists of six 10 foot wide by 6 foot high reinforced concrete box culverts. Upstream of the railroad crossing is a fully lined proposed channel section. The MC85 crossing is located approximately 150 feet downstream of the railroad crossing. The channel between the crossings is also fully lined. There would be approximately 5 feet of fill placed on top of the railroad culvert based on the proposed channel grade.

The MC85 crossing also has two alternatives to be considered for the crossing. The first alternative is a pre-cast standard girder bridge and the second is a multiple barrel concrete box culvert. The recommended crossing for MC85 is the concrete box culvert. There are two reasons for this recommendation. First, the cost of a culvert is significantly lower than for a bridge. And secondly, the bridge would require MC85 to be raised above its existing profile elevation to accommodate the bridge girders. The estimated unit costs are $50 and $25 per square foot for the bridge and culvert, respectively. The total costs are $247,900 and $127,700 for the bridge and culvert, respectively. The costs associated with the roadway improvements required for the bridge alternative are not included in the above cost comparison. The preliminary bridge plans received from MCDOT indicate that MC85 was to be raised approximately 8 feet. The bridge alternative for this study would raise the

roadway approximately 3 feet. The culvert structure consists of six 10 foot wide by 6 foot high reinforced concrete box culvert barrels. The channel upstream of the culvert will be fully lined. Downstream, the proposed channel section is a composite section. It will require a fully lined section for approximately 25 feet downstream of the culvert. The box culvert alternative will not require raising the existing roadway profile.

Buckeye Irrigation District Canal

The recommended crossing structure for the BID canal is a clear span slab bridge. Through discussions with the Buckeye Irrigation District, it is evident that a clear span slab bridge best accommodates their maintenance concerns. The invert of the 42" CMP overchute suspended from the Estrella Parkway bridge is the lowest acceptable elevation above the canal flow line. This criteria, in conjunction with the proposed Bullard Wash channel flow line and existing ground elevations, precludes the use of pre-cast standard concrete girders for bridge design. The girders were too deep and did not allow the necessary head room.

The multiple barrel concrete box culvert alternative provided the most head room but required two vertical walls to be in the canal. The canal receives flows from the Gila River which, at times, produces significant sediment load and debris. The maintenance problems associated with the vertical walls and the potentially debris and sediment laden water caused concern. One solution to the debris problem is to place a trash rack upstream of the culvert structure. However, the BID stated that this was not a preferred alternative unless the trash rack had a mechanical automated trash rake. Preliminary cost estimates and the required maintenance and operation of an automated trash rake appear to exceed the existing effort required for the BID canal operation. A preliminary cost estimate received for the trash rack and automated rake, not including the concrete structure to contain the machinery or other necessary improvements, was $93,000. The total cost of a clear span slab bridge is less than the total cost of a multiple barrel box culvert with an automated trash rack. Refer to Appendix F for the quantity and cost estimate.

The clear span slab bridge provides the desired head room without the vertical wall obstructions of the culvert. The slab thickness will be on the order of 24". The underside of the slab bridge would not only be higher in elevation than the bottom of the existing 42" CMP overchute at the Estrella Parkway bridge but would also provide more vertical headroom in relation to the canal water surface

than at the 42" CMP. The top of the bridge deck will serve as the bottom of the Bullard Wash channel. The abutments of the bridge will be vertical concrete walls and serve as the sides of the canal. The canal bottom will be lined with reinforced concrete to support and facilitate the use of maintenance vehicles. Additional channel protection within the canal approximately 25 feet upstream and downstream will be required at both ends of the bridge. Preliminary HEC-2 runs for the existing and proposed canal conditions are located in the TDN. The slab bridge overchute may need to be designed to accommodate maintenance access by BID maintenance crews. The Bullard Wash flows will be contained by vertical retaining walls on top of the bridge slab approximately 6 feet high. The maintenance access for the canal could utilize the slab bridge itself. Preliminary slab bridge structural calculations are included in Appendix E.

On the downstream side of the canal there will be a drop structure. The structure will consist of a vertical concrete drop or a steep slope concrete drop. The total height of the drop will be approximately 3 feet. An energy dissipation structure, such as the baffle chute drop in Photo #11, is not required because of the drop height. The Segment 4 channel will begin downstream of this drop. The canal bridge crossing and drop structure will require structural design in the final design of this project.

Utilities

The relocation and/or protection of utilities comprises a significant portion of the effort for this project. All the major utilities listed previously have been investigated and approximate procedures for relocating or protecting them have been obtained from the utility companies directly. The discussion on utility relocation and/or protection is preliminary and conceptual in nature. Pot-holing of underground utilities has not been initiated. A vertical measure-down and confirmation of elevation for the 96" diameter Palo Verde water re-use line and Goodyear 15" sewer line have been done. The costs associated with utility relocation and/or protection are generated from the utility companies preliminary estimates. The major utilities which require a significant effort or cost to relocate and/or protect are described below. Those utilities not included below are easily relocated at relatively low cost. All utility relocation cost estimates are included in either the TDN or Appendix F for the Chosen Alternatives or Recommended Alternative, respectively.

The 12" and 20" Santa Fe Pacific petroleum pipelines are major utility relocations and are relatively difficult to relocate. It is possible to relocate the lines but the associated costs are high. The 12" line is not currently in use and is filled with a stationary substitute fluid. The 20" line is in use and will require expensive procedures for the line to be interrupted and relocated. Angled bends must be used to go under the proposed channel as the depth of relocation is too great to under-excavate and relax the pipe. The proposed main channel alignment and configuration requires the petroleum lines to be relocated for approximately 200 feet. The East Local Tributary collector channel does not cross the lines.

The City of Goodyear gravity sewer along Broadway Road will be capped or encased with concrete. The proposed channel flow line is approximately 1.5 feet above the top of pipe. Survey shots of the manholes were obtained to verify as-built information. The manholes are avoided by the proposed channel alignment. The extent of the cap or encasement of the sewer will be completed in the final design phase of this project and approved by the City of Goodyear.

The 8" El Paso natural gas high pressure line crosses both the main Bullard Wash channel and the East Local Tributary collector channel. There is also a potential conflict with the horizontal location of the natural gas line with respect to the collector channel. The natural gas line runs parallel to and just south of the collector channel. Based on the utility maps, it appears that the collector channel can be constructed without a lateral relocation of the natural gas line. Refer to Exhibit 5 Sheet 1 of 2 for the location of the collector channel and proximity of the natural gas line. The procedure for vertical relocation of the natural gas line is relatively simple and inexpensive. Standard 45°or 90° bends can be installed to accommodate necessary vertical clearance. The length of the relocation is dependent on the existing depth of the natural gas line and the crossing locations of the channels. Pothole locations of this natural gas line are recommended prior to design.

The 96" diameter Palo Verde water re-use line will be encased with reinforced concrete. The APS and Palo Verde personnel have informed us that the desired minimum cover is 4 feet for ordinary crossings. However, at this depth, the project would require a very wide channel crossing and would increase costs dramatically. Subsequent telephone conversations have defined an alternative minimum depth if encasement is provided. Based on the information provided about other current encasement of the pipe, the proposed channel flow line is set approximately 1.5 feet above the top

of pipe. This will allow for either a 12" encasement with a 6" reinforced concrete lined channel bottom over the top of the pipe or an 18" encasement with the channel bottom lined from the pipe encasement upstream and downstream. Toe downs designed at the upstream edge of the lined section will prevent scour from impacting the pipe. The proposed flow line and top of pipe will be reviewed by APS and comments will be addressed in the final design of this project.

Irrigation Facilities

The existing irrigation tailwater flows in the Bullard Wash main channel will need to be separated from flood flows. The separation of irrigation flows is necessary to maintain the existing irrigation practices south of MC85 and to remove constant nuisance flow from the flood control channel. In Segment 1, the low flow channel will most likely be at the same grade as the main channel and located within the main channel banks. There is an existing low flow turnout just downstream from the end of Segment 1 and near the upstream end of Segment 2. At this approximate location, the low flow/irrigation tailwater channel will begin separation from the proposed Bullard Wash channel by grade as well. The low flow/tailwater channel will require a turn-out structure to separate it from the flood control channel. In Segment 2, the low flow/tailwater channel will be on the west side of and parallel to the main flood control channel.

The irrigation flows will need to cross the railroad and MC85 through a different structure than the main channel. The size and type of structure will be determined by the maximum desired irrigation flow based on input from local land users. A 36" diameter pipe is the size anticipated for the irrigation flows. Any excess flows which may enter the irrigation channel at the turn-out structure will be hydraulically restricted by the crossing structure under the railroad and MC85 and will overflow back to the main channel. South of MC85, the irrigation flows will return to the existing irrigation ditch and be conveyed to the west.

Irrigation tailwater flows also enter the study area via the East Local Tributary. These flows currently cross the railroad and MC85 at the existing major bridge structures and enter an existing tailwater sump south of MC85. These flows will be maintained and controlled in a manner similar to the main channel irrigation flows. A control structure in conjunction with a crossing structure will be used to deliver the desired maximum flow to the sump. Again, the amount of flow required will be determined through input by the local land users. Flows in excess of the desired maximum will

continue west in the East Local Tributary collector channel and enter the main channel. The intent of the irrigation channels and control structures is to maintain the existing irrigation practices by providing the desired amount of tailwater and, at the same time, to limit the amount of drainage or flood flows entering the irrigation system. The capacity and design of the irrigation channels and corresponding control structures for both the main channel and the local tributary will need to be investigated further in the final design.

The extensive irrigation facilities that exist in Segment 3 will be impacted by the proposed channel. There are seven existing irrigation ditches that cross the proposed alignment. Among them are an existing tailwater ditch from the irrigation sump to the existing Bullard Wash and low flow confluence just south of MC85, two minor tailwater ditches that drain local fields and are located north of the east-west farm roads, one major tailwater ditch that drains several local fields and is located just north of the BID canal, and three concrete-lined supply ditches that are located on the south side of the farm roads and provide water to multiple fields. In general, irrigation occurs from north to south and from east to west through the study area.

The excess irrigation flows which enter the existing sump from the East Local Tributary will outlet to the proposed Bullard Wash channel instead of continuing to the west. This will eliminate the tailwater ditch between the sump and the existing confluence. This is anticipated to be acceptable based on the current use and availability of tailwater in Segment 3. The irrigation tailwater which arrives from the East Local Tributary can either be stored in the sump and used for irrigation purposes or, when the sump is full, bypassed to the proposed Bullard Wash channel. The irrigation flows separated from the Bullard Wash channel in Segments 1 and 2 will continue to the west for irrigation of the fields located west of Estrella Parkway. If the tailwater arriving from the East Local Tributary is necessary for the irrigation practices west of Estrella Parkway, then either an inverted siphon or a pump must be used to convey the water under the proposed channel and back to the existing ditch. An inverted siphon may not be desirable due to the sediment load typically carried in the tailwater.

The tailwater ditches are earth cut and relatively shallow. Irrigation practices in this area basically flood the fields and, ideally, there would be no tailwater runoff to disposed of. The occasional tailwater runoff will be conveyed to the BID canal via a small tailwater collector channel located

along the east side of the proposed Bullard Wash channel. The collector channel will cross several farm roads and the BID canal maintenance road by pipe culverts. Excess tailwater and storm runoff that exceed the capacity of the collector channel will overflow the collector channel and enter the proposed Segment 3 channel north of the BID canal.

The supply ditches in Segment 3 provide water for the irrigation of multiple fields throughout the area and can not be removed. There are three supply ditches which will require inverted siphons to convey the water under the proposed Bullard Wash channel and connect to the west. The southern-most supply ditch of the three only supplies one field. If the operation and maintenance of an inverted siphon is overly difficult, then that field could be supplied from the next supply ditch to the north, thus, eliminating one inverted siphon. The design and implementation of the inverted siphons will need to be addressed in the final design of this project. Irrigation practices may change throughout the seasons and years. For the final design of this project, coordination with the current land user will be required.

RECOMMENDED ALTERNATIVE

The purpose of this section is to provide technical documentation supporting the alternative and alignment recommended in the previous section. Preliminary design calculations are presented in Appendix E of this report. Individual segments of Bullard Wash now form a continuous recommended alignment through the study area. The recommended alignment plan view and profile are illustrated in Exhibit 5 - Sheets 1 and 2 of 2 at the end of this section. Table 4, at the end of this section, contains the summary costs for each segment and the total project cost representing the entire recommended alternative. Appendix F contains quantity and cost estimate calculations for the recommended alternative.

General

The U.S. Army Corps of Engineers' computer program HEC-2 (September 1990 version, as implemented by the Boss Corporation, version 3.10) was used for hydraulic modeling of the Bullard Wash Outfall channel. The development of the conceptual channel design was based on 1" = 400' topographic mapping with 2-foot contour intervals. The mapping was prepared for the Flood Control District of Maricopa County (District) by Cooper Aerial of Phoenix, Inc., flight date December 22, 1989. Cross sections were taken from the topographic digital terrain model and input

into the HEC-2 model. The channel was modeled using channel improvement cards (CI) to aid in the optimization of channel geometry and to estimate cut and fill quantities for the project.

The 100-year flow of 3200 cfs was input into the hydraulic model. The starting water surface elevation in the HEC-2 model corresponded to the 10-year water surface elevation in the Gila River. The hydraulic capacity of the proposed channel was also evaluated for the 10-year channel flow (Q = 1400 cfs) with a starting water surface corresponding to the 100-year water surface elevation in the Gila River. The 10- and 100-year Gila River flows corresponding to the 10- and 100-year water surface elevations are 95,000 cfs and 250,000 cfs, respectively. Flow rates and water surface elevation information for the Gila River were obtained from the *FEMA Flood Insurance Study, Maricopa County, Arizona and INCORPORATED Areas,* by Dames and Moore, revised December 3, 1993. The vertical datum of the Dames and Moore Study is thought to be 1929 NGVD. However, no benchmark data was available for this study so it was not possible to confirm this.

Manning's "n" values were selected using the Maricopa County Flood Control District's *Drainage Design Manual: Hydraulics* as a guide. For concrete lined channel reaches, a Manning's "n" value of 0.019 was used; for earth lined channels, a value of 0.035 was used. For this analysis, composite channel sections were modeled using a Manning's "n" value of 0.025. These values may be further refined during the final design.

Sloping drop structures presented in this report consist of a concrete approach slab, a 1:1 sloping drop, and a concrete stilling basin below the drop to induce the hydraulic jump and prevent the development of local scour. See Figure 10 for an illustration of the sloping drop structure geometry.

The channel was designed as an incised channel, as it will be collecting lateral inflows at various locations along its length. At several places, where the natural ground is characterized by local low spots, some fill may be required up to a maximum height of 2.5 feet in order to meet the District's freeboard requirements.

The channel profile was determined based in part on freeboard requirements as defined in the District's *Drainage Design Manual.* Additionally, the channel was designed to flow in the subcritical flow regime with a Froude number less than 0.85, per District requirements.

The exact channel geometry and longitudinal slope will need to be refined during the final design process. It is recommended that new 1-foot contour interval topographic mapping be acquired for final design. This will enable the designer to identify local areas that require fill or to adjust the design to accommodate freeboard requirements. The following paragraphs describe the alternatives considered for each segment and provide engineering analysis to support the recommended concept.

Bullard Wash Segment 1

Segment 1, from Lower Buckeye Road to the end of the Phoenix-Goodyear Airport runway, is recommended to be a composite cross-section with an earth bottom and concrete banks. The channel bottom width varies from 85 feet upstream of section 9870 to 55 feet downstream of section 9570, and the longitudinal slope is 0.0017 ft/ft. At the upstream end of the project, the banks will be feathered out to match the existing ground. See Figure 11 for an illustration of the typical Segment 1 channel geometry.

Although the composite channel is recommended, a fully concrete-lined channel was also considered. The full concrete lining was originally proposed in the *Design Concept Report for Chosen Alternatives* in order to minimize the channel width near the airport runway clear zone. Since then, the channel alignment was moved further west, away from the airport, and the channel width restriction is no longer the major design constraint. Construction cost is now the major constraint, and is significantly reduced by using the composite section as opposed to the concrete section.

Due to the lack of nearby suitable native material, soil cement may not be feasible material for the hard banks of the composite section. Results of a "Mechanical Analysis of Soil and Aggregate" by Speedie and Associates dated 1/13/95 indicate that there is a high percentage of fine material (greater than 75 percent passing the #200 sieve) in all reaches of the proposed channel. There does not appear to be enough sand or larger aggregate present to result in a cost-effective use of soil cement. The results of the soil analysis can be found in Appendix E. Also, due to the lack of a nearby source of stone, riprap lining would be prohibitively expensive. Therefore, concrete lining is recommended for bank protection. However, this assumption should be reviewed prior to final design. The concept is workable with any of these materials.

A drop structure is required at the upstream end of the project where the natural ground transitions into the incised channel. The drop structure serves as a hard point to prevent upstream headcutting of the channel and to dissipate energy as the flow in Bullard Wash falls approximately 7 feet as it enters the channel. It also provides upstream property owners the opportunity to extend the channelization in the future.

Although the channel profile has been set with the goal of maintaining a minimum freeboard of one foot, fill is necessary at some isolated locations where there is a low spot in the natural ground. In those cases where the fill extends beyond the purchased channel right-of-way, temporary construction easements may be required. At these locations, the fill will be tied into the natural ground such that lateral flows are directed to the channel. The existing drainage patterns will not be changed.

The hard bank toedown depth for Segment 1 was calculated as 6 feet, with exceptions as discussed in the following sentences. Between cross sections 10170 and 11323, a west bank toedown depth of approximately 12 feet is recommended due to lateral inflows entering the channel from the west. Along the east (outside) bank of the 300-foot-radius curve at approximately Section 11275, a toedown depth of 9 feet is recommended as protection against bend scour. Calculations supporting these toedown depth recommendations can be found in Appendix E.

Another consideration in the design of the channel in Segment 1 is the conveyance of irrigation tailwater flows from upstream and adjacent fields. Presently, these flows are carried by a small ditch. A separate tailwater ditch to the west of the proposed channel was considered as a possible way to carry these flows. This concept was eliminated from further consideration because the steep slopes would require excessive earthwork or special hydraulic structures.

After large storm events, maintenance can be reduced by combining the tailwater channel within the main channel. It is therefore recommended that tailwater flows be carried by a typical concrete lined low flow ditch (see Exhibit 2) within the Bullard Wash channel at the toe of the west bank. This low flow channel should be sized to carry the same quantity of flow as the existing irrigation ditches. The tailwater flows will be carried into Segment 2, where they will be diverted out of the channel, as discussed in the following section. Maintenance access into the channel in Segment 1 would need to be provided by down-ramps.

Bullard Wash Segment 2

Segment 2 is mainly characterized by a steep natural ground gradient just north of the Southern Pacific Railroad tracks. In order to maintain a subcritical flow regime in the channel, drop structures are proposed within this reach. Between the drop structures, the channel is characterized by a slope of 0.0017 ft/ft, a bottom width of 55 feet (widening to 65 feet just north of the Southern Pacific Railroad tracks), and concrete lining. See Figure 12 for an illustration of the typical Segment 2 geometry.

Two drop structure options were considered for this reach. One is a two-drop option that would require drop structure heights of approximately 7.5 feet. The other is a three-drop option that would require drop structure heights of approximately 5 feet. As a general guideline, drop structures less than 6 feet in height are proposed wherever possible for public safety reasons. Therefore, the three drop structure option is recommended for Segment 2 of Bullard Wash. These concrete drop structures are the "sloping drop" type of structure (see Figure 10), with concrete stilling basins to induce a hydraulic jump and minimize scour.

Drop structure stilling basins in Bullard Wash can be drained by using several design options. These options are described in the following paragraphs and are illustrated in Figure 10.

1) Design the stilling basin bottom simply as an extension of the downstream channel, rather than being depressed one or two feet below the adjacent channel bottom. The stilling basin sill would consist of a concrete baffle structure protruding one or two feet above the channel bottom. A notch approximately one foot in width would be provided near the center of the channel to provide a direct outlet for water upstream of the baffle structure. Since the stilling basin is an extension of the channel bottom, it would be sloped to drain towards these notches in the baffle structure.

2) Use a baffle structure-type stilling basin sill as described in Item 1, but instead of a notch, provide a nuisance drain pipe extending form the stilling basin bottom to the downstream channel.

3) Eliminate the stilling basin entirely. Stilling basins are normally provided to control the location of the hydraulic jump. This is necessary when the downstream channel is totally or partially unlined to ensure that the high-velocity supercritical flow areas stays within the lined reach. In this case, however, the entire Segment 2 is lined. Therefore, there is no scour concern if the hydraulic jump extends further downstream than would otherwise occur with a stilling basin in place.

All of the above stilling basin options are feasible, but must be analyzed further in the final design phase before selecting a design alternative.

Although flow is subcritical between the drop structures, full concrete lining is recommended for this entire reach, specifically, between cross section 6865.9 and cross section 8100, to prevent scour and undermining of the drop structures.

A low flow diversion structure will be required for irrigation tailwater. It will consist of a vertical dam within the low flow channel, with a 36" pipeline inlet into which the low flows will enter. The 36" pipeline carries the irrigation tailwater flow to a proposed open ditch just west of the Bullard Wash channel. This ditch then carries flows southward to the Southern Pacific railroad where a 36" CMP enables flows to pass under the railroad. A similar structure also passes flows under MC85. The irrigation tailwater then flows into an existing irrigation ditch just south of MC85 and just west of the proposed Bullard Wash channel in Segment 3.

Just north of the Southern Pacific railroad tracks, a collector channel (capacity of 850 cfs) enters the Bullard Wash channel from the East Local Tributary. This proposed channel is concrete lined and carries runoff from the Phoenix-Goodyear Airport as well as from land east of the airport and north of the railroad tracks. The channel has an 8-foot bottom width and 2:1 side slopes. The channel extends approximately 2400 feet from the main channel to the existing Bullard Wash crossing of the Southern Pacific Railroad tracks. See Figure 13 for an illustration of the collector channel geometry.

The east bank of the proposed Bullard Wash channel is notched to accommodate the collector channel inflow. The collector channel flow line at the notch is approximately three feet above the main channel flow line, providing a small drop for the lateral inflows. Another drop structure is

proposed at the upstream end of the lateral channel where overland flows transition into the incised channel. This drop is six feet in height and is a sloping drop similar to the others along the main channel. Upstream of the proposed drop structure, the channel bottom is unlined and is feathered to match natural ground approximately 200 feet upstream of the drop.

Guide dikes or berms are proposed to direct overland flows upstream of this drop structure into the collector channel. These guide dikes extend from the top of the drop structure for a distance of approximately 200 feet and are approximately three feet in height. The recommended alignment of the north dike is a curved, quarter-ellipse shape per Arizona Department of Transportation spur dike standards. The recommended alignment of the south dike is parallel to the Southern Pacific Railroad tracks. The upstream end of the dike ties in to the railroad embankment to ensure that all flow along the embankment is directed into the channel.

At the Southern Pacific Railroad tracks, either a box culvert or a trestle bridge could be used. In the HEC-2 file, a 6-barrel 10' x 6' box culvert is modeled, providing a 100-year crossing with approximately 3.5 feet of freeboard to the top of the proposed channel lining. The box culvert model is the hydraulically worst case scenario. The standard trestle provides more conveyance and thus more freeboard than the box culvert. The box culvert is the recommended option because of cost savings. However, input and approval from Southern Pacific Railroad is required prior to the final design. The box culvert would be designed to support heavy loads due to the railroad.

A box culvert is recommended for the MC85 crossing of Bullard Wash. The proposed box culvert is a 6-barrel 10' x 6' RCBC, which allows approximately 1 foot of freeboard at the roadway and matches the 65-foot upstream channel bottom width. The 6-foot high RCBC was selected because it produced no impact to the existing MC85 roadway profile.

As in Segment 1, fill is necessary at some isolated locations where there is a low spot in the adjacent natural ground. Due to the use of drop structures, maintenance access into the channels in Segment 2 would need to be provided by down-ramps from the adjoining maintenance roads. Access also needs to be provided to the proposed irrigation low flow channel and airport property between the proposed Bullard Wash channel and the IMSALCO property.

Bullard Wash Segment 3

The profile of Segment 3 of the Bullard Wash Outfall channel was largely determined by utility constraints. Specifically, two underground pipe utilities cross the channel alignment within Segment 3. One is the City of Goodyear 15" diameter sewer line and the other a 96" diameter reclaimed water pipeline for the Palo Verde Nuclear Power Generating Station. The presence of these pipelines sets a minimum elevation for the channel flow line at both locations. A cover depth of 1.5 feet was allowed over the top of pipe in both cases. The 96" line is approximately 250 feet north of the BID Canal and the 15" line is located in the Broadway Road alignment.

In addition to these constraints, the box culvert at MC85 imposed a maximum channel flow line elevation, since a major goal in setting the channel profile was to minimize the impact to the MC85 roadway at the culvert crossing. The Southern Pacific Railroad crossing, on the other hand, did not impose a restriction on the channel profile, as the railroad track elevation is 3.5 feet higher than the MC85 pavement elevation. As a result of these constraints, the channel longitudinal slope is 0.0017 ft/ft.

Two channel lining options were considered for this segment of the channel: 1) a composite lining and 2) a concrete lining. Option 1, the composite lining, consists of an 85-foot wide earth bottom with 2:1 concrete sides. The depth of the channel ranges from 5 to 6 feet. Additional protection is necessary just upstream of the BID canal where overland flows from the east will enter the channel.

Option 2, the concrete lining, consists of a fully-lined channel section, with a 65-foot bottom width and 2:1 side slopes. The channel depth is the same as the composite lining option.

The composite channel lining option is recommended because scour is not a major concern in this reach of the channel. See Figure 14 for an illustration of the typical Segment 3 channel geometry. The presence of the "hard points" in the channel, including the box culverts at MC85, the pipeline crossings, and the BID canal crossing, reduce the likelihood of significant scour in the channel. The resulting cost savings is also significant compared to the concrete lining option.

In general, a minimum hard bank toedown depth of 6 feet is recommended for Segment 3. This value is based on examination of low flow channel incisement and bed form scour. Toedown calculations are provided in Appendix E.

Just north of the BID canal near cross section 2730, local inflow from the east will need to enter the channel. Refer to Figure 16 for profiles of the east channel bank and the water surface near cross section 2730. In that figure, a dip in the natural ground profile can be seen. At this location, the east bank of the channel must be notched for approximately 200 feet to accommodate the local inflow, meaning that no freeboard is provided. In this notched reach, an additional toedown depth corresponding to the depth of the notch is recommended. Placement of fill along the east bank at this location is recommended to provide additional freeboard as long as the notch is provided to allow lateral flows to enter the channel. Continuous fill along the west bank to provide one foot of freeboard within this reach of the channel is recommended.

The local inflow to Segment 3 at this location occurs from drainage sub-basins 364 and 365 of the White Tanks/Agua Fria ADMS. The 100-year discharge from these areas is estimated at approximately 800 cfs. This local drainage should be analyzed in more detail in final design.

At the BID canal, two crossing options were considered. The first is a 3-barrel 10' x 10' box culvert to carry canal flows. Bullard Wash channel flows would pass over the top of the box culvert structure. The second option, a slab bridge, would span the canal without any piers.

The slab bridge is recommended because the lack of piers allows canal flows to pass underneath with less risk of debris clogging. This option may be the more costly, but was chosen due to its increased hydraulic performance. Preliminary structural calculations for the slab bridge are included in Appendix E.

As a measure to reduce the cost of the canal crossing, it was attempted to minimize the width of the bridge slab crossing structure. Since the recommended width, 65 feet, is less than the upstream channel bottom width, a constriction transition just upstream of the canal crossing is necessary. The transition will be concrete lined and will extend upstream beyond the Palo Verde pipeline. This will provide scour protection for the pipeline.

Immediately downstream of the BID canal crossing, a 3-foot drop structure is needed both as a hard point to prevent headcutting into the BID canal and to lower the channel flow line as the channel daylights in the Gila River floodplain. An 8-foot cutoff wall depth is recommended at the downstream end of this drop structure, based on scour depth as calculated using the Schoklitsch (1932) equation. Refer to Appendix E for supporting calculations.

Two configurations for this drop structure were considered: a vertical drop structure and a sloping drop structure. The vertical drop structure is recommended because it is the most effective in preventing access between Segments 3 and 4, and because it is a more efficient energy dissipator. The drop structure design will be refined once the BID and the District personnel have provided input.

Bullard Wash Segment 4

Segment 4 consists of a mostly incised channel from the BID canal to the point where the channel daylights in the Gila River. As the channel passes through low points in the natural ground along its alignment, some fill is necessary to build up the channel banks to the 100-year Bullard Wash channel water surface elevation.

Downstream of roughly cross section 2410, the 10-year water surface elevation of the Gila River exceeds the banks of the incised channel, meaning that some reconstruction of these fill embankments may be necessary following flow events in the Gila River.

As an option, cut material from the proposed channel upstream of the BID canal could be placed on the west side of the Segment 4 channel, extending from the channel all the way to Estrella Parkway. The fill would be placed to an elevation matching the 100-year Gila River water surface elevation. This fill would provide significant protection to the west channel bank and would help to reduce maintenance requirements.

As a further option, additional fill could also be placed on the east side of the channel for approximately one hundred feet upstream in the Gila River in areas where the channel passes low points in the natural ground. In this way, the east channel banks would also be better protected from Gila River flows and would thus require less frequent maintenance.

This overbank area of the Gila River is a fringe district and relatively ineffective from a hydraulic standpoint. Placing fill as recommended will not have a significant impact on the Gila River flood water surface. However, environmental and archeological considerations may have an impact on options involving fill.

Segment 4 of the proposed channel system will be susceptible to scour/deposition from the Gila River. This segment will require annual maintenance to limit the growth of vegetation (salt cedar) and may require significant debris clearance following major flows in the Gila River. Periodic monitoring and maintenance of the channel, including clearing out any such growth is necessary to ensure that it performs as designed. Due to the relatively high potential of flood damage, capital expenses were minimized in the concept design of Segment 4.

A concrete lined channel was initially considered for Segment 4. However, this option was eliminated because the risk of damage to the lining from Gila River flows was too great considering the high cost of concrete lining. An earth channel, while requiring more frequent maintenance, costs much less to construct and maintain following flows in the Gila River.

The recommended alternative for Segment 4 involves a composite section in the north approximately one half of the segment (from the BID canal downstream to cross section 1940) and an earth section in the south approximately one half of the segment (from cross section 1940 downstream to cross section 1340). The composite section would utilize wire enclosed rock or "gabion mattress" lining on the channel sides and an earth bottom (see Figure 15A). This lining would stabilize the Segment 4 channel and prevent lateral migration. The gabion mattress lining is more flexible than concrete lining and better able to withstand potential overflows from the Gila River without significant damage. Gila River overflow would occur if the land adjacent to the Segment 4 channel were not filled as suggested previously. In any case, gabion mattress lining would require toe-down and turn-down at the top, bottom and ends to prevent undermining.

Cross section 1940 was selected as the downstream limit of the composite channel. Existing ground elevations in the Gila River drop significantly and Gila River low flow channels are encountered at this location. If lining were extended below this point, it would be subject to greater failure risk unless a large amount of fill were placed upstream of the Segment 4 channel and/or some extensive

continuous hard bank were established on the north bank of the Gila River. Downstream from cross section 1940, the channel would be earth sides and bottom with essentially the same cross section and slope as the composite channel (See Figure 15B).

Summary

The following is a summary of the recommended designs for each segment. Refer to the correct HEC-2 models BULRECOM.DAT and EASTLAT2.DAT for the water surface profiles and flow conditions.

Segment 1:

lining:	composite (earth bottom, concrete sides)
bottom width:	55 to 85 feet
side slopes:	2:1
longitudinal slope:	0.0017 ft/ft
drop structures:	1 sloping drop, 7.9 feet high
reach length:	3200 feet
approx R.O.W. width:	150 feet

Segment 2:

lining:	concrete sides and bottom
bottom width:	55 to 65 feet
side slopes:	2:1
longitudinal slope:	0.0017 ft/ft
drop structures:	3 sloping drops, 5.2 feet high each
SPRR crossing:	6-barrel 10' x 6' RCBC recommended
MC85 crossing:	6-barrel 10' x 6' RCBC
reach length:	1800 feet
approx R.O.W. width:	130 feet

Segment 2 East Local Tributary collector channel:

lining:	concrete sides and bottom
bottom width:	8 ft
side slopes:	2:1
longitudinal slope:	0.0028 ft/ft
drop structures:	2 sloping drops; 1-6 foot high @ upstream end, 1-3 foot high @ downstream end (main channel)
reach length:	2400 feet
approx R.O.W. width:	70 feet

Segment 3:

lining:	composite (earth bottom, concrete sides)
bottom width:	85 feet, narrowing to 65 feet north of BID canal
side slopes:	2:1
longitudinal slope:	0.0017 ft/ft
drop structures:	1 vertical drop, 3 feet high south of BID canal
BID canal crossing:	Clear span slab bridge
reach length:	4200 feet
approx R.O.W. width:	150 feet

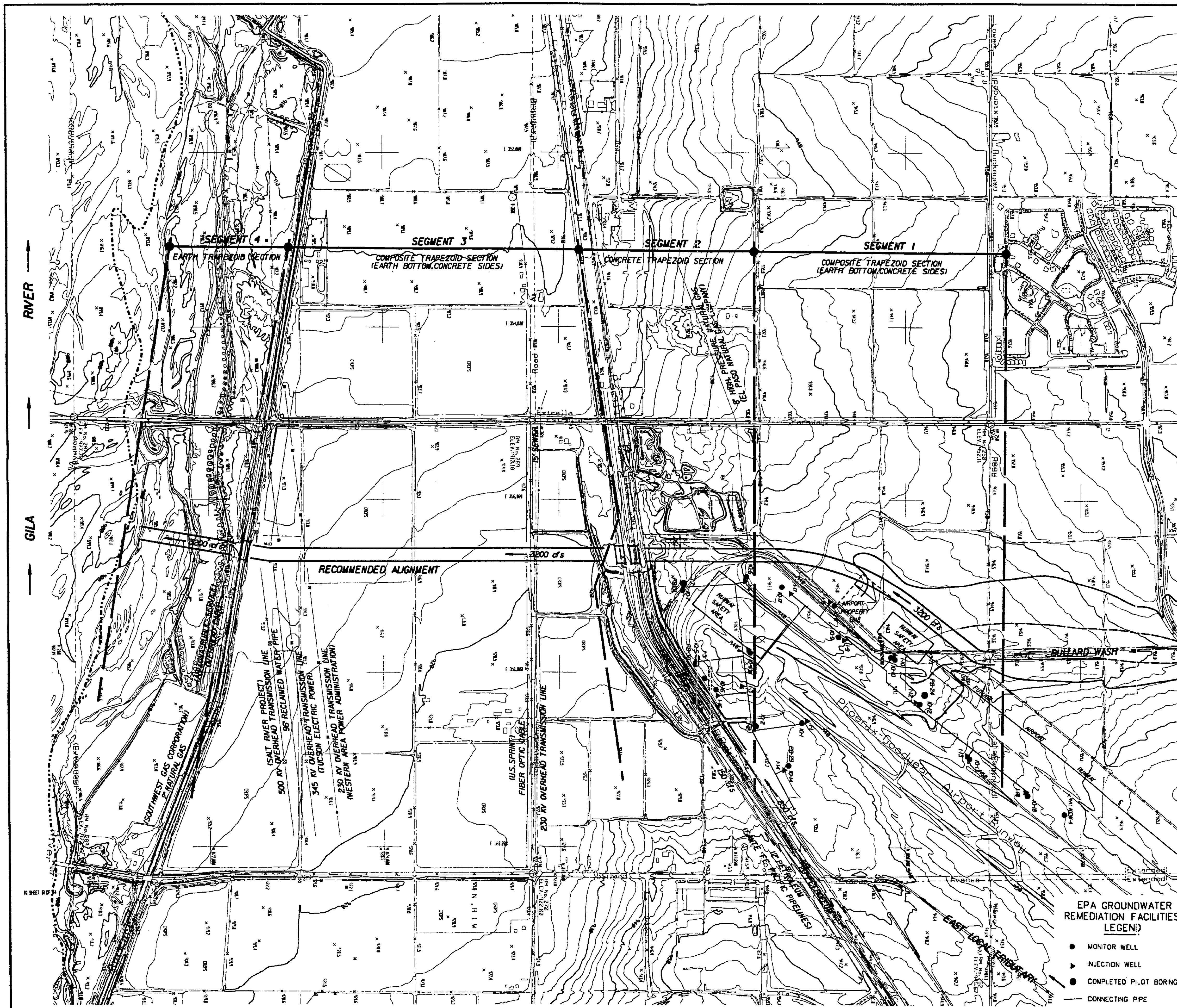
Segment 4:

lining:	upstream ± 500 feet-composite (earth bottom, gabion mattress sides)
	downstream ± 600 feet-earth (no lining)
bottom width:	65 feet
side slopes:	4:1
longitudinal slope:	0.0017 ft/ft
drop structures:	none
reach length:	1100 feet
approx R.O.W. width:	150 feet

TABLE 4
SUMMARY OF COSTS FOR RECOMMENDED ALTERNATIVE

Location	Description	Cost
Segment 1	Composite Channel (Alignment modified for future airport runway)	$ 1,808,500
Segment 2	Concrete Channel (Alignment A, Shifted East)	$ 2,695,600
Segment 3	Composite Channel (Alignment A)	$ 2,485,900
Segment 4	Composite/Earth Channel (Alignment A)	$ 346,800
	TOTAL PROJECT COST	**$ 7,336,800**

Note: Costs represent general construction costs, necessary crossing structures, major utility relocation and/or protection, 10% construction contingency, and right-of-way acquisition. Culvert structures as opposed to bridges are reflected for the SPRR and MC85 crossings. A clear span slab bridge is reflected for the BID canal crossing as opposed to a box culvert. Segment 2 includes the East Local Tributary collector channel cost. Supporting quantity and cost calculations are included in Appendix F. Total costs for each segment differ from those in Table 3 due to refinements and additions through the course of study.



BULLARD WASH OUTFALL FEASIBILITY STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FDC 94-06)

NOTES:

1. CHANNEL ALIGNMENTS ARE ILLUSTRATIVE AND DO NOT REPRESENT ACTUAL WIDTH.
2. DESIGN DISCHARGES ARE BASED ON WHITE TANKS/AGUA FRIA ADMS HEC-1 MODEL BY THE WLB GROUP REVISED BY STANLEY CONSULTANTS TO REFLECT FUTURE DYSART DRAIN AND WHITE TANKS #3 FLOOD CONTROL PROJECTS.

LEGEND

- RECOMMEMDED CHANNEL ALIGNMENT LOCATION
- CULVERT OR BRIDGE
- 850 cfs DESIGN DISCHARGE AND FLOW DIRECTION
- SEGMENT LIMITS
- OVERHEAD ELECTRIC (WITH SELECTED POLES\TOWERS)
- FIBER OPTIC CABLE (U.S. SPRINT)
- UTILITY / UTILITY OWNER
- CORPS 404 WATERS OF THE U.S. JURISDICTIONAL LIMIT
- BULLARD WASH OR LOCALIZED FLOODPLAIN LIMIT
- BULLARD WASH FLOODWAY LIMIT

N

400 200 0 400 800 1200

SCALE : 1" = 400'
CONTOUR INTERVAL=2'

BASE MAP: WHITE TANKS/AGUA FRIA ADMS (FCD 89-70)

MAPPING COMPANY: COOPER AERIAL OF PHOENIX INC. FLIGHT DATE 12-22-89

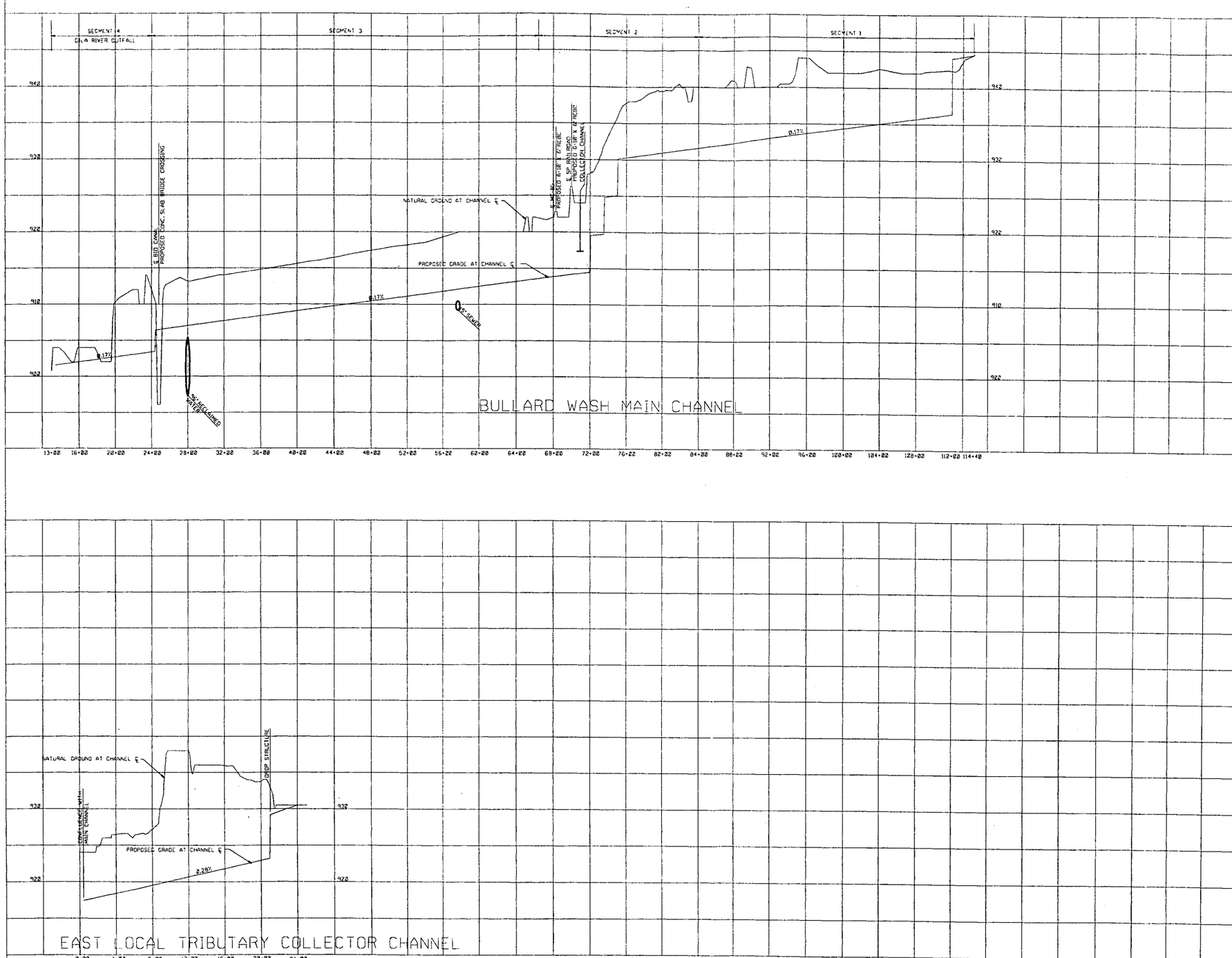
BULLARD WASH OUTFALL FEASIBILITY STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCD 94-06)

EXHIBIT 5
RECOMMENDED ALTERNATIVE
PLAN VIEW

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

DES. S.W.	CKD. G.S.B.
DRN. P.J.P.	APP.
DATE 6-26-95	
SHEET 1 OF 2	
DWG.	
PROJ. NO. 12278	



BULLARD WASH OUTFALL FEASIBILITY STUDY

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
(FCD 94-06)

SCALE : HORIZ. 1" = 400'
VERT. 1" = 5'

BULLARD WASH OUTFALL
FEASIBILITY STUDY

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
(FCD 94-06)

EXHIBIT 5
RECOMMENDED ALTERNATIVE
PROFILE

WOOD/PATEL
ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 (602) 912-5508

DES. S.W.	DKD. C.S.B.
DRN. P.J.P.	APP.
DATE 6-26-95	
SHEET 2 OF 2	
DWG.	
PROJ. NO. 12276	

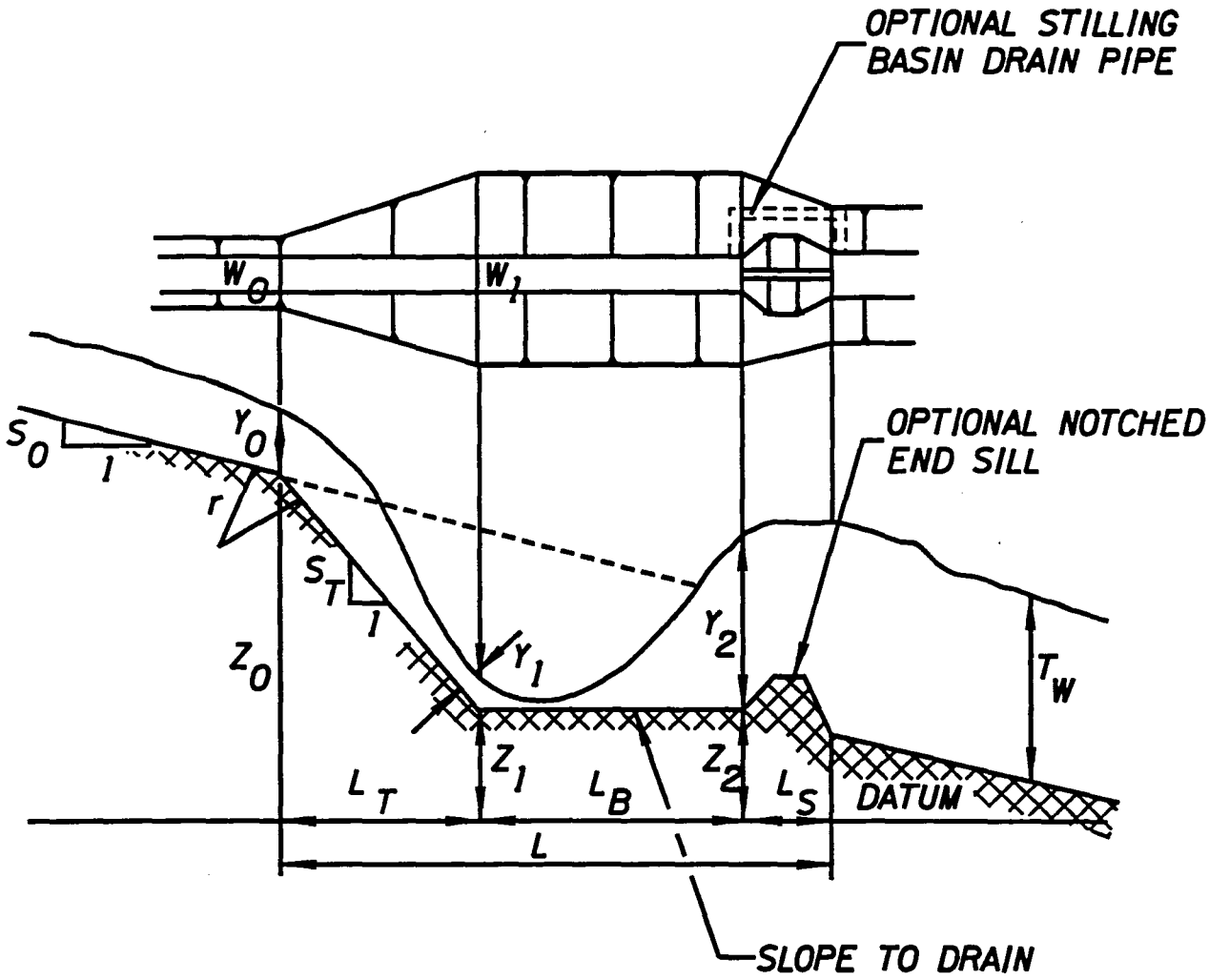


FIGURE 10

BULLARD WASH OUTFALL STUDY

SLOPING DROP STRUCTURE

WOOD/PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344

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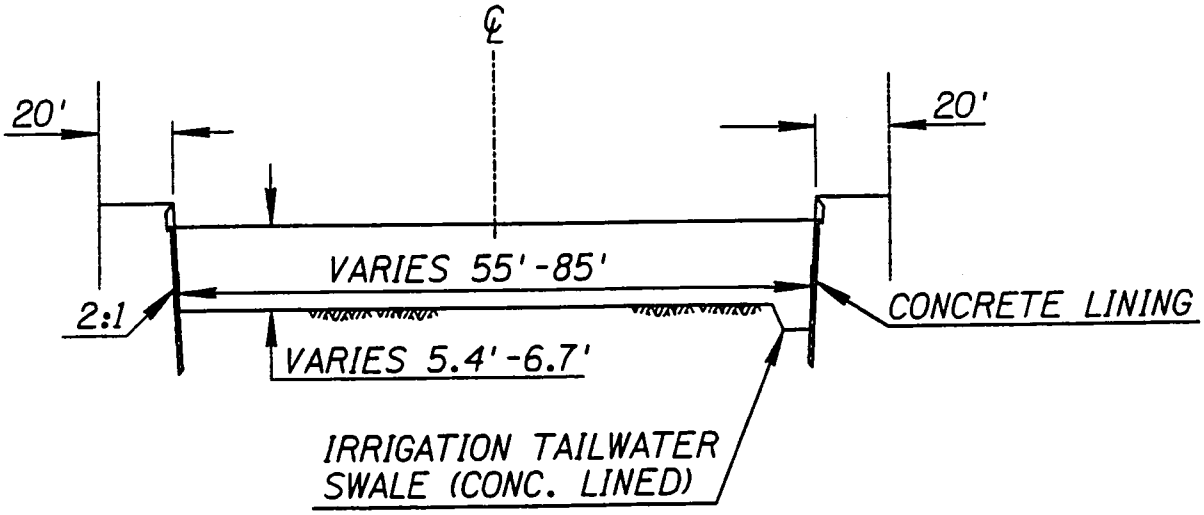

COMPOSITE CHANNEL
(LOOKING DOWNSTREAM)

FIGURE 11

BULLARD WASH
OUTFALL STUDY

SEGMENT 1
COMPOSITE CHANNEL

WOOD/PATEL
ASSOCIATES
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Hydrologists
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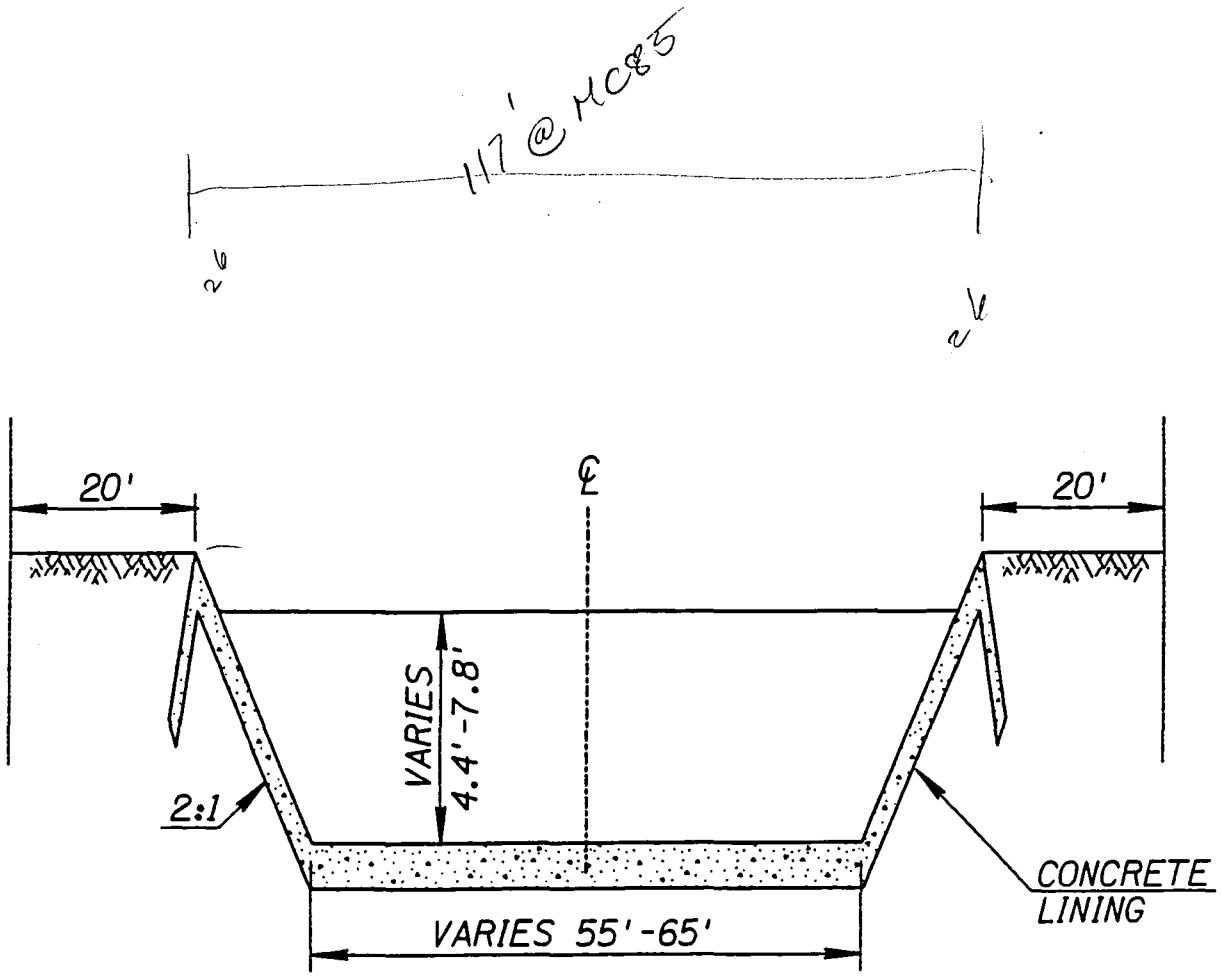

CONCRETE CHANNEL

FIGURE 12

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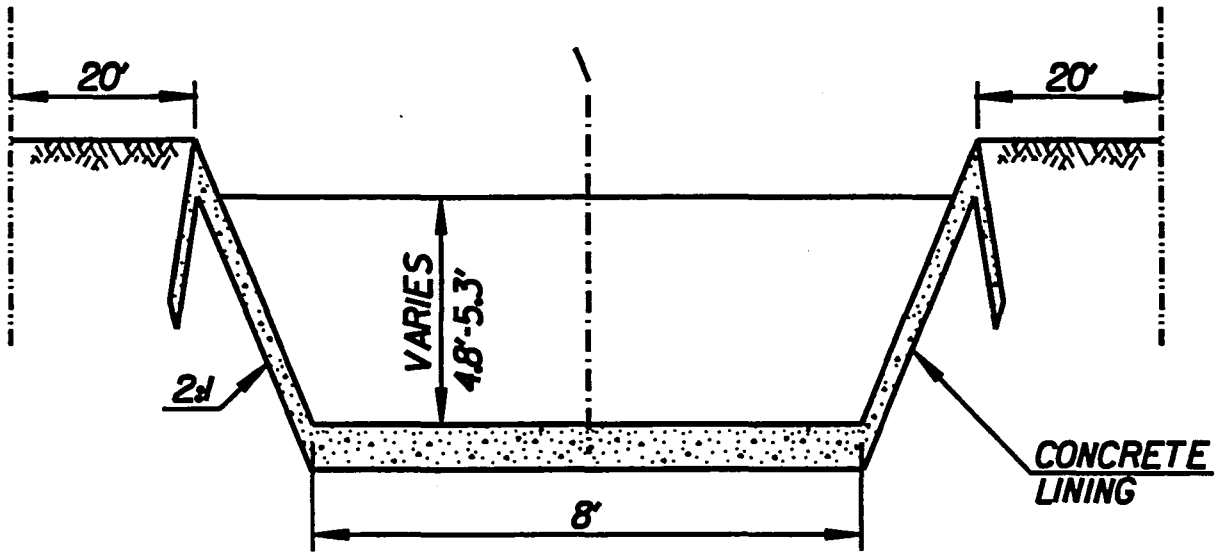
BULLARD WASH
OUTFALL STUDY

SEGMENT 2
CONCRETE CHANNEL

WOOD/PATEL
ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344



CONCRETE CHANNEL

FIGURE 13

BULLARD WASH
OUTFALL STUDY

SEGMENT 2
COLLECTOR

WOOD/PATEL
ASSOCIATES

V:/94K022/BULWASH3.DGN

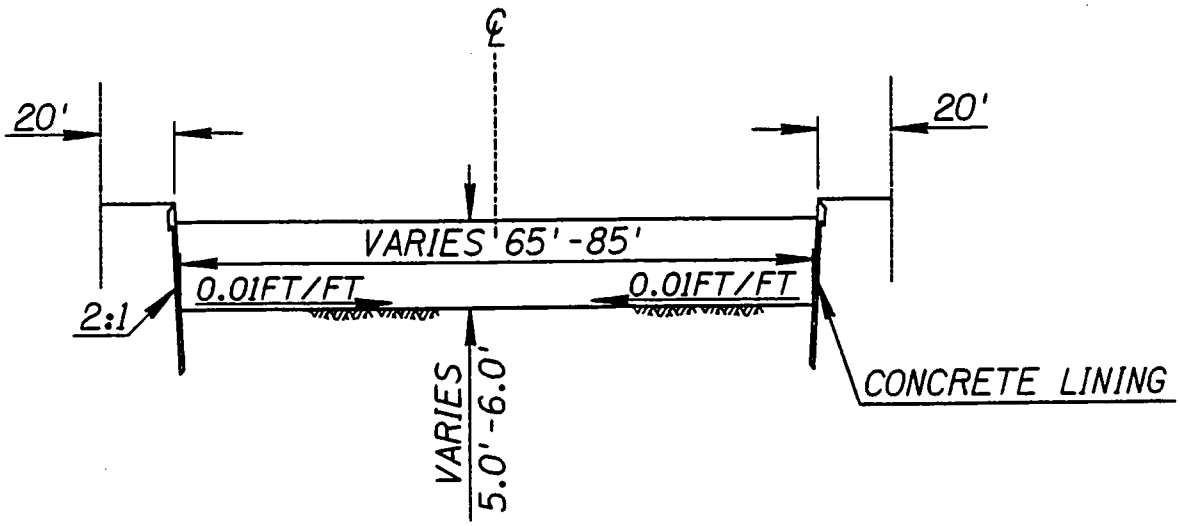


FIGURE 14

V:/941022/BULWASH3.DGN

BULLARD WASH
OUTFALL STUDY

SEGMENT 3
COMPOSITE CHANNEL

WOOD/PATEL
ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344

V:/941022/BULWASH3.DGN

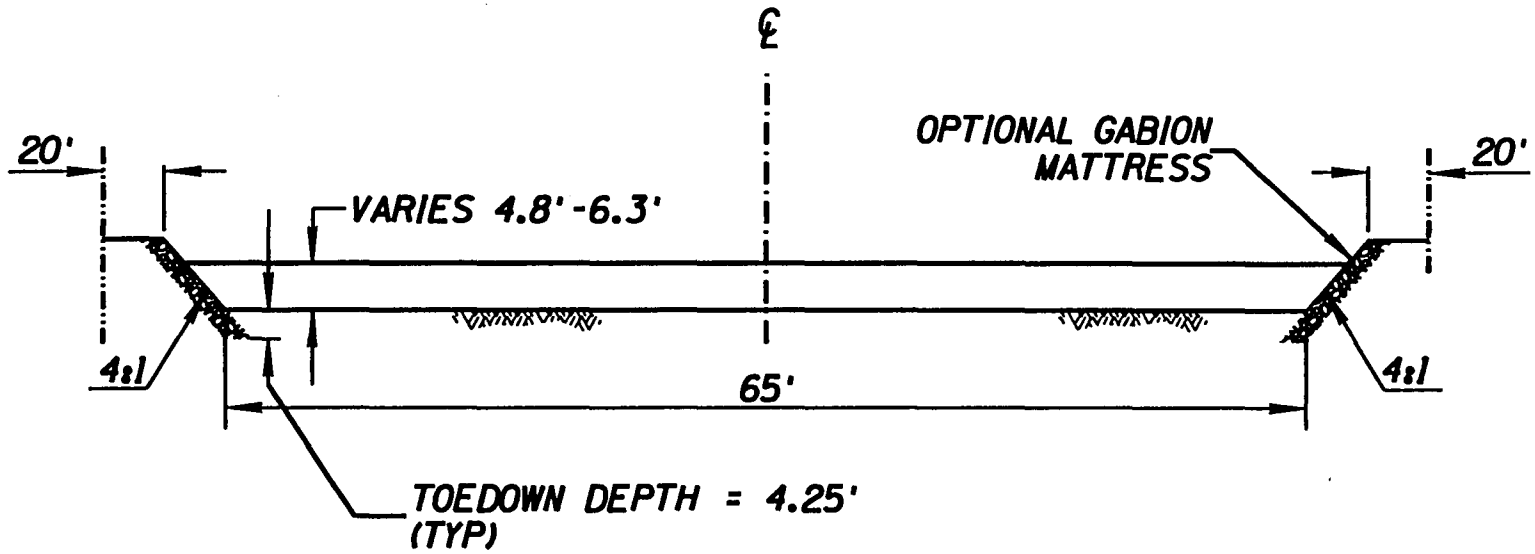


FIGURE 15A

BULLARD WASH OUTFALL STUDY

SEGMENT 4 UNLINED CHANNEL

WOOD/PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344

V:/941022/BULWASH3.DGN

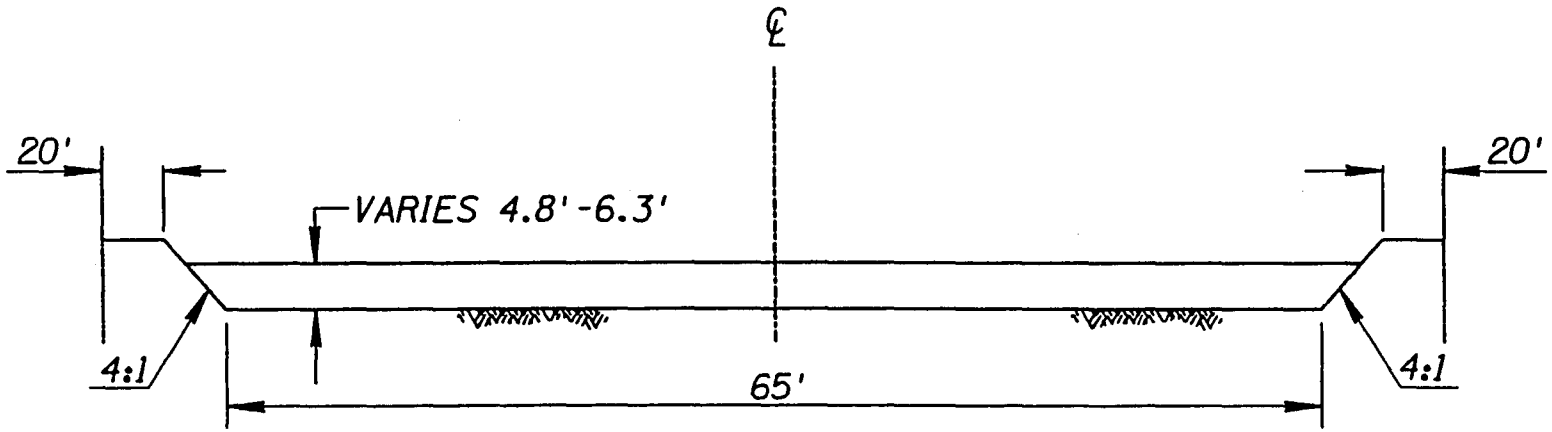
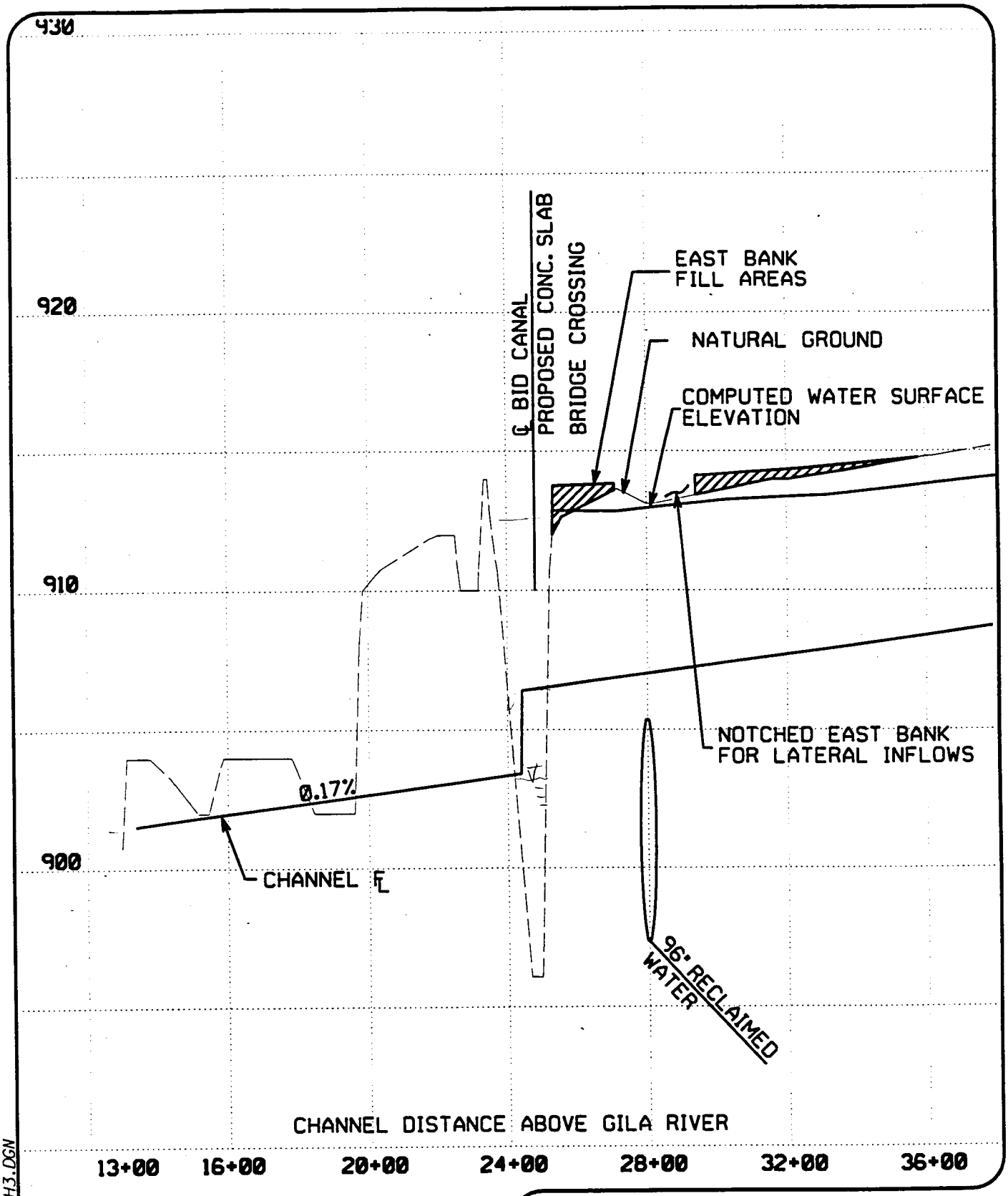


FIGURE 15B

BULLARD WASH
OUTFALL STUDY

SEGMENT 4
UNLINED CHANNEL

WOOD/PATEL
ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344



V:/941022/BULWASH3.DGN

FIGURE 16

BULLARD WASH OUTFALL STUDY

CHANNEL AND WATER SURFACE PROFILE

WOOD/PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344

HEC-1 AND HEC-2 FILENAMES AND DESCRIPTIONS

HEC-1

ADMS_H1	Original White Tanks/Agua Fria ADMS HEC-1 by the WLB Group provided by the District.
12278H1A	Revised HEC-1 for Bullard Wash reflecting flood control improvements, 100-year, 24-hour storm, and NOAA Atlas 2 depth-area reduction factors.
12278H1B	Same as 12278H1A except for a 100-year, 6-hour storm and FCDMC Hydrology Manual depth-area reduction factors.
12278H1C	HEC-1 model of Detention Basin 1.

HEC-2

ADMS_H2A	Original White Tanks/Agua Fria ADMS HEC-2 by the WLB Group provided by the District. The model includes the reach downstream of Yuma Road.
12278H2A	Revised HEC-2 model incorporating revised 100-year peak flow rates from 12278H1A.
BULRECOM.DAT	Proposed HEC-2 model of the main Bullard Wash channel for the Recommended Alternative.
EASTLAT2.DAT	Proposed HEC-2 model of the East Local Tributary for the Recommended Alternative.

REFERENCES

1. White Tanks/Agua Fria Area Drainage Master Study, Flood Control District of Maricopa County, The WLB Group, Inc., October 1992.

2. Flood Delineation Study of Salt-Gila Rivers (Preliminary), Flood Control District of Maricopa County, Michael Baker Jr., Inc., July 1994.

3. Gila River Study, Flood Control District of Maricopa County, Dames & Moore, Revised December 3, 1993.

4. Aerial Topography for White Tanks/Agua Fria Area Drainage Master Study, Flood Control District of Maricopa County, The WLB Group, Inc., Cooper Aerial of Phoenix, Inc., Flight Date: December 22, 1989, Contour Intervals: 2 Feet.

5. Standard Drawings, June 1992, Arizona Department of Transportation, Highways Division, Structures Section.

6. Construction Costs 1993, Arizona Department of Transportation, Highway Division, Contracts and Specifications Section.

7. HEC-1 Flood Hydrograph Package, Version 4.0, U.S. Army Corps of Engineers, Hydrologic Engineering Center, Davis, California, September 1990.

8. HEC-2 Water Surface Profiles, Version 4.6.2, U.S. Army Corps of Engineers, Hydrologic Engineering Center, Davis, California, May 1991.

9. Drainage Design Manual for Maricopa County, Volume I - Hydrology, Flood Control District of Maricopa County, June 1992.

10. Drainage Design Manual for Maricopa County, Volume II - Hydraulics, Flood Control District of Maricopa County, November 1991.

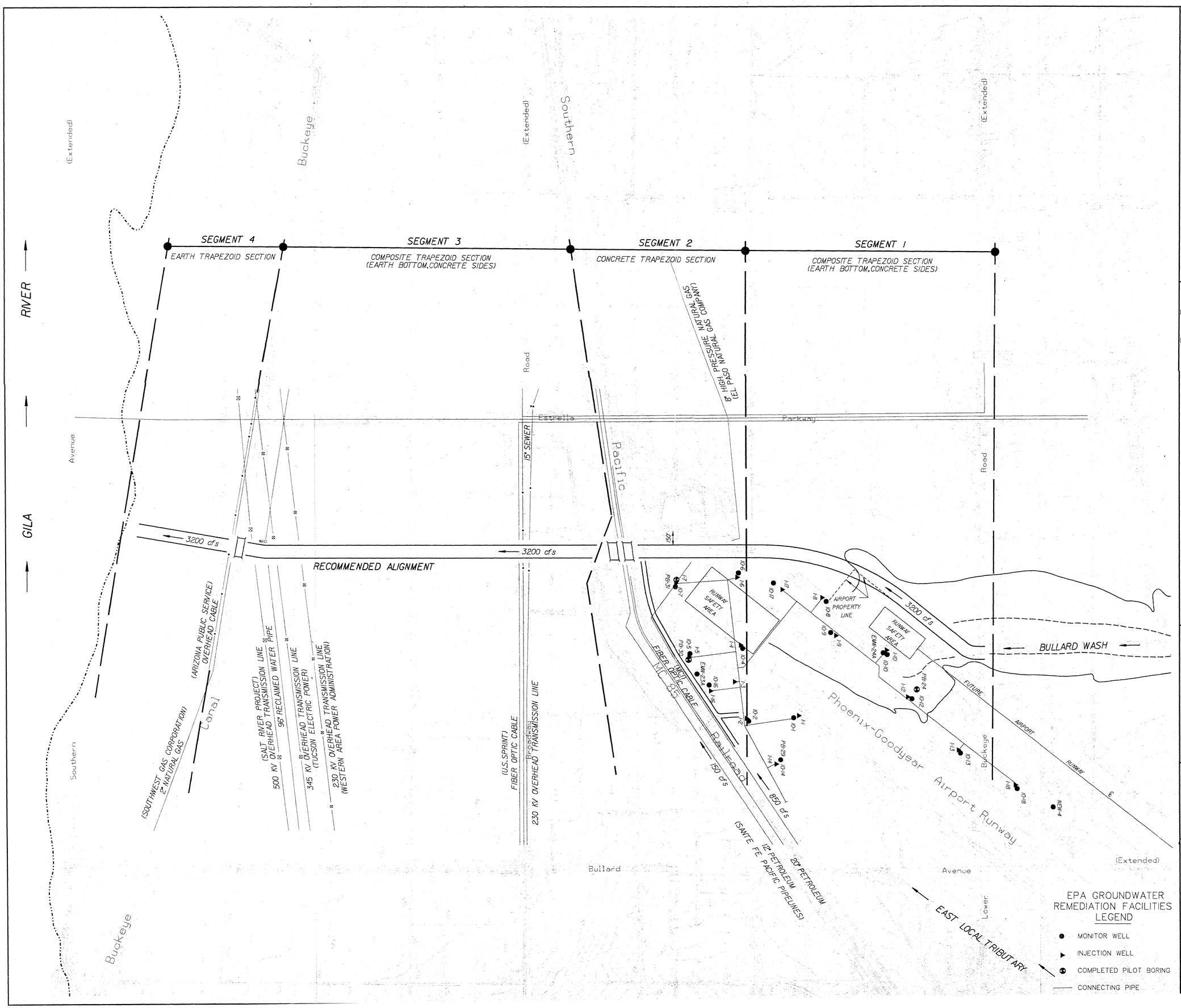
11. Drainage Design Manual for Maricopa County, Volume III - Erosion Control, Flood Control District of Maricopa County, January 1993.

12. Phase I Environmental Site Assessment of Areas Affected by the Bullard Wash Outfall Project in Goodyear, Arizona, Flood Control District of Maricopa County, Growth Environmental Services, Inc., May 1, 1995.

13. An Archeological Inventory of the Bullard Wash Outfall Project Area of Southern Goodyear, Arizona, Flood Control District of Maricopa County, Scientific Archeological Services, April 21, 1995.

14. Vegetation Survey for Bullard Wash Outlet Project, Flood Control District of Maricopa County, March 7, 1995.

15. MCDOT Construction Staging Report, Estrella Parkway from McDowell Road to Vineyard Avenue, Maricopa County Work Order #D 80440, Kirkham, Michael and Associates, July 1995.



BULLARD WASH OUTFALL FEASIBILITY STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FDC 94-06)

NOTES:

1. CHANNEL ALIGNMENTS ARE ILLUSTRATIVE AND DO NOT REPRESENT ACTUAL WIDTH.
2. DESIGN DISCHARGES ARE BASED ON WHITE TANKS/AGUA FRIA ADMS HEC-1 MODEL BY THE WLB GROUP REVISED BY STANLEY CONSULTANTS TO REFLECT FUTURE DYSART DRAIN AND WHITE TANKS #2 FLOOD CONTROL PROJECTS.

LEGEND

- RECOMMEMDED CHANNEL ALIGNMENT LOCATION
- CULVERT OR BRIDGE
- 850 cfs — DESIGN DISCHARGE AND FLOW DIRECTION
- SEGMENT LIMITS
- OVERHEAD ELECTRIC (WITH SELECTED POLES\TOWERS)
- FIBER OPTIC CABLE (U.S. SPRINT) — UTILITY / UTILITY OWNER
- CORPS 404 WATERS OF THE U.S. JURISDICTIONAL LIMIT
- BULLARD WASH OR LOCALIZED FLOODPLAIN LIMIT
- BULLARD WASH FLOODWAY LIMIT

N

400 200 0 400 800 1200

SCALE : 1" = 400'
CONTOUR INTERVAL=2'

BASE MAP: WHITE TANKS/AGUA FRIA ADMS (FCD 89-70)

MAPPING COMPANY: COOPER AERIAL OF PHOENIX INC. FLIGHT DATE 12-22-89

BULLARD WASH OUTFALL FEASIBILITY STUDY

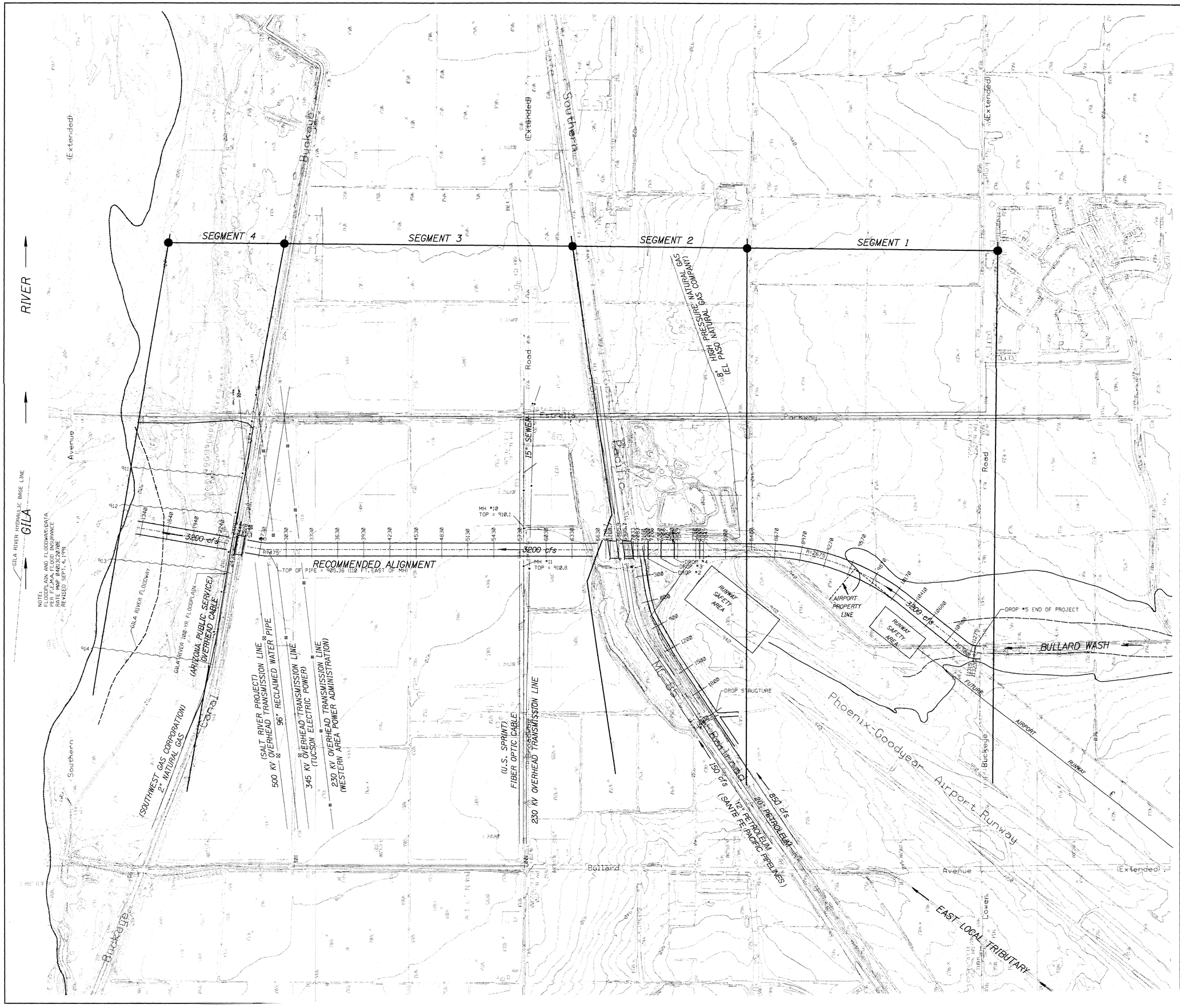
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCD 94-06)

Registered Professional Engineer (Civil) CERTIFICATE NO. 26887 G. SCOTT BUCHANAN Date Signed 7-27-95 ARIZONA, U.S.A.

EXHIBIT 5
RECOMMENDED ALTERNATIVE
PLAN VIEW

STANLEY CONSULTANTS, INC.
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016 • (602) 912-6500

DES. S.W.	CKD. G.S.B.
DRN. P.J.P.	APP.
DATE 6-26-95	
SHEET 1 OF 2	
DWG.	



BULLARD WASH OUTFALL FEASIBILITY STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FDC 94-06)

NOTES:

1. CHANNEL ALIGNMENTS ARE ILLUSTRATIVE AND DO NOT REPRESENT ACTUAL WIDTH.
2. DESIGN DISCHARGES ARE BASED ON WHITE TANKS/AGUA FRIA ADMS HEC-1 MODEL BY THE WLB GROUP REVISED BY STANLEY CONSULTANTS TO REFLECT FUTURE DYSART DRAIN AND WHITE TANKS #3 FLOOD CONTROL PROJECTS.

LEGEND

- RECOMMEMDED CHANNEL ALIGNMENT LOCATION
- CULVERT OR BRIDGE
- 850 cfs — DESIGN DISCHARGE AND FLOW DIRECTION
- 12535 — HEC-2 CROSS SECTION
- SEGMENT LIMITS
- OVERHEAD ELECTRIC (WITH SELECTED POLES TOWERS)
- FIBER OPTIC CABLE (U.S. SPRINT)
- UTILITY
- UTILITY OWNER
- CORPS 404 WATERS OF THE U.S. JURISDICTIONAL LIMIT
- BULLARD WASH OR LOCALIZED FLOODPLAIN LIMIT
- BULLARD WASH FLOODWAY LIMIT

N

400 200 0 400 800 1200

SCALE : 1" = 400'
CONTOUR INTERVAL=2'

BASE MAP: WHITE TANKS/AGUA FRIA ADMS (FCD 89-70)

MAPPING COMPANY: COOPER AERIAL OF PHOENIX INC. FLIGHT DATE 12-22-89

BULLARD WASH OUTFALL FEASIBILITY STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCD 94-06)

Registered Professional Engineer (Civil) CERTIFICATE NO. 29837 G. SCOTT BUCHANAN Date Signed 6-23-95 ARIZONA, U.S.A.

EXHIBIT 6

HEC-2 CROSS SECTION LOCATIONS

WOOD/PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344

STANLEY CONSULTANTS, INC.

DES.	A.J.R. CKD. J.J.H.
DRN.	REED APP.
DATE	6-23-95
SHEET	1 OF 1

APPENDIX B

REVISED WHITE TANKS/AGUA FRIA ADMS HEC-1 HYDROLOGY

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*            SEPTEMBER 1990             *
*             VERSION 4.0               *
*                                       *
*  RUN DATE  10/29/1994  TIME  10:38:33 *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                          HEC-1 INPUT                                                    PAGE  1

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    1           ID     BULLARD WASH OUTFALL FEASIBILITY STUDY          STANLEY CONSULTANTS, INC.
    2           ID     FLOOD CONTROL DISTRICT OF MARICOPA COUNTY                     SCI #12278
    3           ID     (FCD #94-06)                                        INPUT FILE: 12278H1A
    4           ID
    5           ID     100-YEAR, 24-HOUR STORM
    6           ID     SCS TYPE II RAINFALL DISTRIBUTION
    7           ID     NOAA ATLAS 2, VOLUME VIII-ARIZONA DEPTH-AREA REDUCTION
    8           ID     ONLY BULLARD WASH CONTRIB AREA CONSIDERED; HC FIELD 2, TAREA ADJUSTED
    9           ID
   10           ID     ***************************************************************************
   11           ID     THIS MODEL IS DERIVED FROM THE WHITE TANKS/AGUA FRIA AREA DRAINAGE MASTER
   12           ID     STUDY (ADMS) CONDUCTED BY THE WLB GROUP FOR FCDMC AND DATED OCTOBER 1992.
   13           ID     THE BASIC ADMS MODEL PARAMETERS AND METHODOLGY HAVE NOT BEEN CHANGED.  THE
   14           ID     SUB-BASINS CONTRIBUTING TO BULLARD WASH HAVE BEEN ISOLATED FROM THE REST
   15           ID     OF THE ORIGINAL WLB MODEL. THIS MODEL REFLECTS PROPOSED DYSART DRAIN AND
   16           ID     WHITE TANKS #3 FLOOD CONTROL IMPROVEMENTS.
   17           ID     ***************************************************************************
   18           ID
               *DIAGRAM
   19           IT       5                    300
   20           IO       5
   21           IN      15
   22           JD    4.03    .001
   23           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
   24           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
   25           PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
   26           PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
   27           PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
   28           PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
   29           PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
   30           PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
   31           PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
   32           PC    .983    .986    .989    .992    .995    .998    1.00   1.000   1.000   1.000
   33           JD    3.99      10
   34           JD    3.83      50
   35           JD    3.76     100
   36           JD    3.70     200

   37           KK     159
   38           KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 159
   39           BA     .58
   40           LG     .35     .34    3.81     .65     .00
   41           UI     66.    169.    316.    407.    539.    797.    641.    495.    375.    269.
   42           UI    139.    105.     66.     33.     20.     20.     20.      0.      0.      0.
   43           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

   44           KK    R159
   45           KM        ROUTE FLOW FROM CP159 TO CP160
   46           RS       1                -1       0
   47           RC    .022    .022    .025     830   .0036
   48           RX    1000    1001    1002    1020    1060    1150    1320    1440
   49           RY    1265    1265    1265    1264    1264    1266    1268    1270
1                                          HEC-1 INPUT                                                    PAGE  2

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   50           KK     160
   51           KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 160
   52           BA     .39
   53           LG     .35     .33    3.98     .34     .00
   54           UI     41.     92.    184.    238.    301.    435.    474.    354.    279.    216.
```

```
 55          UI    150.     79.     64.     41.     22.     13.     13.     13.     13.      0.
 56          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 57          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 58          KK   CP160
 59          KM        ADD HYDROGRAPHS AT CP160
 60          HC       2     .97

 61          KK    R160
 62          KM        ROUTE FLOW FROM CP160 TO CP161
 63          RS       3               -1       0
 64          RC    .075     .04     .04    2650   .0072
 65          RX    1000    1001    1210    1630    1670    1688    1689    1690
 66          RY    1259    1259    1258    1256    1256    1257    1257    1257

 67          KK     161
 68          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 161
 69          BA     .50
 70          LG     .49     .03    4.09     .77     .00
 71          UI     24.     24.     24.     70.     92.    114.    127.    140.    155.    176.
 72          UI    195.    236.    297.    307.    258.    225.    202.    184.    161.    145.
 73          UI    127.    115.     93.     70.     43.     42.     40.     36.     24.     24.
 74          UI     23.      7.      7.      7.      7.      7.      7.      7.      7.      7.
 75          UI      7.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 76          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 77          KK   CP161
 78          KM        ADD HYDROGRAPHS AT CP161
 79          HC       2    1.47

 80          KK    R161
 81          KM        ROUTE FLOW FROM CP161 TO CP163
 82          RS       6               -1       0
 83          RC     .08     .04     .04    5280   .0074
 84          RX    1000    1500    1910    2455    2470    2488    2489    2490
 85          RY    1226    1224    1222    1220    1220    1221    1221    1221

 86          KK     162
 87          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 162
 88          BA     .25
 89          LG     .50     .00    3.96     .59     .00
 90          UI     22.     35.     86.    114.    137.    169.    233.    270.    206.    170.
 91          UI    138.    110.     78.     44.     37.     26.     22.      7.      7.      7.
 92          UI      7.      7.      0.      0.      0.      0.      0.      0.      0.      0.
 93          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 94          KK    R162
 95          KM        ROUTE FLOW FROM CP162 TO CP163
 96          RS       8               -1       0
 97          RC     .08     .04     .04    5460   .0062
 98          RX    1000    1500    1910    2455    2470    2488    2489    2490
 99          RY    1226    1224    1222    1220    1220    1221    1221    1221

100          KK     163
101          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 163
102          BA     .75
103          LG     .50     .00    3.70     .42     .00
104          UI     37.     37.     37.    107.    140.    173.    193.    212.    235.    267.
105          UI    296.    361.    456.    458.    383.    336.    303.    274.    240.    216.
106          UI    187.    170.    133.    101.     65.     63.     60.     51.     37.     37.
107          UI     30.     11.     11.     11.     11.     11.     11.     11.     11.     11.
108          UI     11.      0.      0.      0.      0.      0.      0.      0.      0.      0.
109          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

110          KK   1I163
111          KM        ADD HYDROGRAPHS AT CP163
112          HC       2    1.0

113          KK   CP163
114          KM        ADD HYDROGRAPHS AT CP163
115          HC       2    2.47

116          KK    D163
117          KM        DIVERT TO CP176A FROM CP163
118          DT  DI176A
119          DI       0      72     427    1229    2615    4708    5777    6545    8336   11092
120          DQ       0       0       0       0       0       0       9      95     329     762

121          KK    D163
122          KM        RETURN DIVERT AT CP163
123          DR  DI176A

124          KK    R163
125          KM        ROUTE FLOW FROM CP163 TO CP176A
126          RS       6               -1       0
127          RC    .035    .035    .075    5280   .0040
128          RX    1000    1001    1002    1010    1025    1320    1620    1845
129          RY    1197    1197    1197    1196    1196    1198    1200    1202

130          KK    176A
131          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 176A
132          BA     .62
133          LG     .50     .00    4.09     .42     .00
134          UI     24.     24.     24.     24.     79.     89.    106.    118.    131.    139.
135          UI    151.    166.    182.    200.    236.    283.    318.    279.    245.    221.
136          UI    203.    189.    171.    155.    142.    129.    117.    105.     87.     69.
```

```
137        UI    46.    43.    41.    40.    37.    24.    24.    24.    21.     7.
138        UI     7.     7.     7.     7.     7.     7.     7.     7.     7.     7.
139        UI     7.     0.     0.     0.     0.     0.     0.     0.     0.     0.
140        UI     0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
```



```
LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

141        KK  CP176A
142        KM        ADD HYDROGRAPHS AT CP176A
143        HC       2    3.09

144        KK   D176A
145        KM        DIVERT TO CP191 FROM CP176A
146        DT   DI191
147        DI       0      47     164     349     497    1107    2599    4968    8289
148        DQ       0       0       0       0       0      60     278     719    1444

149        KK     174
150        KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 174
151        BA     .45
152        LG     .35     .33    3.90     .33     .00
153        UI     62.    218.    346.    474.    735.    574.    418.    294.    145.     94.
154        UI     57.     19.     19.     19.      0.      0.      0.      0.      0.      0.
155        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

156        KK    R174
157        KM        ROUTE FLOW FROM CP174 TO CP176
158        RS       7              -1       0
159        RC    .025    .025    .025    7020   .0073
160        RX    1000    1040    1100    1200    1600    1620    1630    1750
161        RY    1223    1222    1220    1218    1218    1220    1222    1224

162        KK     175
163        KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 175
164        BA     .28
165        LG     .35     .33    3.87     .33     .00
166        UI     38.    128.    207.    279.    440.    364.    267.    192.    103.     63.
167        UI     38.     15.     12.     12.      0.      0.      0.      0.      0.      0.
168        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

169        KK    D175
170        KM        DIVERT TO CP175A FROM CP175
171        DT   DI175A
172        DI       0      53     200     459     854    1367    2544    4308    6658    9613
173        DQ       0      53     200     459     854    1047    1478    2105    2915    3906

174        KK    R175
175        KM        ROUTE REMAINDER FROM CP175 TO CP176
176        RS       5              -1       0
177        RC    .025    .022    .022    6500   .0074
178        RX    1000    1100    1300    1420    1470    1558    1559    1560
179        RY    1226    1224    1222    1220    1220    1222    1222    1222

180        KK     176
181        KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 176
182        BA     .67
183        LG     .35     .34    4.03     .35     .00
184        UI     66.    128.    279.    362.    449.    588.    817.    642.    515.    407.
185        UI    319.    208.    115.     99.     66.     37.     20.     20.     20.     20.
186        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
187        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```



```
LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

188        KK   1I176
189        KM        ADD HYDROGRAPHS AT CP176
190        HC       2     .95

191        KK   CP176
192        KM        ADD HYDROGRAPHS AT CP176
193        HC       2    1.40

194        KK    R176
195        KM        ROUTE FLOW FROM CP176 TO CP191
196        RS       5              -1       0
197        RC    .035    .035    .075    5540   .0067
198        RX    1000    1001    1002    1025    1100    1400    1720    2050
199        RY    1163    1163    1163    1162    1162    1164    1166    1168

200        KK    D175
201        KM        RETURN DIVERT AT CP175
202        DR   DI175A

203        KK    R175
204        KM        ROUTE FLOW FROM CP175 TO CP175A
205        RS       2              -1       0
206        RC    .022    .022    .025    1560   .0013
207        RX    1000    1001    1002    1020    1055    1150    1190    1390
208        RY    1136    1136    1136    1134    1134    1136    1138    1140

209        KK    175A
210        KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 175A
211        BA     .47
212        LG     .35     .33    3.80     .65     .00
213        UI     42.     66.    162.    215.    258.    317.    439.    507.    388.    320.
214        UI    258.    207.    147.     82.     69.     48.     41.     13.     13.     13.
```

```
215          UI     13.     13.      0.      0.      0.      0.      0.      0.      0.      0.
216          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

217          KK  CP175A
218          KM        ADD HYDROGRAPHS AT CP175A
219          HC       2     .75

220          KK   R175A
221          KM        ROUTE FLOW FROM CP175A TO CP189
222          RS      11              -1       0
223          RC    .022    .022    .025    3300   .0009
224          RX    1000    1001    1002    1020    1035    1170    1460    1720
225          RY    1233    1233    1233    1232    1232    1234    1236    1238

226          KK     189
227          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 189
228          BA     .51
229          LG     .35     .35    4.17     .40     .00
230          UI     52.    110.    229.    298.    372.    516.    631.    471.    376.    293.
231          UI    219.    118.     88.     59.     43.     16.     16.     16.     16.      0.
232          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
233          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1                                          HEC-1 INPUT                                          PAGE  6

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

234          KK   CP189
235          KM        ADD HYDROGRAPHS AT CP189
236          HC       2    1.26

237          KK    R189
238          KM        ROUTE FLOW FROM CP189 TO CP190
239          RS       8              -1       0
240          RC     .08    .035    .035    6900   .0057
241          RX    1000    1270    1700    2040    2090    2118    2119    2120
242          RY    1212    1210    1208    1206    1206    1207    1207    1207

243          KK     190
244          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 190
245          BA     .86
246          LG     .50     .00    4.18     .42     .00
247          UI     44.     44.     44.    141.    176.    209.    238.    261.    292.    331.
248          UI    381.    482.    570.    492.    422.    374.    339.    297.    264.    232.
249          UI    207.    167.    124.     77.     76.     72.     59.     44.     44.     31.
250          UI     13.     13.     13.     13.     13.     13.     13.     13.     13.      0.
251          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
252          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

253          KK   CP190
254          KM        ADD HYDROGRAPHS AT CP190
255          HC       2    2.12

256          KK    R190
257          KM        ROUTE FLOW FROM CP190 TO CP191
258          RS       5              -1
259          RC    .075    .035    .035    5280   .0076
260          RX    1000    1260    2080    2310    2330    2358    2359    2360
261          RY    1182    1180    1178    1176    1176    1177    1177    1177

262          KK   D176A
263          KM        RETURN DIVERT AT CP176A
264          DR   DI191

265          KK   R176A
266          KM        ROUTE FLOW FROM CP176A TO CP191
267          RS       4              -1       0
268          RC    .035    .035     .08    5280   .0062
269          RX    1000    1001    1002    1025    1100    1400    1720    2050
270          RY    1163    1163    1163    1162    1162    1164    1166    1168

271          KK   1I191
272          KM        ADD HYDROGRAPHS AT CP191
273          HC       3    6.33

274          KK     191
275          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 191
276          BA     .99
277          LG     .50     .00    3.59     .41     .00
278          UI     39.     39.     39.     40.    127.    144.    170.    189.    210.    223.
279          UI    243.    267.    293.    322.    381.    459.    509.    443.    389.    353.
1                                          HEC-1 INPUT                                          PAGE  7

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

280          UI    324.    301.    272.    247.    227.    204.    186.    166.    135.    111.
281          UI     70.     68.     65.     63.     56.     39.     39.     39.     30.     12.
282          UI     12.     12.     12.     12.     12.     12.     12.     12.     12.     12.
283          UI     12.      0.      0.      0.      0.      0.      0.      0.      0.      0.
284          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

285          KK   CP191
286          KM        ADD HYDROGRAPHS AT CP191
287          HC       2    7.32

288          KK   CP191
289          KM        DIVERT TO CP208 FROM CP191
290          DT   DI208
291          DI       0      80     468    1339    2000    3000    4000    5000    6000
292          DQ       0      80     468    1339    1339    1339    1339    1339    1339
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293          KK    R191
294          KM        ROUTE REMAINDER FROM CP191 TO CP192A
295          RS       5              -1        0
296          RC     .08      .04      .04     2640    .0045
297          RX    1000     1350     1800     2200     2225     2278     2279     2280
298          RY    1148     1146     1144     1142     1142     1143     1143     1143

299          KK    192A
300          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 192A
301          BA     .50
302          LG     .50      .00     4.18      .41      .00
303          UI     22.      22.      22.      50.      79.      96.     110.     122.     133.     146.
304          UI    164.     180.     217.     267.     291.     246.     215.     194.     178.     160.
305          UI    142.     129.     114.     105.      85.      64.      43.      40.      37.      37.
306          UI     25.      22.      22.      17.       7.       7.       7.       7.       7.       7.
307          UI      7.       7.       7.       7.       0.       0.       0.       0.       0.       0.
308          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

309          KK  CP192A
310          KM        ADD HYDROGRAPHS AT CP192A
311          HC       2    7.82

312          KK   R192A
313          KM        ROUTE REMAINDER FROM CP192A TO CP192
314          RS       9              -1        0
315          RC     .08      .04      .04     2640    .0045
316          RX    1000     1350     1800     2200     2225     2278     2279     2280
317          RY    1148     1146     1144     1142     1142     1143     1143     1143

318          KK     192
319          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 192
320          BA     .50
321          LG     .50      .00     4.18      .41      .00
322          UI     22.      22.      22.      51.      80.      96.     110.     123.     134.     147.
323          UI    165.     182.     219.     270.     290.     245.     215.     193.     178.     159.
324          UI    142.     129.     114.     104.      83.      64.      41.      40.      37.      37.
325          UI     24.      22.      22.      16.       7.       7.       7.       7.       7.       7.
326          UI      7.       7.       7.       7.       0.       0.       0.       0.       0.       0.
327          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
```



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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

328          KK   CP192
329          KM        ADD HYDROGRAPHS AT CP192
330          HC       2    8.32

331          KK    D192
332          KM        DIVERT TO CP209 FROM CP192
333          DT   DI209
334          DI       0      126      480      965     3703     6169     9453
335          DQ       0      126      419      853     3404     5491     8154

336          KK    D192
337          KM        DIVERT TO CP210 FROM CP192
338          DT   DI210
339          DI       0       61      112      299      678     1299     2208
340          DQ       0        0        0        0        0      433      736

341          KK     188
342          KM        RUNOFFF HYDROGRAPH FROM SUB-BASIN 188
343          BA     .19
344          LG     .35      .33     4.11      .51      .00
345          UI     29.     120.     179.     274.     326.     221.     152.      76.      44.      24.
346          UI      9.       9.       0.       0.       0.       0.       0.       0.       0.       0.
347          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

348          KK    R188
349          KM        ROUTE FLOW FROM CP188 TO CP207A
350          RS       3              -1
351          RC    .025     .022     .025     5460    .0079
352          RX    1000     1100     1200     1210     1230     1335     1355     1510
353          RY    1240     1214     1212     1210     1210     1212     1214     1240

354          KK    207A
355          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 207A
356          BA     .50
357          LG     .35      .34     4.03      .55      .00
358          UI     53.     124.     244.     314.     400.     593.     595.     448.     350.     270.
359          UI    176.      93.      76.      53.      20.      16.      16.      16.       0.       0.
360          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

361          KK  CP207A
362          KM        ADD HYDROGRAPHS AT CP207A
363          HC       2    0.69

364          KK   R207A
365          KM        ROUTE FLOW FROM CP207A TO CP214
366          RS       2              -1
367          RC    .022     .022     .025     3200    .0069
368          RX    1000     1020     1030     1045     1065     1085     1325     1490
369          RY    1179     1176     1172     1170     1170     1172     1174     1176
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

370          KK     214
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371          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 214
372          BA     .16
373          LG     .35      .35     4.16      .38      .00
374          UI     22.      81.     127.     176.     267.     201.     146.     100.      47.      31.
375          UI     18.       7.       7.       7.       0.       0.       0.       0.       0.       0.
376          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

377          KK   CP214
378          KM        ADD HYDROGRAPHS AT CP214
379          HC       2    0.85

380          KK    R214
381          KM        ROUTE FLOW FROM CP214 TO CP215
382          RS       1               -1
383          RC    .022     .022     .025     2250   .0049
384          RX    1000     1010     1030     1045     1070     1150     1190     1310
385          RY    1061     1060     1058     1056     1056     1058     1060     1062

386          KK    215A
387          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 215A
388          BA     .35
389          LG     .35      .33     3.94      .34      .00
390          UI     68.     251.     379.     628.     557.     376.     232.     101.      62.      19.
391          UI     18.       0.       0.       0.       0.       0.       0.       0.       0.       0.

392          KK   R215A
393          KM        ROUTE FLOW FROM CP215A TO CP215
394          RS       2               -1
395          RC    .025      .02     .025     2800   .0046
396          RX    1000     1190     1425     1435     1455     1478     1479     1480
397          RY    1158     1156     1154     1152     1152     1159     1159     1159

398          KK     215
399          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 215
400          BA     .35
401          LG     .35      .34     3.71      .31      .00
402          UI     39.      95.     181.     233.     303.     457.     398.     306.     235.     177.
403          UI     98.      65.      45.      29.      12.      12.      12.      12.       0.       0.
404          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

405          KK   1I215
406          KM        ADD HYDROGRAPHS AT CP215
407          HC       2     .70

408          KK   CP215
409          KM        ADD HYDROGRAPHS AT CP215
410          HC       2    1.55
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

411          KK    R215
412          KM        ROUTE FLOW FROM CP215 TO CP233
413          RS       3               -1
414          RC     .02      .02     .025     5280   .0032
415          RX    1000     1010     1020     1030     1050     1070     1190     1540
416          RY    1043     1042     1040     1038     1038     1040     1042     1044

417          KK     233
418          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 233
419          BA     .50
420          LG     .35      .35     4.22      .39      .00
421          UI     49.      94.     206.     267.     331.     430.     604.     483.     386.     306.
422          UI    242.     163.      86.      76.      49.      31.      15.      15.      15.      15.
423          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
424          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

425          KK   CP233
426          KM        ADD HYDROGRAPHS AT CP233
427          HC       2    2.05

428          KK    R233
429          KM        ROUTE FLOW FROM CP233 TO CP234
430          RS       2               -1
431          RC    .075     .035     .035     2640   .0057
432          RX    1000     1200     1540     1930     1965     1980     2009     2010
433          RY    1031     1030     1028     1026     1026     1028     1029     1029

434          KK     216
435          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 216
436          BA     .51
437          LG     .46      .09     4.21      .40      .00
438          UI     26.      26.      27.      88.     108.     128.     145.     160.     180.     203.
439          UI    240.     304.     342.     285.     246.     220.     198.     172.     154.     134.
440          UI    117.      89.      63.      47.      44.      43.      27.      26.      26.       9.
441          UI      8.       8.       8.       8.       8.       8.       8.       8.       0.       0.
442          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

443          KK    R216
444          KM        ROUTE FLOW FROM CP216 TO CP234
445          RS       4               -1
446          RC     .02      .02      .04     5280   .0044
447          RX    1000     1015     1020     1035     1070     1080     1140     1400
448          RY    1031     1030     1028     1026     1026     1028     1030     1032

449          KK     234
450          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 234
451          BA     .53
452          LG     .50      .00     4.25      .40      .00
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453          UI     22.     22.     22.     35.     74.     87.    103.    113.    124.    134.
454          UI    148.    164.    179.    214.    259.    289.    250.    219.    197.    181.
455          UI    167.    149.    136.    122.    110.    100.     82.     63.     43.     39.
456          UI     37.     36.     30.     22.     22.     22.     11.      7.      7.      7.
457          UI      7.      7.      7.      7.      7.      7.      7.      7.      0.      0.
458          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

459          KK   1I234
460          KM        ADD HYDROGRAPHS AT CP234
461          HC       2    1.04

462          KK   CP234
463          KM        ADD HYDROGRAPHS AT CP234
464          HC       2    3.09

465          KK    D234
466          KM        DIVERT FROM CP234 TO CP248
467          DT   1D248
468          DI       0     290     677    3521   13393
469          DQ       0       0     174    1824   10224

470          KK    R234
471          KM        ROUTE REMAINDER FROM CP234 TO CP235
472          RS       3              -1
473          RC     .06    .025    .025    2640   .0023
474          RX    1000    1460    1900    1915    1930    1958    1959    1960
475          RY    1018    1016    1016    1014    1014    1015    1015    1015

476          KK     207
477          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 207
478          BA    1.00
479          LG     .50     .00    3.99     .39     .00
480          UI     39.     39.     39.     39.    125.    143.    169.    187.    209.    222.
481          UI    241.    263.    291.    316.    374.    445.    510.    454.    399.    358.
482          UI    329.    306.    280.    252.    231.    210.    191.    174.    145.    111.
483          UI     83.     68.     66.     63.     63.     40.     39.     39.     39.     14.
484          UI     12.     12.     12.     12.     12.     12.     12.     12.     12.     12.
485          UI     12.     12.      0.      0.      0.      0.      0.      0.      0.      0.
486          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

487          KK    D207
488          KM        DIVERT FROM CP207 TO CP208
489          DT   2D208
490          DI       0    1709   12182
491          DQ       0    1314    6607

492          KK    R207
493          KM        ROUTE REMAINDER FROM CP207 TO CP217
494          RS       8              -1
495          RC    .035    .035    .075    5280   .0057
496          RX    1000    1001    1002    1015    1060    1490    1740    2250
497          RY    1151    1151    1151    1150    1150    1152    1154    1156

498          KK     217
499          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 217
500          BA     .49
501          LG     .50     .00    4.19     .38     .00
502          UI     22.     22.     22.     54.     81.     98.    112.    124.    135.    150.
503          UI    167.    188.    233.    278.    278.    235.    207.    188.    172.    152.
504          UI    137.    122.    109.     95.     73.     54.     40.     38.     37.     31.
505          UI     22.     22.     22.      7.      7.      7.      7.      7.      7.      7.
1                                          HEC-1 INPUT                                          PAGE 12

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

506          UI      7.      7.      7.      7.      0.      0.      0.      0.      0.      0.
507          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

508          KK   CP217
509          KM        ADD HYDROGRAPHS AT CP217
510          HC       2    1.49

511          KK    D217
512          KM        DIVERT FROM CP217 TO CP218
513          DT   DI218
514          DI       0      90     884    6576   28127
515          DQ       0      51     163    1840   10674

516          KK    R217
517          KM        ROUTE REMAINDER FROM CP217 TO CP235
518          RS       7              -1
519          RC     .02     .03    .075    5280   .0036
520          RX    1000    1020    1035    1040    1050    1300    1640    1790
521          RY    1015    1014    1015    1014    1014    1016    1018    1019

522          KK     235
523          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 235
524          BA     .47
525          LG     .50     .00    4.27     .40     .00
526          UI     19.     19.     19.     28.     63.     74.     89.     98.    106.    115.
527          UI    126.    140.    152.    178.    216.    251.    228.    198.    177.    162.
528          UI    150.    135.    122.    112.     99.     91.     79.     62.     49.     34.
529          UI     33.     31.     31.     21.     19.     19.     19.      6.      6.      6.
530          UI      6.      6.      6.      6.      6.      6.      6.      6.      6.      0.
531          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
532          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
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533          KK   1I235
534          KM        ADD HYDROGRAPHS AT CP235
535          HC       2    1.96

536          KK   CP235
537          KM        ADD HYDROGRAPHS AT CP235
538          HC       2    5.05

539          KK    D235
540          KM        DIVERT FROM CP235 TO CP248
541          DT   2D248
542          DI       0     158     313    4490    9737
543          DQ       0       0     155    2380    5077

544          KK    R235
545          KM        ROUTE REMAINDER FROM CP235 TO CP236
546          RS       5              -1
547          RC     .04     .02     .02    5280   .0051
548          RX    1000    1640    1660    1675    1685    1778    1779    1780
549          RY    1097    1094    1095    1094    1094    1095    1095    1095
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

550          KK    D191
551          KM         RETURN DIVERTED HYDROGRAPH AT CP291 IN THE WTPHS1 HEC-1 MODEL
552          DR   DI208

553          KK    R191
554          KM        ROUTE FLOW FROM CP191 TO CP208
555          RS       5              -1       0
556          RC    .022    .022    .050    5280   .0040
557          RX    1000    1001    1002    1045    1110    1130    1160    1890
558          RY    1143    1143    1143    1142    1142    1143  1141.5    1150

559          KK     208
560          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 208
561          BA    1.00
562          LG     .50     .00    4.18     .42     .00
563          UI     40.     40.     40.     57.    133.    156.    188.    206.    224.    243.
564          UI    265.    294.    320.    371.    453.    523.    489.    424.    379.    346.
565          UI    321.    290.    262.    239.    215.    195.    172.    137.    110.     72.
566          UI     72.     67.     67.     50.     40.     40.     40.     17.     12.     12.
567          UI     12.     12.     12.     12.     12.     12.     12.     12.     12.      0.
568          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
569          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

570          KK   1I208
571          KM        ADD HYDROGRAPHS AT CP208
572          HC       2    8.32

573          KK    D207
574          KM        RETURN DIVERT AT CP207
575          DR   2D208

576          KK    R207
577          KM        ROUTE FLOW FROM CP207 TO CP208
578          RS       8              -1
579          RC    .075    .035    .035    5280   .0059
580          RX    1000    1001    1350    2000    2020    2038    2039    2040
581          RY    1056    1056    1054    1052    1052    1053    1053    1053

582          KK   CP208
583          KM        ADD HYDROGRAPHS AT CP208
584          HC       2    9.32

585          KK    D208
586          KM        DIVERT FROM CP208 TO CP219
587          DT   1D219
588          DI       0     599    5129    9299
589          DQ       0     406    1039    1295

590          KK    D208
591          KM        DIVERT FROM CP208 TO CP209A
592          DT  DI209A
593          DI       0     193    4090    8004
594          DQ       0     193    4066    7610
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

595          KK    R208
596          KM        ROUTE REMAINDER FROM CP208 TO CP218
597          RS      13              -1
598          RC    .025    .025    .035    5280   .0047
599          RX    1000    1001    1002    1010    1040    1055    1100    2010
600          RY    1123    1123    1123    1122    1122    1125    1124    1130

601          KK     218
602          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 218
603          BA    1.00
604          LG     .50     .00    4.20     .39     .00
605          UI     39.     39.     39.     41.    128.    145.    172.    191.    212.    225.
606          UI    246.    269.    295.    325.    385.    463.    514.    447.    393.    356.
607          UI    327.    304.    275.    249.    229.    206.    188.    168.    136.    112.
608          UI     71.     69.     65.     64.     57.     39.     39.     39.     31.     12.
609          UI     12.     12.     12.     12.     12.     12.     12.     12.     12.     12.
```

```
610          UI     12.      0.      0.      0.      0.      0.      0.      0.      0.      0.
611          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

612          KK   1I218
613          KM        ADD HYDROGRAPHS AT CP218
614          HC       2   10.32

615          KK    D217
616          KM        RETURN DIVERT AT CP217
617          DR   DI218

618          KK    R217
619          KM        ROUTE FLOW FROM CP217 TO CP218
620          RS      10              -1
621          RC    .075    .035    .035    5280   .0047
622          RX    1000    1190    1650    1980    2030    2048    2049    2050
623          RY    1123    1122    1120    1118    1118    1119    1119    1119

624          KK   CP218
625          KM        ADD HYDROGRAPHS AT CP218
626          HC       2   10.81

627          KK    D218
628          KM        DIVERT FROM CP218 TO CP237
629          DT   DI237
630          DI       0      68    1086   10670
631          DQ       0      68     664    2533

632          KK    D218
633          KM        DIVERT FROM CP218 TO CP219
634          DT   2D219
635          DI       0       0     422    8137
636          DQ       0       0      99    2461
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

637          KK    R218
638          KM        ROUTE REMAINDER FROM CP218 TO CP236
639          RS       5              -1
640          RC     .02     .02    .075    5280   .0040
641          RX    1000    1001    1002    1020    1090    1100    1210    1720
642          RY    1097    1097    1097    1096    1096    1099    1098    1102

643          KK     236
644          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 236
645          BA    1.00
646          LG     .50     .00    3.88     .45     .00
647          UI     38.     38.     38.     38.    113.    137.    160.    180.    199.    214.
648          UI    229.    251.    276.    297.    343.    419.    470.    474.    411.    366.
649          UI    334.    310.    288.    261.    236.    220.    196.    181.    161.    132.
650          UI    108.     70.     67.     64.     62.     60.     38.     38.     38.     38.
651          UI     12.     12.     12.     12.     12.     12.     12.     12.     12.     12.
652          UI     12.     12.     12.      0.      0.      0.      0.      0.      0.      0.
653          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

654          KK   1I236
655          KM        ADD HYDROGRAPHS AT CP236
656          HC       2   11.87

657          KK   CP236
658          KM        ADD HYDROGRAPHS AT CP236
659          HC       2   15.37

660          KK    D236
661          KM        DIVERT FROM CP236 TO CP249
662          DT   DI249
663          DI       0     236     411    6597   30351
664          DQ       0       0      38    2223    8777

665          KK    D236
666          KM        DIVERT FROM CP236 TO CP250
667          DT   1D250
668          DI       0     236     373    4374   21574
669          DQ       0       0     124    2251    8636

670          KK    R236
671          KM        ROUTE REMAINDER FROM CP236 TO CP237
672          RS       2              -1
673          RC     .02     .02     .02    2640   .0038
674          RX    1000    1070    1100    1120    1150    1178    1179    1180
675          RY    1079    1075    1082    1076    1076    1077    1077    1077

676          KK    209A
677          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 209A
678          BA     .50
679          LG     .50     .00    4.27     .41     .00
680          UI     22.     22.     22.     42.     75.     89.    103.    115.    124.    137.
681          UI    152.    166.    191.    238.    275.    260.    224.    199.    181.    167.
682          UI    149.    134.    121.    108.     99.     80.     62.     40.     38.     36.
683          UI     35.     26.     22.     22.     20.      7.      7.      7.      7.      7.
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

684          UI      7.      7.      7.      7.      7.      7.      0.      0.      0.      0.
685          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

686          KK    D208
```

```
687          KM        RETURN DIVERT AT CP208
688          DR  DI209A

689          KK    R208
690          KM        ROUTE FLOW FROM CP208 TO CP209A
691          RS       2              -1
692          RC     .75      .03     .03    2640   .0045
693          RX    1000     1490    1890    1950    1970    1998    1999    2000
694          RY    1130     1128    1126    1124    1124    1125    1125    1125

695          KK  CP209A
696          KM        ADD HYDROGRAPHS AT CP209A
697          HC       2    9.82

698          KK   D209A
699          KM        DIVERT FROM CP209A TO CP220
700          DT   1D220
701          DI       0       57    5215   28650
702          DQ       0       39    1907    3775

703          KK   D209A
704          KM        DIVERT FROM CP209A TO CP209
705          DT   2D209
706          DI       0       18    3308   24875
707          DQ       0        0     900   10854

708          KK   R209A
709          KM        ROUTE REMAINDER FROM CP209A TO CP219
710          RS       7              -1
711          RC    .035     .035    .075    5280   .0045
712          RX    1000     1001    1002    1010    1200    1500    1880    2100
713          RY    1113     1113    1113    1112    1112    1114    1116    1117

714          KK    D208
715          KM        RETURN DIVERT AT CP208
716          DR   1D219

717          KK    R208
718          KM        ROUTE FLOW FROM CP208 TO CP219
719          RS      22              -1
720          RC    .075     .075    .075    6070   .0059
721          RX    1000     1001    1002    1270    2570    2698    2699    2700
722          RY    1115     1115    1115    1114    1114    1115    1115    1115

723          KK     219
724          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 219
725          BA     .50
726          LG     .50      .00    4.21     .40     .00
727          UI     22.      22.     22.     45.     77.     92.    105.    119.    128.    140.
728          UI    158.     173.    202.    247.    289.    253.    220.    196.    180.    164.
729          UI    146.     132.    119.    106.     93.     72.     55.     39.     38.     36.
1                                           HEC-1 INPUT                                          PAGE 17

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

730          UI     33.      22.     22.     22.     12.      7.      7.      7.      7.      7.
731          UI      7.       7.      7.      7.      7.      0.      0.      0.      0.      0.
732          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.

733          KK   1I219
734          KM        ADD HYDROGRAPHS AT CP219
735          HC       2     9.82

736          KK   2I219
737          KM        ADD HYDROGRAPHS AT CP219
738          HC       2    10.32

739          KK    D218
740          KM        RETURN DIVERT AT CP218
741          DR   2D219

742          KK    R218
743          KM        ROUTE FLOW FROM CP218 TO CP219
744          RS      12              -1
745          RC    .075      .04     .04    2640   .0045
746          RX    1000     1110    1290    1600    2050    2108    2109    2110
747          RY    1101     1100    1098    1096    1096    1097    1097    1097

748          KK   CP219
749          KM        ADD HYDROGRAPHS AT CP219
750          HC       2   11.81

751          KK    D219
752          KM        DIVERT FROM CP219 TO CP238
753          DT   DI238
754          DI       0       70    1410   16774
755          DQ       0       68     990   10452

756          KK    D219
757          KM        DIVERT FROM CP219 TO CP220
758          DT   2D220
759          DI       0        2     420    6322
760          DQ       0        0     174    3073

761          KK    R219
762          KM        ROUTE REMAINDER FROM CP219 TO CP237
763          RS      14              -1
764          RC    .035     .035    .075    5280   .0036
765          RX    1000     1001    1002    1020    1300    1820    2099    2100
766          RY    1087     1087    1087    1086    1086    1088    1089    1089
```

```
767          KK    D218
768          KM        RETURN DIVERT AT CP218
769          DR   DI237
1                                    HEC-1 INPUT                                                    PAGE 18

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

770          KK    R218
771          KM        ROUTE FLOW FROM CP218 TO CP237
772          RS      14              -1
773          RC    .035     .035     .075    6700    .0046
774          RX    1000     1001     1002    1020     1300    1820    2099    2100
775          RY    1087     1087     1087    1086     1086    1088    1089    1089

776          KK     237
777          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 237
778          BA     .50
779          LG     .50      .00     3.61     .46      .00
780          UI     20.      20.      20.     23.      65.     74.     88.     98.    108.    115.
781          UI    126.     139.     151.    169.     204.    241.    255.    219.    195.    176.
782          UI    162.     150.     135.    123.     113.    100.     93.     80.     62.     49.
783          UI     35.      35.      32.     32.      23.     20.     20.     20.      9.      6.
784          UI      6.       6.       6.      6.       6.      6.      6.      6.      6.      6.
785          UI      6.       0.       0.      0.       0.      0.      0.      0.      0.      0.
786          UI      0.       0.       0.      0.       0.      0.      0.      0.      0.      0.

787          KK   1I237
788          KM        ADD HYDROGRAPHS AT CP237
789          HC       2   11.31

790          KK   2I237
791          KM        ADD HYDROGRAPHS AT CP237
792          HC       2   12.31

793          KK   CP237
794          KM        ADD HYDROGRAPHS AT CP237
795          HC       2   16.87

796          KK    D237
797          KM        DIVERT FROM CP237 TO CP250
798          DT   2D250
799          DI       0      292      346     629    3340   24038
800          DQ       0        0        0     103    1577   11878

801          KK    D237
802          KM        DIVERT FROM CP237 TO CP250A
803          DT  1D250A
804          DI       0      292      346     526    1763   12160
805          DQ       0        0       54     203     974    3738

806          KK    R237
807          KM        ROUTE REMAINDER FROM CP237 TO CP238
808          RS       1              -1
809          RC     .04      .02      .02    2640    .0049
810          RX    1000     1545     1560    1570     1585    1618    1619    1620
811          RY    1069     1066     1067  1062.5   1062.5    1067    1067    1067
1                                    HEC-1 INPUT                                                    PAGE 19

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

812          KK   1D192
813          KM        RETURN DIVERTED HYDROGRAPH FROM WTPHS1 HEC-1 MODEL
814          DR   DI209

815          KK    R192
816          KM        ROUTE FLOW FROM CP192 TO CP209
817          RS       5              -1       0
818          RC    .035     .035      .15    5280    .0045
819          RX    1000     1001     1002    1015     1200    1470    1840    2300
820          RY    1111     1111     1111    1110     1110    1112    1114    1116

821          KK     209
822          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 209
823          BA     .50
824          LG     .50      .00     3.85     .46      .00
825          UI     22.      22.      22.     51.      80.     97.    111.    123.    134.    148.
826          UI    166.     183.     221.    273.     289.    244.    215.    193.    178.    158.
827          UI    141.     128.     113.    103.      82.     64.     40.     40.     37.     37.
828          UI     23.      22.      22.     14.       7.      7.      7.      7.      7.      7.
829          UI      7.       7.       7.      7.       0.      0.      0.      0.      0.      0.
830          UI      0.       0.       0.      0.       0.      0.      0.      0.      0.      0.

831          KK   1I209
832          KM        ADD HYDROGRAPHS AT CP209
833          HC       2    8.82

834          KK   D209A
835          KM        RETURN DIVERT AT CP209A
836          DR   2D209

837          KK   R209A
838          KM        ROUTE FLOW FROM CP209A TO CP209
839          RS       7              -1
840          RC    .075     .035     .035    2640    .0057
841          RX    1000     1240     1700    1980     1990    3028    3029    3030
842          RY    1117     1116     1114    1112     1112    1113    1113    1113
```

```
843          KK   CP209
844          KM        ADD HYDROGRAPHS AT CP209
845          HC       2   11.32

846          KK    D209
847          KM        DIVERT FROM CP209 TO CP221
848          DT   1D221
849          DI       0      39    3983   16787
850          DQ       0      34    1666    5085

851          KK    D209
852          KM        DIVERT FROM CP209 TO CP210
853          DT   2D210
854          DI       0       5    2317   11702
855          DQ       0       0     703    5354
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

856          KK    R209
857          KM        ROUTE REMAINDER FROM CP209 TO CP220
858          RS       7              -1
859          RC    .035    .035    .075    5280   .0040
860          RX    1000    1001    1002    1015    1180    1560    1820    2050
861          RY    1091    1091    1091    1090    1090    1092    1094    1095

862          KK   D209A
863          KM        RETURN DIVERT AT CP209A
864          DR   1D220

865          KK   R209A
866          KM        ROUTE FLOW FROM CP209A TO CP220
867          RS      12              -1
868          RC    .075    .075    .075    6230   .0058
869          RX    1000    1001    1002    1090    1280    1298    1299    1300
870          RY    1140    1107    1107    1106    1106    1107    1107    1140

871          KK     220
872          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 220
873          BA     .50
874          LG     .50     .00    4.13     .41     .00
875          UI     22.     22.     22.     41.     74.     89.    103.    115.    124.    136.
876          UI    151.    166.    189.    237.    272.    262.    224.    199.    182.    167.
877          UI    150.    134.    122.    109.    100.     81.     62.     42.     38.     36.
878          UI     35.     27.     22.     22.     21.      7.      7.      7.      7.      7.
879          UI      7.      7.      7.      7.      7.      7.      0.      0.      0.      0.
880          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

881          KK   1I220
882          KM        ADD HYDROGRAPHS AT CP220
883          HC       2   10.32

884          KK   2I220
885          KM        ADD HYDROGRAPHS AT CP220
886          HC       2   11.82

887          KK    D219
888          KM        RETURN DIVERT AT CP219
889          DR   2D220

890          KK    R219
891          KM        ROUTE FLOW FROM CP219 TO CP220
892          RS       3              -1
893          RC    .075    .020    .020    2640   .0045
894          RX    1000    1460    1670    1700    1730    1768    1769    1770
895          RY    1088    1085    1087    1080    1080    1087    1087    1087

896          KK   CP220
897          KM        ADD HYDROGRAPHS AT CP220
898          HC       2   13.81
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

899          KK    D220
900          KM        DIVERT FROM CP220 TO CP239
901          DT   DI239
902          DI       0     735    9080   34764
903          DQ       0     537    3765    9314

904          KK    D220
905          KM        DIVERT FROM CP220 TO CP221
906          DT   2D221
907          DI       0     198    5315   25450
908          DQ       0     174    4011   17035

909          KK    R220
910          KM        ROUTE REMAINDER FROM CP220 TO CP238
911          RS      15              -1
912          RC    .035    .035    .075    5280   .0038
913          RX    1000    1001    1002    1020    1150    1670    1869    1870
914          RY    1033    1033    1033    1032    1032    1034    1036    1036

915          KK    D219
916          KM        RETURN DIVERT AT CP219
917          DR   DI238

918          KK    R219
```

```
919          KM        ROUTE FLOW FROM CP219 TO CP238
920          RS       8              -1
921          RC    .035     .035     .075     6230    .0051
922          RX    1000     1001     1002     1020     1150     1670     1869     1870
923          RY    1033     1033     1033     1032     1032     1034     1036     1036

924          KK     238
925          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 238
926          BA     .50
927          LG     .50      .00     3.52      .47      .00
928          UI     21.      21.      21.      34.      70.      83.      98.     108.     118.     127.
929          UI    140.     156.     170.     204.     247.     273.     234.     206.     185.     170.
930          UI    157.     140.     127.     115.     104.      93.      76.      60.      39.      37.
931          UI     35.      34.      27.      21.      21.      21.       9.       6.       6.       6.
932          UI      6.       6.       6.       6.       6.       6.       6.       6.       0.       0.
933          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

934          KK   1I238
935          KM        ADD HYDROGRAPHS AT CP238
936          HC       2   12.31

937          KK   2I238
938          KM        ADD HYDROGRAPHS AT CP238
939          HC       2   14.31
```



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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

940          KK   CP238
941          KM        ADD HYDROGRAPHS AT CP238
942          HC       2   19.37

943          KK    D238
944          KM        DIVERT FROM CP238 TO CP250A
945          DT  2D250A
946          DI       0      180      568     2711     8584    18252
947          DQ       0        0        0      184      837     2617

948          KK    D238
949          KM        DIVERT FROM CP238 TO CP251
950          DT   1D251
951          DI       0      568     2527     7747    15635
952          DQ       0        0      522     2262     4829

953          KK    R238
954          KM        ROUTE REMAINDER FROM CP238 TO CP239
955          RS       4              -1
956          RC    .075      .02      .02     2640    .0023
957          RX    1000     1230     1780     1790     1800     1810     1829     1830
958          RY    1062     1060     1058     1056     1056     1058     1059     1059

959          KK   2D192
960          KM        RETURN DIVERTED HYDROGRAPH FROM WTPHS1 HEC-1 MODEL
961          DR   DI210

962          KK    R192
963          KM        ROUTE FLOW FROM CP192 TO CP210
964          RS       7              -1        0
965          RC     .15      .15      .15     5900    .0054
966          RX    1000     1001     1002     1050     2400     2548     2549     2550
967          RY  1113.5     1113     1113     1112     1112     1113     1113   1113.5

968          KK     210
969          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 210
970          BA     .46
971          LG     .50      .00     3.84      .52      .00
972          UI     20.      20.      20.      42.      71.      85.      97.     110.     118.     130.
973          UI    146.     160.     188.     230.     266.     232.     202.     180.     165.     151.
974          UI    133.     121.     108.      97.      84.      65.      49.      36.      35.      33.
975          UI     29.      20.      20.      20.       9.       6.       6.       6.       6.       6.
976          UI      6.       6.       6.       6.       6.       0.       0.       0.       0.       0.
977          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

978          KK   1I210
979          KM        ADD HYDROGRAPHS AT CP210
980          HC       2    8.78
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

981          KK    D209
982          KM        RETURN DIVERT AT CP209
983          DR   2D210

984          KK    R209
985          KM        ROUTE FLOW FROM CP209 TO CP210
986          RS       6              -1
987          RC    .075     .035     .035     2560    .0030
988          RX    1000     1001     1630     2120     2250     2268     2269     2270
989          RY    1102     1102     1100     1098     1098     1099     1099     1099

990          KK   CP210
991          KM        ADD HYDROGRAPHS AT CP210
992          HC       2   11.78

993          KK    R210
994          KM        ROUTE FLOW FROM CP210 TO CP221
995          RS      14              -1
```

```
 996          RC    .035     .035     .075     5450    .0033
 997          RX    1000     1001     1002     1020     1280     1880     2469     2470
 998          RY    1083     1083     1083     1082     1082     1084     1086     1088

 999          KK    D209
1000          KM        RETURN DIVERT AT CP209
1001          DR   1D221

1002          KK    R209
1003          KM        ROUTE FLOW FROM CP209 TO CP221
1004          RS      22               -1
1005          RC    .075     .075     .075     5910    .0044
1006          RX    1000     1001     1002     1120     2150     2278     2279     2280
1007          RY    1091     1091     1091     1090     1090     1091     1091     1091

1008          KK     221
1009          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 221
1010          BA     .48
1011          LG     .50      .00     3.53      .48      .00
1012          UI     20.      20.      20.      36.      69.      82.      96.     106.     116.     126.
1013          UI    139.     154.     172.     210.     250.     258.     220.     194.     176.     162.
1014          UI    147.     132.     120.     107.      97.      84.      66.      50.      36.      35.
1015          UI     33.      33.      20.      20.      20.      15.       6.       6.       6.       6.
1016          UI      6.       6.       6.       6.       6.       6.       6.       0.       0.       0.
1017          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

1018          KK   1I221
1019          KM        ADD HYDROGRAPHS AT CP221
1020          HC       2   11.80

1021          KK   2I221
1022          KM        ADD HYDROGRAPHS AT CP221
1023          HC       2   12.26
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1024          KK    D220
1025          KM        RETURN DIVERT AT CP220
1026          DR   2D221

1027          KK    R220
1028          KM        ROUTE FLOW FROM CP220 TO CP221
1029          RS       4               -1
1030          RC    .075     .035     .035     2200    .0023
1031          RX    1000     1001     1470     1870     2160     2178     2179     2180
1032          RY    1082     1082     1080     1078     1078     1081     1081     1081

1033          KK   CP221
1034          KM        ADD HYDROGRAPHS AT CP221
1035          HC       2   14.75

1036          KK    R221
1037          KM        ROUTE FLOW FROM CP221 TO CP239
1038          RS      20               -1
1039          RC    .075     .075     .075     5750    .0032
1040          RX    1000     1001     1002     1320     2850     2998     2999     2999
1041          RY    1100     1071     1071     1070     1070     1071     1071     1100

1042          KK    D220
1043          KM        RETURN DIVERT AT CP220
1044          DR   DI239

1045          KK    R220
1046          KM        ROUTE FLOW FROM CP220 TO CP239
1047          RS      21               -1
1048          RC    .075     .075     .075     5750    .0045
1049          RX    1000     1001     1002     1320     2850     2998     2999     3000
1050          RY    1071     1071     1071     1070     1070     1071     1071     1071

1051          KK     239
1052          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 239
1053          BA     .48
1054          LG     .50      .00     3.56      .47      .00
1055          UI     21.      21.      21.      41.      72.      86.     100.     112.     120.     133.
1056          UI    148.     161.     188.     231.     269.     247.     213.     191.     173.     159.
1057          UI    142.     128.     115.     104.      92.      74.      59.      37.      37.      34.
1058          UI     34.      23.      21.      21.      17.       6.       6.       6.       6.       6.
1059          UI      6.       6.       6.       6.       6.       6.       0.       0.       0.       0.
1060          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

1061          KK   1I239
1062          KM        ADD HYDROGRAPHS AT CP239
1063          HC       2   14.29

1064          KK   2I239
1065          KM        ADD HYDROGRAPHS AT CP239
1066          HC       2   15.23
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1067          KK   CP239
1068          KM        ADD HYDROGRAPHS AT CP239
1069          HC       2   20.79

1070          KK    D239
1071          KM        DIVERT FROM CP239 TO CP251
```

```
1072          DT   2D251
1073          DI       0     283     389     786    3215
1074          DQ       0       0      69     333    2481

1075          KK    R239
1076          KM        ROUTE REMAINDER FROM CP239 TO CP240
1077          RS       5              -1
1078          RC     .05     .02     .02    2640   .0007
1079          RX    1000    1510    1755    1765    1775    1785    1809    1810
1080          RY    1058    1056    1054    1052    1052    1054    1055    1055

1081          KK     240
1082          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 240
1083          BA     .40
1084          LG     .50     .00    3.59     .48     .00
1085          UI     19.     19.     19.     53.     71.     89.     99.    110.    121.    136.
1086          UI    151.    180.    225.    249.    209.    182.    163.    149.    131.    117.
1087          UI    104.     92.     79.     59.     41.     34.     32.     32.     21.     19.
1088          UI     19.     11.      6.      6.      6.      6.      6.      6.      6.      6.
1089          UI      6.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1090          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1091          KK   CP240
1092          KM        ADD HYDROGRAPHS AT CP240
1093          HC       2   21.19

1094          KK    R240
1095          KM        ROUTE FLOW FROM CP240 TO CP241
1096          RS       5              -1
1097          RC    .025     .02     .02    3600   .0011
1098          RX    1000    1280    1620    1745    1770    1798    1799    1800
1099          RY    1056    1054    1052    1050    1050    1051    1051    1051

1100          KK     213
1101          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 213
1102          BA     .35
1103          LG     .35     .35    3.50     .28     .00
1104          UI     31.     51.    124.    164.    197.    244.    345.    374.    285.    235.
1105          UI    189.    151.    103.     56.     52.     32.     26.     10.     10.     10.
1106          UI     10.     10.      0.      0.      0.      0.      0.      0.      0.      0.
1107          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1108          KK    R213
1109          KM        ROUTE FLOW FROM CP213 TO CP212
1110          RS       8              -1
1111          RC    .025    .022    .025    4060   .0002
1112          RX    1000    1001    1140    1220    1290    1478    1479    1480
1113          RY  1077.7  1077.7    1076    1074    1074    1076  1077.7  1077.7
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1114          KK     212
1115          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 212
1116          BA     .54
1117          LG     .50     .00    3.59     .49     .00
1118          UI     18.     18.     18.     18.     34.     59.     69.     80.     87.     95.
1119          UI    102.    109.    116.    127.    137.    148.    171.    205.    226.    232.
1120          UI    203.    183.    167.    155.    146.    135.    124.    114.    106.     97.
1121          UI     89.     84.     70.     57.     49.     32.     32.     31.     30.     30.
1122          UI     22.     18.     18.     18.     17.      6.      6.      6.      6.      6.
1123          UI      6.      6.      6.      6.      6.      6.      6.      6.      6.      0.
1124          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1125          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1126          KK   SR212
1127          KM        STORAGE ROUTE THROUGH CP212
1128          RS       1    STOR       0       0
1129          SV       0    2.48   13.74   26.18   63.33
1130          SQ       0       0       0     483    6314
1131          SE  1077.1    1078  1079.4    1080    1081

1132          KK   CP212
1133          KM        ADD HYDROGRAPHS AT CP212
1134          HC       2    0.89

1135          KK    R212
1136          KM        ROUTE FLOW FROM CP212 TO CP221A
1137          RS      11              -1
1138          RC    .025    .022    .025    5000   .0002
1139          RX    1000    1001    1070    1090    1220    1287    1289    1290
1140          RY    1077    1077    1076    1074    1074    1079    1079    1079

1141          KK     211
1142          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 211
1143          BA     .49
1144          LG     .50     .00    3.69     .52     .00
1145          UI     21.     21.     21.     40.     72.     86.    100.    112.    121.    132.
1146          UI    147.    162.    183.    231.    264.    258.    220.    196.    178.    165.
1147          UI    147.    132.    120.    107.     98.     81.     60.     43.     37.     35.
1148          UI     35.     28.     21.     21.     21.      8.      6.      6.      6.      6.
1149          UI      6.      6.      6.      6.      6.      6.      0.      0.      0.      0.
1150          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1151          KK    R211
1152          KM        ROUTE FLOW FROM CP211 TO CP221A
1153          RS       9              -1
1154          RC    .035    .035    .075    5400   .0009
1155          RX    1000    1001    1002    1020    1100    1620    2119    2120
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1156          RY    1081     1081     1081     1080     1080     1082     1084     1084
1                                              HEC-1 INPUT                                                          PAGE 27

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1157          KK    221A
1158          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 221A
1159          BA     .31
1160          LG     .50      .00     3.66      .53      .00
1161          UI     12.      12.      12.      12.      36.      43.      50.      57.      63.      67.
1162          UI     72.      79.      87.      94.     109.     132.     151.     145.     126.     113.
1163          UI    103.      96.      88.      80.      73.      67.      60.      56.      48.      38.
1164          UI     32.      21.      21.      20.      19.      17.      12.      12.      12.       9.
1165          UI      4.       4.       4.       4.       4.       4.       4.       4.       4.       4.
1166          UI      4.       4.       4.       0.       0.       0.       0.       0.       0.       0.
1167          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

1168          KK   1I221A
1169          KM        ADD HYDROGRAPHS AT CP221A
1170          HC       2     .80

1171          KK   SR221A
1172          KM        STORAGE ROUTE THROUGH CP221A
1173          RS       1    STOR       0       0
1174          SV       0    1.31    8.04   28.16      40
1175          SQ       0       0       0    2250    5262
1176          SE    1077    1078  1078.9    1080  1080.5

1177          KK   CP221A
1178          KM        ADD HYDROGRAPHS AT CP221A
1179          HC       2    1.69

1180          KK    R221A
1181          KM        ROUTE FLOW FROM CP221A TO CP222
1182          RS       6              -1
1183          RC    .025     .022     .022     7800    .0024
1184          RX    1000     1001     1070     1090     1220     1287     1289     1290
1185          RY    1077     1077     1076     1074     1074     1079     1079     1079

1186          KK     222
1187          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 222
1188          BA    1.10
1189          LG     .31      .35     3.59      .29    15.00
1190          UI     34.      34.      34.      34.      34.     112.     121.     135.     158.     168.
1191          UI    184.     194.     205.     219.     237.     257.     272.     305.     354.     407.
1192          UI    455.     414.     370.     337.     311.     291.     274.     257.     236.     218.
1193          UI    204.     189.     173.     163.     148.     130.      98.      87.      60.      60.
1194          UI     58.      56.      56.      47.      34.      34.      34.      34.      24.      10.
1195          UI     10.      10.      10.      10.      10.      10.      10.      10.      10.      10.
1196          UI     10.      10.      10.      10.       0.       0.       0.       0.       0.       0.
1197          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

1198          KK    CP222
1199          KM        ADD HYDROGRAPHS AT CP222
1200          HC       2    2.79
1                                              HEC-1 INPUT                                                          PAGE 28

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1201          KK     R222
1202          KM        ROUTE FLOW FROM CP222 TO CP241
1203          RS       8              -1
1204          RC     .03     .025      .03     5770    .0022
1205          RX    1000     1100     1320     1540     2350     2470     2630     2710
1206          RY    1057     1056     1054     1052     1052     1054     1056     1057

1207          KK     226
1208          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 226
1209          BA    1.18
1210          LG     .15      .26     3.53      .34    17.00
1211          UI    134.     343.     641.     827.    1094.    1619.    1306.    1008.     765.     549.
1212          UI    283.     214.     134.      68.      41.      41.      41.       0.       0.       0.
1213          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

1214          KK    SR226
1215          KM        STORAGE ROUTE THROUGH CP226
1216          RS       1    STOR       0       0
1217          SV       0    0.24    3.34   18.04   51.44  102.84  171.74
1218          SQ       0       0      21     136     428     875    1487
1219          SE  1075.2  1075.5    1076  1076.5    1077  1077.5    1078

1220          KK     R226
1221          KM        ROUTE FLOW FROM CP226 TO CP223
1222          RS      26              -1       0
1223          RC     .05      .05      .05     7840    .0011
1224          RX    1000     1200     1300     1500     1600     1800     1900     2000
1225          RY    1100   1074.5     1074     1073     1073     1074   1074.5     1100

1226          KK     201
1227          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 201
1228          BA     .34
1229          LG     .35      .35     3.56      .29      .00
1230          UI     38.      96.     180.     233.     304.     457.     381.     294.     225.     166.
1231          UI     86.      64.      40.      24.      12.      12.      12.       0.       0.       0.
1232          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

1233          KK     R201
1234          KM        ROUTE FLOW FROM CP201 TO CP223
```

```
1235          RS      19              -1       0
1236          RC     .05     .035    .050    7000   .0017
1237          RX    1000     1200    1300    1500    1600    1800    1900    2000
1238          RY    1078   1074.5    1074    1073    1073    1074  1074.5    1078

1239          KK     223
1240          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 223
1241          BA    1.26
1242          LG     .12      .33    5.09     .20   72.00
1243          UI    119.     218.    491.    643.    786.   1003.   1453.   1254.    993.    797.
1244          UI    634.     465.    257.    200.    140.    112.     37.     37.     37.     37.
1245          UI     37.       0.      0.      0.      0.      0.      0.      0.      0.      0.
1246          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
1                                          HEC-1 INPUT                                          PAGE 29

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1247          KK   1I223
1248          KM        ADD HYDROGRAPHS AT CP223
1249          HC       2    1.60

1250          KK   CP223
1251          KM        ADD HYDROGRAPHS AT CP223
1252          HC       2    2.78

1253          KK    D223
1254          KM        DIVERT FROM CP223 TO CP225
1255          DT   DI225
1256          DI       0      60     400    1000    4000    8000
1257          DQ       0      60      60      60      60      60

1258          KK    R223
1259          KM        ROUTE REMAINDER FROM CP223 TO CP224
1260          RS       4              -1
1261          RC     .03     .025     .03    2900   .0017
1262          RX    1000     1120    1350    1590    1780    1960    2129    2130
1263          RY    1067     1066    1064    1063    1063    1064  1065.5  1065.5

1264          KK     224
1265          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 224
1266          BA     .80
1267          LG     .35      .32    4.03     .25     .00
1268          UI     94.     258.    469.    606.    833.   1145.    854.    655.    492.    310.
1269          UI    163.     121.     79.     29.     29.     29.     29.      0.      0.      0.
1270          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.

1271          KK   CP224
1272          KM        ADD HYDROGRAPHS AT CP224
1273          HC       2    3.58

1274          KK    R224
1275          KM        ROUTE FLOW FROM CP224 TO CP241
1276          RS       7              -1
1277          RC     .03     .025     .03    5460   .0027
1278          RX    1000     1100    1320    1540    2350    2470    2630    2710
1279          RY    1057     1056    1054    1052    1052    1054    1056    1057

1280          KK     241
1281          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 241
1282          BA    1.51
1283          LG     .38      .28    4.04     .40     .00
1284          UI    133.     206.    513.    682.    817.   1005.   1376.   1635.   1253.   1036.
1285          UI    834.     673.    488.    276.    223.    162.    133.     50.     41.     41.
1286          UI     41.      41.      0.      0.      0.      0.      0.      0.      0.      0.
1287          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
1                                          HEC-1 INPUT                                          PAGE 30

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1288          KK   1I241
1289          KM        ADD HYDROGRAPHS AT CP241
1290          HC       2    5.09

1291          KK   2I241
1292          KM        ADD HYDROGRAPHS AT CP241
1293          HC       2    7.88

1294          KK   CP241
1295          KM        ADD HYDROGRAPHS AT CP241
1296          HC       2   29.07

1297          KK   SR241
1298          KM        STORAGE ROUTE THROUGH CP241
1299          RS       1    STOR       0       0
1300          SV       0     .09     .65     .94    8.45   16.94
1301          SQ       0       4     280     324    1773    7505
1302          SE  1042.2    1044    1046  1046.3    1048    1049

1303          KK    R241
1304          KM        ROUTE FLOW FROM CP241 TO CP253
1305          RS       4              -1
1306          RC    .075     .03    .075    5700   .0039
1307          RX    1000     1001    1440    1565    1585    1700    2324    2325
1308          RY    1030     1030    1028    1026    1026    1028    1030    1030

1309          KK     253
1310          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 253
1311          BA    1.00
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```
1312          LG     .50     .00    3.82     .43     .00
1313          UI     42.     42.     42.     67.    140.    164.    195.    214.    235.    253.
1314          UI    280.    310.    339.    406.    491.    545.    470.    413.    371.    341.
1315          UI    314.    280.    255.    230.    207.    188.    153.    119.     80.     73.
1316          UI     70.     68.     56.     42.     42.     42.     20.     13.     13.     13.
1317          UI     13.     13.     13.     13.     13.     13.     13.     13.      0.      0.
1318          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1319          KK   1I253
1320          KM        ADD HYDROGRAPHS AT CP253
1321          HC       2   30.07

1322          KK    253A
1323          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 253A
1324          BA     .25
1325          LG     .32     .33    4.04     .37     .00
1326          UI     29.     75.    139.    179.    239.    349.    274.    211.    160.    111.
1327          UI     57.     43.     29.     12.      9.      9.      9.      0.      0.      0.
1328          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1329          KK   R253A
1330          KM        ROUTE FLOW FROM CP253A TO CP253
1331          RS      10              -1
1332          RC    .075    .075    .075    2800   .0030
1333          RX    1000    1001    1010    1110    1320    1480    1709    1710
1334          RY    1027    1027    1026    1025    1025    1026    1027    1027

1335          KK   2I253
1336          KM        ADD HYDROGRAPHS AT CP253
1337          HC       2   30.32

1338          KK     247
1339          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 247
1340          BA     .50
1341          LG     .50     .00    4.21     .40     .00
1342          UI     21.     21.     21.     38.     72.     85.    100.    111.    121.    131.
1343          UI    145.    161.    180.    219.    261.    269.    229.    203.    183.    169.
1344          UI    153.    137.    125.    111.    101.     88.     68.     52.     37.     37.
1345          UI     35.     34.     21.     21.     21.     15.      6.      6.      6.      6.
1346          UI      6.      6.      6.      6.      6.      6.      6.      0.      0.      0.
1347          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1348          KK    D247
1349          KM        DIVERT FROM CP247 TO CP261
1350          DT   DI261
1351          DI       0    3183    4006    8756   30610
1352          DQ       0       0       0     293    4086

1353          KK    R247
1354          KM        ROUTE REMAINDER FROM CP247 TO CP248
1355          RS       6              -1
1356          RC    .075     .03     .03    5280   .0049
1357          RX    1000    1370    1800    1950    2080    2108    2109    2110
1358          RY    1100    1098    1096    1094    1094    1095    1095    1095

1359          KK     248
1360          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 248
1361          BA    1.00
1362          LG     .50     .00    4.22     .40     .00
1363          UI     37.     37.     37.     37.    108.    134.    156.    177.    194.    210.
1364          UI    225.    245.    269.    290.    328.    399.    454.    482.    417.    371.
1365          UI    338.    312.    291.    264.    241.    221.    201.    184.    169.    142.
1366          UI    107.     84.     66.     65.     61.     61.     45.     37.     37.     37.
1367          UI     24.     11.     11.     11.     11.     11.     11.     11.     11.     11.
1368          UI     11.     11.     11.     11.      0.      0.      0.      0.      0.      0.
1369          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1370          KK    D234
1371          KM        RETURN DIVERT AT CP234
1372          DR   1D248
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1373          KK    R234
1374          KM        ROUTE FLOW FROM CP234 TO CP248
1375          RS       5              -1
1376          RC     .02     .02     .04    6550   .0050
1377          RX    1000    1001    1002    1040    1090    1100    1130    2000
1378          RY    1101    1101    1101    1100    1100    1101    1100    1102

1379          KK   1I248
1380          KM        ADD HYDROGRAPHS AT CP248
1381          HC       2    4.09

1382          KK   2I248
1383          KM        ADD HYDROGRAPHS AT CP248
1384          HC       2    4.59

1385          KK    D235
1386          KM        RETURN DIVERT AT CP235
1387          DR   2D248

1388          KK    R235
1389          KM        ROUTE FLOW FROM CP235 TO CP248
```

```
1390          RS       4              -1
1391          RC     .02     .02     .04    5280   .0051
1392          RX    1000    1001    1002    1040    1090    1100    1130    2000
1393          RY    1101    1101    1101    1100    1100    1101    1100    1102

1394          KK   CP248
1395          KM        ADD HYDROGRAPHS AT CP248
1396          HC       2   12.55

1397          KK    D248
1398          KM        DIVERT FROM CP248 TO CP262
1399          DT   DI262
1400          DI       0     691    6380   18685
1401          DQ       0     683    5565   15348

1402          KK    R248
1403          KM        ROUTE REMAINDER FROM CP248 TO CP249
1404          RS      10              -1
1405          RC    .075    .035    .035    5280   .0036
1406          RX    1000    1290    1690    1970    2000    2028    2029    2030
1407          RY    1085    1084    1082    1080    1080    1081    1081    1081

1408          KK     249
1409          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 249
1410          BA    1.00
1411          LG     .50     .00    3.98     .48     .00
1412          UI     37.     37.     37.     37.    112.    136.    159.    179.    197.    213.
1413          UI    228.    249.    274.    294.    338.    415.    461.    478.    412.    368.
1414          UI    335.    310.    290.    261.    238.    220.    198.    181.    163.    135.
1415          UI    108.     75.     66.     64.     62.     62.     39.     37.     37.     37.
1416          UI     17.     11.     11.     11.     11.     11.     11.     11.     11.     11.
1417          UI     11.     11.     11.      0.      0.      0.      0.      0.      0.      0.
1418          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1419          KK   1I249
1420          KM        ADD HYDROGRAPHS AT CP249
1421          HC       2   13.55

1422          KK    D236
1423          KM        RETURN DIVERT AT CP236
1424          DR   DI249

1425          KK    R236
1426          KM        ROUTE FLOW FROM CP236 TO CP249
1427          RS       6              -1
1428          RC     .02     .02    .075    5280   .0036
1429          RX    1000    1001    1002    1040    1100    1110    1280    1520
1430          RY    1073    1073    1073    1072    1072    1074    1076    1078

1431          KK   CP249
1432          KM        ADD HYDROGRAPHS AT CP249
1433          HC       2   17.87

1434          KK    D249
1435          KM        DIVERT FROM CP249 TO CP264
1436          DT   DI264
1437          DI       0      72     654    2109    5685
1438          DQ       0       0      66     481    1754

1439          KK    R249
1440          KM        ROUTE REMAINDER FROM CP249 TO CP250
1441          RS       6              -1
1442          RC     .05     .03     .03    5280   .0040
1443          RX    1000    1580    1660    1670    1705    1728    1729    1730
1444          RY    1100    1058    1059    1058    1058    1059    1059    1100

1445          KK    D236
1446          KM        RETURN DIVERT AT CP236
1447          DR   1D250

1448          KK    R236
1449          KM        ROUTE FLOW FROM CP236 TO CP250
1450          RS      39              -1
1451          RC    .075    .075    .075    7540   .0047
1452          RX    1000    1001    1002    1140    2330    2718    2719    2720
1453          RY    1071    1071    1071    1070    1070    1071    1071    1071

1454          KK     250
1455          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 250
1456          BA     .49
1457          LG     .50     .00    3.73     .47     .00
1458          UI     21.     21.     21.     40.     72.     86.    100.    112.    121.    132.
1459          UI    147.    161.    183.    230.    263.    258.    221.    196.    178.    165.
1460          UI    147.    132.    121.    107.     98.     82.     60.     43.     37.     35.
1461          UI     35.     28.     21.     21.     21.      8.      6.      6.      6.      6.
1462          UI      6.      6.      6.      6.      6.      6.      0.      0.      0.      0.
1463          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1464          KK   1I250
1465          KM        ADD HYDROGRAPHS AT CP250
1466          HC       2   15.86
```

```
1467          KK    D237
1468          KM         RETURN DIVERT AT CP237
1469          DR   2D250

1470          KK    R237
1471          KM         ROUTE FLOW FROM CP237 TO CP250
1472          RS      10              -1
1473          RC    .035     .035     .075     5280    .0032
1474          RX    1000     1001     1002     1010     1120     1670     1929     1930
1475          RY  1058.5   1058.5   1058.5     1058     1058     1060     1061     1061

1476          KK   2I250
1477          KM         ADD HYDROGRAPHS AT CP250
1478          HC       2   17.36

1479          KK   CP250
1480          KM         ADD HYDROGRAPHS AT CP250
1481          HC       2   19.86

1482          KK    R250
1483          KM         ROUTE FLOW FROM CP250 TO CP250A
1484          RS       5              -1
1485          RC     .05      .03      .03     3050    .0036
1486          RX    1000     1580     1660     1670     1705     1728     1729     1730
1487          RY    1100     1050     1051     1050     1050     1051     1051     1100

1488          KK    D237
1489          KM         RETURN DIVERT AT CP237
1490          DR  1D250A

1491          KK    R237
1492          KM         ROUTE FLOW FROM CP237 TO CP250A
1493          RS      12              -1
1494          RC     .02     .035     .075     6550    .0040
1495          RX    1000     1030     1050     1070     1220     1580     1839     1840
1496          RY    1051     1050     1051     1050     1050     1052     1054     1054

1497          KK    250A
1498          KM         RUNOFF HYDROGRAPH FROM SUB-BASIN 250A
1499          BA     .51
1500          LG     .50      .00     3.59      .47      .00
1501          UI     20.      20.      20.      25.      67.      77.      92.     102.     111.     120.
1502          UI    130.     145.     157.     178.     220.     251.     257.     221.     196.     179.
1503          UI    165.     152.     136.     125.     113.     102.      94.      78.      59.      44.
1504          UI     36.      35.      33.      33.      20.      20.      20.      18.       6.       6.
1505          UI      6.       6.       6.       6.       6.       6.       6.       6.       6.       6.
1506          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
1507          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1508          KK  1I250A
1509          KM         ADD HYDROGRAPHS AT CP250A
1510          HC       2   17.38

1511          KK    D238
1512          KM         RETURN DIVERT AT CP238
1513          DR  2D250A

1514          KK    R238
1515          KM         ROUTE FLOW FROM CP238 TO CP250A
1516          RS      20              -1
1517          RC     .02     .035     .075     5280    .0030
1518          RX    1000     1030     1050     1070     1220     1580     1839     1040
1519          RY    1051     1050     1051     1050     1050     1052     1054     1054

1520          KK  2I250A
1521          KM         ADD HYDROGRAPHS AT CP250A
1522          HC       2   19.88

1523          KK  CP250A
1524          KM         ADD HYDROGRAPHS AT CP250A
1525          HC       2   22.87

1526          KK   D250A
1527          KM         DIVERT FROM CP250A TO CP265A
1528          DT  DI265A
1529          DI       0     825     2520     4782    10712
1530          DQ       0       0       13      174      958

1531          KK   D250A
1532          KM         DIVERT FROM CP250A TO CP266
1533          DT   1D266
1534          DI       0     825     2507     4608     9754
1535          DQ       0       0     1091     2426     4520

1536          KK   R250A
1537          KM         ROUTE REMAINDER FROM CP250A TO CP251
1538          RS       3              -1
1539          RC    .075     .03      .03     2550    .0031
1540          RX    1000     1001     1440     1650     1680     1708     1709     1710
1541          RY    1043     1043     1042     1040     1040     1041     1041     1041

1542          KK    D238
1543          KM         RETURN DIVERT AT CP238
1544          DR   1D251

1545          KK    R238
```

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1546          KM        ROUTE FLOW FROM CP238 TO CP251
1547          RS      42              -1
1548          RC    .075     .075     .075    5910    .0041
1549          RX    1000     1001     1002    1120     2210    2488    2489    2490
1550          RY    1047     1047     1047    1046     1046    1047    1047    1047
1                                             HEC-1 INPUT                                                          PAGE 36

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1551          KK     251
1552          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 251
1553          BA     .50
1554          LG     .50      .00     3.53     .48     .00
1555          UI     21.      21.      21.     34.     70.     83.     98.    108.    118.    127.
1556          UI    141.     156.     171.    204.    248.    273.    234.    206.    185.    170.
1557          UI    157.     140.     127.    115.    104.     93.     75.     60.     38.     37.
1558          UI     35.      34.      27.     21.     21.     21.      9.      6.      6.      6.
1559          UI      6.       6.       6.      6.      6.      6.      6.      6.      0.      0.
1560          UI      0.       0.       0.      0.      0.      0.      0.      0.      0.      0.

1561          KK   1I251
1562          KM        ADD HYDROGRAPHS AT CP251
1563          HC       2   19.87

1564          KK    D239
1565          KM        RETURN DIVERT AT CP239
1566          DR   2D251

1567          KK    R239
1568          KM        ROUTE FLOW FROM CP239 TO CP251
1569          RS       6              -1
1570          RC    .035     .035     .075    5280    .0034
1571          RX    1000     1001     1002    1055     1095    1770    1959    1960
1572          RY    1049     1049     1049    1048     1048    1050    1051    1051

1573          KK   2I251
1574          KM        ADD HYDROGRAPHS AT CP251
1575          HC       2   21.29

1576          KK   CP251
1577          KM        ADD HYDROGRAPHS AT CP251
1578          HC       2   24.79

1579          KK    D251
1580          KM        DIVERT FROM CP251 TO CP266
1581          DT   2D266
1582          DI       0       70     825    2936
1583          DQ       0       48     687    2384

1584          KK    R251
1585          KM        ROUTE REMAINDER FROM CP251 TO CP252
1586          RS       6              -1
1587          RC    .075     .035     .035    2640    .0019
1588          RX    1000     1001     1240    1880     1970    1998    1999    2000
1589          RY    1039     1039     1038    1036     1036    1037    1037    1037

1590          KK     252
1591          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 252
1592          BA     .50
1593          LG     .50      .00     4.45     .40     .00
1594          UI     21.      21.      21.     33.     69.     81.     97.    106.    116.    125.
1595          UI    138.     153.     167.    199.    241.    272.    237.    207.    187.    171.
1596          UI    158.     141.     128.    116.    104.     96.     79.     59.     43.     37.
1                                             HEC-1 INPUT                                                          PAGE 37

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1597          UI     35.      34.      30.     21.     21.     21.     13.      6.      6.      6.
1598          UI      6.       6.       6.      6.      6.      6.      6.      6.      0.      0.
1599          UI      0.       0.       0.      0.      0.      0.      0.      0.      0.      0.

1600          KK   CP252
1601          KM        ADD HYDROGRAPHS AT CP252
1602          HC       2   25.29

1603          KK    D252
1604          KM        DIVERT FROM CP252 TO CP267
1605          DT   DI267
1606          DI       0       67    2745    5417   10449
1607          DQ       0       66    2582    5037    8991

1608          KK    R252
1609          KM        ROUTE REMAINDER FROM CP252 TO CP253
1610          RS      11              -1
1611          RC    .075     0.35     .035    2900    .0028
1612          RX    1000     1001     1002    1910     1930    1958    1959    1960
1613          RY    1032     1032     1030    1028     1028    1029    1029    1029

1614          KK   CP253
1615          KM        ADD HYDROGRAPHS AT CP253
1616          HC       2   34.82

1617          KK   SR253
1618          KM        STORAGE ROUTE THROUGH CP253
1619          RS       1    STOR       0       0
1620          SV       0    .045    3.58   16.31   29.98   43.46   60.96
1621          SQ       0       2     190     380    1145    3731    6823
1622          SE  1021.1    1022    1024  1025.3    1026  1026.5  1027.0
```

```
1623          KK    R253
1624          KM        ROUTE FLOW FROM CP253 TO CP268
1625          RS       7              -1
1626          RC    .075     .03     .075    5280   .0023
1627          RX    1000    1001    1002    1400    1520    2630    2629    2628
1628          RY    1100    1022    1022    1020    1020    1022    1022    1100

1629          KK     268
1630          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 268
1631          BA     .95
1632          LG     .50     .00    5.00     .38     .00
1633          UI     36.     36.     36.     36.    116.    134.    158.    176.    196.    209.
1634          UI    226.    247.    273.    295.    346.    413.    479.    436.    381.    343.
1635          UI    314.    291.    269.    240.    222.    201.    182.    169.    141.    109.
1636          UI     86.     64.     64.     60.     60.     43.     36.     36.     36.     20.
1637          UI     11.     11.     11.     11.     11.     11.     11.     11.     11.     11.
1638          UI     11.     11.      0.      0.      0.      0.      0.      0.      0.      0.
1639          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1                                              HEC-1 INPUT                                          PAGE 38

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


1640          KK   1I268
1641          KM        ADD HYDROGRAPHS AT CP268
1642          HC       2   35.77

1643          KK   D250A
1644          KM        RETURN DIVERT AT CP250A
1645          DR   1D266

1646          KK   R250A
1647          KM        ROUTE FLOW FROM CP250A TO CP266
1648          RS      15              -1
1649          RC     .03     .03     .075    6230   .0034
1650          RX    1000    1001    1002    1060    1110    1838    1839    1840
1651          RY    1031    1031    1031    1030    1030    1032    1032    1032

1652          KK     266
1653          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 266
1654          BA     .33
1655          LG     .50     .00    3.50     .47     .00
1656          UI     12.     12.     12.     12.     28.     40.     46.     54.     59.     64.
1657          UI     68.     73.     79.     87.     94.    108.    131.    145.    150.    130.
1658          UI    116.    106.     98.     92.     85.     77.     71.     65.     59.     55.
1659          UI     48.     39.     34.     21.     21.     20.     19.     19.     13.     12.
1660          UI     12.     12.      8.      4.      4.      4.      4.      4.      4.      4.
1661          UI      4.      4.      4.      4.      4.      4.      0.      0.      0.      0.
1662          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1663          KK   1I266
1664          KM        ADD HYDROGRAPHS AT CP266
1665          HC       2   23.20

1666          KK    D251
1667          KM        RETURN DIVERT AT CP251
1668          DR   2D266

1669          KK    R251
1670          KM        ROUTE FLOW FROM CP251 TO CP266
1671          RS       6              -1
1672          RC     .03     .03     .075    5280   .0025
1673          RX    1000    1001    1002    1060    1110    1838    1839    1840
1674          RY    1100    1031    1031    1030    1030    1032    1032    1032

1675          KK   CP266
1676          KM        ADD HYDROGRAPHS AT CP266
1677          HC       2   25.12

1678          KK    D266
1679          KM        DIVERT FROM CP266 TO CP283
1680          DT   DI283
1681          DI       0     231     647    1811    5693
1682          DQ       0      38      73     203    1051
1                                              HEC-1 INPUT                                          PAGE 39

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


1683          KK    R266
1684          KM        ROUTE REMAINDER FROM CP266 TO CP267
1685          RS       4              -1
1686          RC    .075    .035     .035    2500   .0036
1687          RX    1000    1001    1002    1680    1890    1908    1909    1910
1688          RY    1100    1021    1021    1020    1020    1021    1021    1100

1689          KK    D252
1690          KM        RETURN DIVERT AT CP252
1691          DR   DI267

1692          KK    R252
1693          KM        ROUTE FLOW FROM CP252 TO CP267
1694          RS       8              -1
1695          RC     .02     .03     .075    5280   .0032
1696          RX    1000    1020    1050    1065    1085    1590    1919    1920
1697          RY    1027    1026    1027    1026    1026    1028    1029    1029

1698          KK     267
1699          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 267
1700          BA     .50
```

```
1701          LG     .50     .00    5.36     .36     .00
1702          UI     21.     21.     21.     33.     69.     81.     97.    106.    116.    125.
1703          UI    138.    153.    167.    199.    241.    272.    237.    207.    187.    171.
1704          UI    158.    141.    128.    116.    104.     96.     79.     59.     43.     37.
1705          UI     35.     34.     30.     21.     21.     21.     13.      6.      6.      6.
1706          UI      6.      6.      6.      6.      6.      6.      6.      6.      0.      0.
1707          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1708          KK   1I267
1709          KM        ADD HYDROGRAPHS AT CP267
1710          HC       2   25.79

1711          KK   CP267
1712          KM        ADD HYDROGRAPHS AT CP267
1713          HC       2   26.12

1714          KK    D267
1715          KM        DIVERT FROM CP267 TO CP284
1716          DT   DI284
1717          DI       0     5.4     506    3382
1718          DQ       0     5.4     412    1981

1719          KK    R267
1720          KM        ROUTE REMAINDER FROM CP267 TO CP268
1721          RS       5              -1
1722          RC    .075    .035    .035    2350   .0013
1723          RX    1000    1001    1220    1600    1890    1928    1929    1930
1724          RY    1017    1017    1016    1014    1014    1015    1015    1015
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1725          KK   CP268
1726          KM        ADD HYDROGRAPHS AT CP268
1727          HC       2   36.60

1728          KK   SR268
1729          KM        STORAGE ROUTE THROUGH CP268
1730          RS       1    STOR       0       0
1731          SV       0    7.04   46.85   92.08  124.01
1732          SQ       0       0     288    3172    8930
1733          SE  1008.3  1009.3    1011    1012  1012.5

1734          KK    R268
1735          KM        ROUTE FLOW FROM CP268 TO CP286
1736          RS      11              -1
1737          RC    .075     .05    .075    6700   .0031
1738          RX    1000    1001    1260    1650    2410    2870    2059    2060
1739          RY    1003    1003    1002    1000    1000    1002    1004    1004

1740          KK     286
1741          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 286
1742          BA     .70
1743          LG     .50     .00    5.06     .37     .00
1744          UI     30.     30.     30.     53.    101.    120.    141.    156.    170.    185.
1745          UI    205.    226.    253.    312.    367.    375.    320.    283.    256.    236.
1746          UI    214.    191.    175.    155.    141.    121.     93.     71.     53.     51.
1747          UI     49.     46.     30.     30.     30.     19.      9.      9.      9.      9.
1748          UI      9.      9.      9.      9.      9.      9.      9.      0.      0.      0.
1749          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1750          KK   1I286
1751          KM        ADD HYDROGRAPHS AT CP286
1752          HC       2   37.30

1753          KK     288
1754          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 288
1755          BA     .22
1756          LG     .50     .00    7.50     .19     .00
1757          UI      8.      8.      8.      8.     27.     31.     37.     41.     46.     49.
1758          UI     53.     58.     64.     69.     82.     98.    112.    100.     88.     79.
1759          UI     72.     67.     62.     56.     51.     46.     42.     39.     32.     24.
1760          UI     18.     15.     15.     14.     14.      9.      8.      8.      8.      3.
1761          UI      3.      3.      3.      3.      3.      3.      3.      3.      3.      3.
1762          UI      3.      3.      0.      0.      0.      0.      0.      0.      0.      0.
1763          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1764          KK    R288
1765          KM        ROUTE FLOW FROM CP288 TO CP286
1766          RS       3              -1
1767          RC    .035    .035    .075    1500   .0033
1768          RX    1000    1001    1002    1040    1055    1280    1849    1850
1769          RY     997     997     997     996     996     998    1000    1000
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1770          KK   CP286
1771          KM        ADD HYDROGRAPHS AT CP286
1772          HC       2   37.52

1773          KK    R286
1774          KM        ROUTE FLOW FROM CP286 TO CP287
1775          RS       2              -1
1776          RC    .075    .075    .075    1100   .0027
1777          RX    1000    1001    1210    1510    1950    2360    2529    2530
1778          RY    1000     993     992     990     990     992     993    1000
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1779          KK     287
1780          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 287
1781          BA     .23
1782          LG     .50      .00     3.77      .38      .00
1783          UI     15.      15.      39.      63.      77.      89.     103.     121.     158.     194.
1784          UI    165.     138.     120.     102.      87.      74.      56.      36.      27.      25.
1785          UI     18.      15.      11.       5.       5.       5.       5.       5.       5.       5.
1786          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
1787          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

1788          KK   1I287
1789          KM        ADD HYDROGRAPHS AT CP287
1790          HC       2   37.75

1791          KK    D266
1792          KM        RETURN DIVERT AT CP266
1793          DR   DI283

1794          KK    R266
1795          KM        ROUTE FLOW FROM CP266 TO CP283
1796          RS      12               -1
1797          RC     .03      .03     .075     5900    .0017
1798          RX    1000     1001     1002     1030     1050     1240     1479     1480
1799          RY    1021     1021     1021     1020     1020     1022     1023     1023

1800          KK     283
1801          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 283
1802          BA     .16
1803          LG     .50      .00     3.52      .47      .00
1804          UI      7.       7.       7.      12.      23.      28.      32.      36.      39.      42.
1805          UI     47.      52.      58.      72.      84.      85.      73.      65.      58.      54.
1806          UI     49.      44.      40.      35.      32.      28.      21.      16.      12.      12.
1807          UI     11.      10.       7.       7.       7.       4.       2.       2.       2.       2.
1808          UI      2.       2.       2.       2.       2.       2.       2.       0.       0.       0.
1809          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

1810          KK   CP283
1811          KM        ADD HYDROGRAPHS AT CP283
1812          HC       2   25.28
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1813          KK    R283
1814          KM        ROUTE FLOW FROM CP283 TO CP285B
1815          RS       5               -1
1816          RC    .075     .075     .075     1100    .0045
1817          RX    1000     1001     1002     1070     1700     1748     1849     1850
1818          RY    1001     1001     1001     1000     1000     1001     1001     1001

1819          KK    285B
1820          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 285B
1821          BA     .06
1822          LG     .50      .00     3.50      .47      .00
1823          UI      7.      20.      36.      47.      65.      86.      63.      48.      36.      21.
1824          UI     12.       9.       5.       2.       2.       2.       0.       0.       0.       0.
1825          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

1826          KK  CP285B
1827          KM        ADD HYDROGRAPHS AT CP285B
1828          HC       2   25.34

1829          KK  SR285B
1830          KM        STORAGE ROUTE THROUGH CP285B
1831          RS       1    STOR       0       0
1832          SV       0      .7    5.68    7.84    10.0
1833          SQ       0      16     227     435    1468
1834          SE  1005.5  1006.9  1009.5  1010.0  1011.0

1835          KK   D285B
1836          KM        DIVERT FROM CP285B TO CP297
1837          DT   DI297
1838          DI       0      16     227     435
1839          DQ       0      16     227     274

1840          KK   R285B
1841          KM        ROUTE REMAINDER FROM CP285B TO CP285A
1842          RS       7               -1
1843          RC    .075     .035     .035     1072    .0009
1844          RX    1000     1001     1002     1280     1550     1598     1599     1600
1845          RY    1011     1011     1011     1010     1010     1015     1015     1015

1846          KK    D267
1847          KM        RETURN DIVERT AT CP267
1848          DR   DI284

1849          KK    R267
1850          KM        ROUTE FLOW FROM CP267 TO CP284
1851          RS       9               -1
1852          RC    .025     .025      .05     6080    .0008
1853          RX    1000     1001     1002     1040     1060     1190     1740     1940
1854          RY    1013     1013     1013     1012     1012     1014     1016     1017
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1855          KK     284
1856          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 284
```

```
1857          BA     .52
1858          LG     .50      .00     3.56      .46      .00
1859          UI     21.      21.      21.      33.      71.      84.     100.     110.     120.     130.
1860          UI    143.     158.     173.     204.     247.     282.     248.     216.     195.     178.
1861          UI    165.     148.     133.     122.     108.     100.      84.      63.      47.      38.
1862          UI     37.      35.      33.      21.      21.      21.      15.       7.       7.       7.
1863          UI      7.       7.       7.       7.       7.       7.       7.       7.       0.       0.
1864          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

1865          KK   CP284
1866          KM        ADD HYDROGRAPHS AT CP284
1867          HC       2   26.64

1868          KK   SR284
1869          KM        STORAGE ROUTE THROUGH CP284
1870          RS       1    STOR       0       0
1871          SV       0     .18   25.77  34.058   60.22   83.97
1872          SQ       0       0       0       0     457    2222
1873          SE  1007.6    1008    1010  1010.3    1011  1011.5

1874          KK    R284
1875          KM        ROUTE FLOW FROM CP284 TO CP285A
1876          RS       2              -1
1877          RC    .075    .075    .075    1050   .0076
1878          RX    1000    1001    1002    1020    1440    1448    1449    1450
1879          RY    1050    1009    1009    1008    1008    1009    1009    1050

1880          KK    285A
1881          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 285A
1882          BA     .06
1883          LG     .50      .00     3.50      .47      .00
1884          UI      7.      18.      33.      43.      57.      84.      66.      51.      38.      27.
1885          UI     14.      10.       7.       3.       2.       2.       2.       0.       0.       0.
1886          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

1887          KK  1I285A
1888          KM        ADD HYDROGRAPHS AT CP285A
1889          HC       2   26.70

1890          KK  CP285A
1891          KM        ADD HYDROGRAPHS AT CP285A
1892          HC       2   26.92

1893          KK  SR285A
1894          KM        STORAGE ROUTE THROUGH CP285A
1895          RS       1    STOR       0       0
1896          SV       0     .13    4.35    4.40    5.19    6.89   15.46
1897          SQ       0      35     193   196.5   246.5   925.5    3914
1898          SE   999.7  1000.7 1005.47  1005.5  1006.0  1006.5  1007.5
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1899          KK   D285A
1900          KM        DIVERT FROM CP285A TO CP297A
1901          DT  1D297A
1902          DI       0      35     193     196     246     925
1903          DQ       0      35     193     196     218     237

1904          KK   R285A
1905          KM        ROUTE REMAINDER FROM CP285A TO CP285
1906          RS       2              -1
1907          RC     .07     .02    .025    1745   .0029
1908          RX    1000    1001    1530    1540    1550    1560    1570    1610
1909          RY    1010     999     998     996     996     998    1000    1010

1910          KK     285
1911          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 285
1912          BA     .04
1913          LG     .50      .00     3.50      .47      .00
1914          UI      5.      14.      25.      32.      46.      58.      42.      32.      23.      12.
1915          UI      8.       5.       3.       1.       1.       1.       0.       0.       0.       0.
1916          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

1917          KK   CP285
1918          KM        ADD HYDROGRAPHS AT CP285
1919          HC       2   26.96

1920          KK   SR285
1921          KM        STORAGE ROUTE THROUGH CP285
1922          RS       1    STOR       0       0
1923          SV       0     .17    1.61    4.19
1924          SQ       0      82     694    1687
1925          SE  1002.8    1003  1003.5    1004

1926          KK    D285
1927          KM        DIVERT FROM CP285 TO CP297A
1928          DT  2D297A
1929          DI       0      82     694    1687
1930          DQ       0      23     188     462

1931          KK    R285
1932          KM        ROUTE REMAINDER  FROM CP285 TO CP287
1933          RS       2              -1       0
1934          RC    .075     .02    .025    2460   .0061
1935          RX    1000    1001    1530    1540    1550    1560    1570    1610
1936          RY     999     999     998     996     996     998    1000    1010

1937          KK   CP287
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1938          KM        ADD HYDROGRAPHS AT CP287
1939          HC       2   38.59
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1940          KK   SR287
1941          KM        STORAGE ROUTE THROUGH CP287
1942          RS       1    STOR       0       0
1943          SV       0   14.18   61.23  266.05  356.54  502.54
1944          SQ       0     373    2288    4167    5000    6570
1945          SE     988     990     992     994   994.5  995.23

1946          KK    R287
1947          KM        ROUTE FLOW FROM CP287 TO CP298
1948          RS       5              -1       0
1949          RC     .05     .03     .05    4370   .0023
1950          RX    1000    1200    1380    1500    1890    2090    2330    2560
1951          RY     990     988     986     984     984     986     988     990

1952          KK     298
1953          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 298
1954          BA     .84
1955          LG     .50     .00    3.53     .46     .00
1956          UI     40.     40.     40.    105.    146.    181.    203.    225.    247.    277.
1957          UI    306.    360.    445.    521.    449.    388.    347.    316.    282.    250.
1958          UI    224.    199.    175.    137.    102.     70.     68.     65.     54.     40.
1959          UI     40.     36.     12.     12.     12.     12.     12.     12.     12.     12.
1960          UI     12.     12.      0.      0.      0.      0.      0.      0.      0.      0.
1961          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

1962          KK   CP298
1963          KM        ADD HYDROGRAPHS AT CP298
1964          HC       2   39.43

1965          KK   SR298
1966          KM        STORAGE ROUTE THROUGH CP298
1967          RS       1    STOR       0       0
1968          SV       0     .08    7.03    9.28   32.19   53.97
1969          SQ       0       0       0       0    2881    8075
1970          SE   975.5     976     978   978.3     980     981

1971          KK    R298
1972          KM        ROUTE FLOW FROM CP298 TO CP316
1973          RS       6              -1       0
1974          RC     .05     .03     .05    5280    .003
1975          RX    1000    1100    1210    1410    1830    2030    2140    2310
1976          RY     980     978     976     974     974     976     978     980

1977          KK     316
1978          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 316
1979          BA     .82
1980          LG     .50     .00    3.57     .42     .00
1981          UI     33.     33.     33.     43.    108.    125.    151.    165.    181.    195.
1982          UI    212.    236.    255.    293.    363.    410.    409.    352.    314.    286.
1983          UI    264.    243.    217.    198.    180.    163.    147.    121.     94.     65.
1984          UI     58.     55.     54.     48.     33.     33.     33.     24.     10.     10.
1985          UI     10.     10.     10.     10.     10.     10.     10.     10.     10.     10.
1986          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1987          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1988          KK   CP316
1989          KM        ADD HYDROGRAPHS AT CP316
1990          HC       2   40.25

1991          KK    R316
1992          KM        ROUTE FLOW FROM CP316 TO CP334
1993          RS       4              -1       0
1994          RC     .06     .03     .06    3280    .003
1995          RX    1000    1360    1570    1590    1780    2070    2280    2400
1996          RY     966   960.5     961     960     960     962     964     965

1997          KK     334
1998          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 334
1999          BA     .64
2000          LG     .50     .00    3.57     .43     .00
2001          UI     30.     30.     30.     76.    109.    133.    151.    167.    182.    204.
2002          UI    227.    259.    327.    382.    351.    300.    267.    243.    219.    194.
2003          UI    176.    153.    140.    115.     86.     57.     53.     49.     49.     30.
2004          UI     30.     30.     16.      9.      9.      9.      9.      9.      9.      9.
2005          UI      9.      9.      9.      0.      0.      0.      0.      0.      0.      0.
2006          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2007          KK   1I334
2008          KM        ADD HYDROGRAPHS AT CP334
2009          HC       2   40.89

2010          KK    D285
2011          KM        RETURN DIVERT AT CP285
2012          DR  2D297A

2013          KK    R285
2014          KM        ROUTE FLOW FROM CP285 TO CP297A
2015          RS       5              -1       0
2016          RC     .03     .03     .07    3950    .003
```

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2017          RX    1000     1001     1002     1020     1050     1460     1819     1820
2018          RY    1050      997      997      996      996      998      999     1050

2019          KK   D285A
2020          KM         RETURN DIVERT AT 285A
2021          DR  1D297A

2022          KK   R285A
2023          KM         ROUTE FLOW FROM CP285A TO CP297A
2024          RS       5                -1        0
2025          RC     .03      .03      .07     4370    .0041
2026          RX    1000     1001     1002     1020     1050     1460     1819     1820
2027          RY   997.5      997      997      996      996      998      999      999

2028          KK    297A
2029          KM         RUNOFF HYDROGRAPH FROM SUB-BASIN 297A
2030          BA     .27
2031          LG     .50      .00     3.50      .47      .00
2032          UI     14.      14.      17.      48.      59.      70.      79.      88.     100.     112.
2033          UI    136.     175.     178.     147.     128.     115.     102.      89.      78.      69.
1                                             HEC-1 INPUT                                                    PAGE 47

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

2034          UI     58.      42.      26.      25.      23.      19.      14.      14.       9.       4.
2035          UI      4.       4.       4.       4.       4.       4.       4.       0.       0.       0.
2036          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

2037          KK  1I297A
2038          KM         ADD HYDROGRAPHS AT CP297A
2039          HC       2   27.19

2040          KK  CP297A
2041          KM         ADD HYDROGRAPHS AT CP297A
2042          HC       2   27.23

2043          KK   R297A
2044          KM         ROUTE FLOW FROM CP297A TO CP315
2045          RS      19                -1
2046          RC    .075     .075     .075     5620    .0032
2047          RX    1000     1001     1002     1090     1910     2148     2149     2150
2048          RY    1000      985      985      984      984      985      985     1000

2049          KK     315
2050          KM         RUNOFF HYDROGRAPH FROM SUB-BASIN 315
2051          BA     .47
2052          LG     .50      .00     3.56      .47      .00
2053          UI     18.      18.      18.      18.      59.      67.      79.      88.      98.     104.
2054          UI    113.     124.     136.     148.     175.     209.     239.     214.     188.     168.
2055          UI    155.     144.     131.     119.     109.      99.      90.      82.      69.      52.
2056          UI     39.      32.      31.      30.      30.      19.      18.      18.      18.       7.
2057          UI      6.       6.       6.       6.       6.       6.       6.       6.       6.       6.
2058          UI      6.       6.       0.       0.       0.       0.       0.       0.       0.       0.
2059          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

2060          KK   CP315
2061          KM         ADD HYDROGRAPHS AT CP315
2062          HC       2   27.70

2063          KK    R315
2064          KM         ROUTE FLOW FROM CP315 TO CP334
2065          RS      11                -1
2066          RC     .06      .06      .06     4370    .0046
2067          RX    1000     1001     1002     1130     2070     2208     2209     2210
2068          RY     963      963      963      962      962      963      963      963

2069          KK   CP334
2070          KM         ADD HYDROGRAPHS AT CP334
2071          HC       2   41.63

2072          KK    R334
2073          KM         ROUTE FLOW FROM CP334 TO CP335
2074          RS       2                -1
2075          RC     .04      .02      .04     3450    .0035
2076          RX    1000     1380     1430     1450     1465     1470     1540     2040
2077          RY    1054     1050     1051     1050     1050     1051     1050     1054
1                                             HEC-1 INPUT                                                    PAGE 48

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

2078          KK     335
2079          KM         RUNOFF HYDROGRAPH FROM SUB-BASIN 335
2080          BA     .35
2081          LG     .50      .00     4.39      .39      .00
2082          UI     18.      18.      20.      61.      75.      89.     100.     111.     126.     141.
2083          UI    169.     214.     234.     194.     168.     150.     134.     117.     104.      91.
2084          UI     78.      59.      40.      32.      30.      29.      18.      18.      16.       6.
2085          UI      6.       6.       6.       6.       6.       6.       6.       6.       0.       0.
2086          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

2087          KK   CP335
2088          KM         ADD HYDROGRAPHS AT CP335
2089          HC       2   41.98

2090          KK    R335
2091          KM         ROUTE FLOW FROM CP335 TO CP336
2092          RS       3                -1
2093          RC     .04      .02      .04     4520    .0022
2094          RX    1000     1070     1170     1210     1270     1290     1410     1450
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2095          RY     944     942     940     938     938     940     942     943

2096          KK     299
2097          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 299
2098          BA     .40
2099          LG     .50     .00    4.62     .40     .00
2100          UI     19.     19.     19.     49.     69.     84.     95.    106.    115.    129.
2101          UI    144.    166.    207.    243.    217.    186.    166.    151.    136.    120.
2102          UI    109.     95.     86.     68.     53.     33.     33.     31.     29.     19.
2103          UI     19.     19.      7.      6.      6.      6.      6.      6.      6.      6.
2104          UI      6.      6.      0.      0.      0.      0.      0.      0.      0.      0.
2105          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2106          KK    R299
2107          KM        ROUTE FLOW FROM CP299 TO CP317
2108          RS     21              -1
2109          RC     .06     .06     .06    5460   .0033
2110          RX   1000    1001    1002    1420    1840    2220    2514    2515
2111          RY    980     980     980     978     978     980     982     982

2112          KK     317
2113          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 317
2114          BA     .57
2115          LG     .50     .00    3.52     .47     .00
2116          UI     22.     22.     22.     25.     73.     84.    100.    111.    122.    130.
2117          UI    142.    157.    171.    190.    226.    272.    292.    252.    223.    202.
2118          UI    186.    172.    155.    140.    130.    115.    106.     93.     73.     59.
2119          UI     40.     40.     37.     37.     29.     22.     22.     22.     13.      7.
2120          UI      7.      7.      7.      7.      7.      7.      7.      7.      7.      7.
2121          UI      7.      0.      0.      0.      0.      0.      0.      0.      0.      0.
2122          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

2123          KK   CP317
2124          KM        ADD HYDROGRAPHS AT CP317
2125          HC      2     .97

2126          KK    R317
2127          KM        ROUTE FLOW FROM CP317 TO CP336
2128          RS     13              -1
2129          RC     .04     .02     .04   12170   .0032
2130          RX   1000    1070    1170    1210    1270    1290    1410    1450
2131          RY    944     942     940     938     938     940     942     943

2132          KK     300
2133          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 300
2134          BA     .39
2135          LG     .50     .00    6.36     .30     .00
2136          UI     22.     22.     39.     80.    101.    118.    132.    150.    172.    208.
2137          UI    271.    278.    227.    197.    176.    152.    133.    114.     97.     72.
2138          UI     46.     39.     37.     29.     22.     22.      9.      7.      7.      7.
2139          UI      7.      7.      7.      7.      0.      0.      0.      0.      0.      0.
2140          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2141          KK    R300
2142          KM        ROUTE FLOW FROM CP300 TO CP318
2143          RS     21              -1
2144          RC     .05     .05     .05    5620   .0028
2145          RX   1000    1001    1002    1190    1800    2268    2269    2270
2146          RY    975     975     975     974     974     976     976     976

2147          KK     318
2148          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 318
2149          BA     .62
2150          LG     .27     .14    3.66     .39   12.00
2151          UI     43.     43.    119.    181.    222.    254.    299.    354.    475.    537.
2152          UI    428.    363.    313.    264.    222.    183.    124.     76.     71.     58.
2153          UI     43.     36.     13.     13.     13.     13.     13.     13.     13.      0.
2154          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
2155          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2156          KK   CP318
2157          KM        ADD HYDROGRAPHS AT CP318
2158          HC      2    1.01

2159          KK    R318
2160          KM        ROUTE FLOW FROM CP318 TO CP337
2161          RS      4              -1
2162          RC     .03     .03     .03    2000   .0029
2163          RX   1000    1001    1280    1440    2180    2420    2469    2470
2164          RY   1063    1063    1062    1061    1061    1062    1063    1063
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

2165          KK     301
2166          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 301
2167          BA     .30
2168          LG     .24     .28    5.79     .23   10.00
2169          UI     80.    269.    424.    644.    427.    263.    110.     61.     17.     17.
2170          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
2171          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2172          KK    R301
2173          KM        ROUTE FLOW FROM CP301 TO CP319
2174          RS     24              -1
```

```
2175          RC     .05     .05     .05    6240   .0024
2176          RX    1000    1001    1002    1250    2020    2280    2349    2350
2177          RY     973     973     972     970     970     972     973     973

2178          KK     319
2179          KM         RUNOFF HYDROGRAPH FROM SUB-BASIN 319
2180          BA     .54
2181          LG     .23     .18    3.50     .40   14.00
2182          UI     45.     61.    167.    225.    268.    324.    414.    570.    471.    383.
2183          UI    317.    259.    208.    140.     80.     74.     48.     44.     14.     14.
2184          UI     14.     14.     14.      0.      0.      0.      0.      0.      0.      0.
2185          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2186          KK   CP319
2187          KM         ADD HYDROGRAPHS AT CP319
2188          HC       2     .84

2189          KK    R319
2190          KM         ROUTE FLOW FROM CP319 TO CP337
2191          RS       6              -1
2192          RC     .03     .03     .03    2400   .0027
2193          RX    1000    1001    1280    1440    2180    2420    2469    2470
2194          RY    1063    1063    1062    1061    1061    1062    1063    1063

2195          KK     337
2196          KM         RUNOFF HYDROGRAPH FROM SUB-BASIN 337
2197          BA     .49
2198          LG     .19     .30    3.60     .33   23.50
2199          UI     68.    238.    378.    519.    803.    624.    455.    319.    156.    101.
2200          UI     61.     21.     21.     21.      0.      0.      0.      0.      0.      0.
2201          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2202          KK   CP337
2203          KM         ADD HYDROGRAPHS AT CP337
2204          HC       3    2.34

2205          KK   SR337
2206          KM         STORAGE ROUTE THROUGH CP337
2207          RS       1    STOR       0       0
2208          SV       0     .06    3.14   15.08   45.28  110.59  221.78  290.44  449.81
2209          SQ       0      10     100     250     370     380     383     383    8928
2210          SE   951.3     952     954     956     958     960     962   962.8     964
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

2211          KK    D337
2212          KM         DIVERT FLOW IN 96" STORM DRAIN TO AGUA FRIA RIVER AT CP367
2213          DT   DI367
2214          DI       0      10     100     250     370     380     383     383    8928
2215          DQ       0      10     100     250     370     380     383     383     383

2216          KK    R337
2217          KM         ROUTE FLOW FROM CP337 TO CP336
2218          RS      11              -1
2219          RC     .03     .03     .03    9830   .0034
2220          RX    1000    1080    1130    1240    1660    1770    1810    1830
2221          RY    1057    1056    1054    1052    1052    1054    1056    1057

2222          KK   1I336
2223          KM         ADD HYDROGRAPHS AT CP336
2224          HC       2    3.31

2225          KK   2I336
2226          KM         ADD HYDROGRAPHS AT CP336
2227          HC       2   45.29

2228          KK     336
2229          KM         RUNOFF HYDROGRAPH FROM SUB-BASIN 336
2230          BA    1.28
2231          LG     .43     .05    3.50     .43   13.50
2232          UI     32.     32.     32.     32.     32.     32.     98.    107.    124.    135.
2233          UI    150.    159.    171.    179.    188.    197.    208.    222.    237.    250.
2234          UI    264.    291.    330.    380.    408.    429.    386.    352.    326.    305.
2235          UI    288.    272.    260.    248.    230.    215.    203.    193.    181.    168.
2236          UI    159.    150.    135.    124.     94.     93.     63.     57.     57.     56.
2237          UI     53.     53.     53.     40.     32.     32.     32.     32.     32.     20.
2238          UI     10.     10.     10.     10.     10.     10.     10.     10.     10.     10.
2239          UI     10.     10.     10.     10.     10.     10.     10.     10.     10.      0.
2240          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
2241          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2242          KK   CP336
2243          KM         ADD HYDROGRAPHS AT CP336
2244          HC       2   46.57

2245          KK   SR336
2246          KM         STORAGE ROUTE THROUGH CP336
2247          RS       1    STOR       0       0
2248          SV       0     .54    1.72    4.49    5.79   15.91   32.49
2249          SQ       0    1400    2075    2335    2414    2800    8534
2250          SE   922.3     930     932   932.8     933     934     935

2251          KK    336A
2252          KM         RUNOFF HYDROGRAPH FROM SUB-BASIN 336A
2253          BA     .37
2254          LG     .51     .02    3.86     .44    2.00
2255          UI      9.      9.      9.      9.      9.      9.     25.     30.     34.     37.
2256          UI     42.     44.     47.     50.     52.     55.     58.     61.     65.     69.
```

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2257        UI     72.     79.     88.    101.    107.    122.    116.    105.     97.     90.
1                                         HEC-1 INPUT                                          PAGE 52

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

2258        UI     85.     80.     76.     73.     69.     64.     60.     57.     54.     51.
2259        UI     47.     45.     42.     38.     35.     27.     26.     18.     16.     16.
2260        UI     16.     15.     15.     15.     12.      9.      9.      9.      9.      9.
2261        UI      8.      3.      3.      3.      3.      3.      3.      3.      3.      3.
2262        UI      3.      3.      3.      3.      3.      3.      3.      3.      3.      3.
2263        UI      3.      0.      0.      0.      0.      0.      0.      0.      0.      0.
2264        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2265        KK  CP336A
2266        KM        ADD HYDROGRAPHS AT CP336A
2267        HC       2   46.94

2268        KK   R336A
2269        KM        ROUTE FLOW FROM CP336A TO CP364A
2270        RS       2              -1
2271        RC     .03     .02     .03    4210   .0056
2272        RX    1000    1020    1025    1030    1070    1100    1180    1310
2273        RY    1050    1030    1028    1026    1026  1028.5    1027    1050

2274        KK    364A
2275        KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 364A
2276        BA     .07
2277        LG     .35     .35    3.50     .28     .00
2278        UI     10.     33.     53.     71.    112.     90.     66.     47.     24.     15.
2279        UI     10.      3.      3.      3.      0.      0.      0.      0.      0.      0.
2280        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2281        KK  1I364A
2282        KM        ADD HYDROGRAPHS AT CP364A
2283        HC       2   47.01

2284        KK    336B
2285        KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 336B
2286        BA     .08
2287        LG     .35     .35    4.07     .36     .00
2288        UI     83.    262.    198.     57.     13.      0.      0.      0.      0.      0.
2289        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2290        KK  SR336B
2291        KM        STORAGE ROUTE THROUGH CP336B AT S.P.R.R.
2292        RS       1    STOR       0       0
2293        SV       0    2.37    5.42    7.76
2294        SQ       0     110     169    1249
2295        SE   921.3     924     925   925.5

2296        KK   R336B
2297        KM        ROUTE FLOW FROM CP336B TO CP364A
2298        RS       3              -1       0
2299        RC    .025    .025    .025    1250   .0048
2300        RX    1000    1001    1015    1030    1340    1380    1430    1510
2301        RY     921     921     920     918     918     921     919     920
1                                         HEC-1 INPUT                                          PAGE 53

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

2302        KK  CP364A
2303        KM        ADD HYDROGRAPHS AT CP364A
2304        KO       1
2305        HC       2   47.09

2306        KK   D364A
2307        KM        DIVERT FROM CP364A TO CP363
2308        DT   DI363
2309        DI       0     112     925    3216
2310        DQ       0      12     325    1166

2311        KK   R364A
2312        KM        ROUTE REMAINDER FROM CP364A TO CP364
2313        RS       5              -1
2314        RC    .075    .035    .035    3400   .0015
2315        RX    1000    1001    1270    1800    2070    2088    2089    2090
2316        RY     917     917     916     914     914     915     915     915

2317        KK     365
2318        KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 365
2319        BA     .38
2320        LG     .50     .00    4.11     .73     .00
2321        UI     22.     22.     37.     78.     98.    114.    128.    145.    167.    200.
2322        UI    261.    272.    222.    192.    172.    148.    130.    111.     96.     71.
2323        UI     47.     38.     36.     29.     22.     22.      9.      7.      7.      7.
2324        UI      7.      7.      7.      7.      0.      0.      0.      0.      0.      0.
2325        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2326        KK    R365
2327        KM        ROUTE FLOW FROM CP365 TO CP364
2328        RS      26              -1
2329        RC    .035    .035    .075    7020   .0017
2330        RX    1000    1001    1015    1140    1560    1700    2009    2010
2331        RY     915     915     914   913.5   913.5     914     915     915

2332        KK     364
2333        KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 364
2334        BA     .78
2335        LG     .50     .00    4.22     .43     .00
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2336        UI     37.     37.     37.     99.    136.    169.    190.    210.    230.    258.
2337        UI    286.    338.    418.    484.    415.    359.    321.    293.    261.    231.
2338        UI    207.    184.    161.    125.     92.     65.     63.     61.     49.     37.
2339        UI     37.     31.     11.     11.     11.     11.     11.     11.     11.     11.
2340        UI     11.     11.      0.      0.      0.      0.      0.      0.      0.      0.
2341        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2342        KK   1I364
2343        KM        ADD HYDROGRAPHS AT CP364
2344        HC       2    1.16
1                                        HEC-1 INPUT                                          PAGE 54

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


2345        KK   CP364
2346        KM        ADD HYDROGRAPHS AT CP364
2347        HC       2   48.25

2348        KK   SR364
2349        KM        STORAGE ROUTE CP364 BEHIND BUCKEYE CANAL
2350        RS       1    STOR       0       0
2351        SV       0     .91    4.65    6.88   14.06   22.19   33.52
2352        SQ       0       0       0      21     506    4186    7154
2353        SE     908     910     911   911.3     912   912.5   913.0

2354        KK    D364
2355        KM        DIVERT FROM CP364 TO GILA RIVER
2356        DT  DIGILA
2357        DI       0      21     506    4186
2358        DQ       0      21     163     597

2359        KK    R364
2360        KM        ROUTE REMAINDER FROM CP364 TO CP363
2361        RS      16              -1
2362        RC    .075     .06    .075    5770   .0016
2363        RX    1000    1001    1040    1200    2040    2180    2239    2240
2364        RY     950     907     906     905     905     906     907     950

2365        KK   D364A
2366        KM        RETURN DIVERT AT CP364A
2367        DR   DI363

2368        KK   R364A
2369        KM        ROUTE FLOW FROM CP364A TO CP363
2370        RS      17              -1
2371        RC    .075     .06    .075    5460   .0020
2372        RX    1000    1001    1040    1200    2040    2180    2239    2240
2373        RY     907     907     906     905     905     906     907     907

2374        KK     363
2375        KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 363
2376        BA     .63
2377        LG     .50     .00    3.71     .46     .00
2378        UI     23.     23.     23.     23.     68.     84.     98.    112.    122.    132.
2379        UI    142.    154.    170.    183.    207.    252.    286.    303.    262.    234.
2380        UI    213.    196.    183.    166.    152.    139.    127.    116.    106.     90.
2381        UI     67.     53.     41.     41.     38.     38.     28.     23.     23.     23.
2382        UI     15.      7.      7.      7.      7.      7.      7.      7.      7.      7.
2383        UI      7.      7.      7.      7.      0.      0.      0.      0.      0.      0.
2384        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2385        KK   1I363
2386        KM        ADD HYDROGRAPHS AT CP363
2387        HC       2   47.72
1                                        HEC-1 INPUT                                          PAGE 55

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


2388        KK   2I363
2389        KM        ADD HYDROGRAPHS AT CP363
2390        HC       2   48.88

2391        KK     314
2392        KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 314
2393        BA     .42
2394        LG     .50     .00    3.50     .47     .00
2395        UI     20.     20.     20.     51.     72.     89.    101.    111.    122.    136.
2396        UI    151.    176.    219.    257.    227.    195.    174.    158.    142.    126.
2397        UI    114.    100.     90.     71.     54.     35.     34.     32.     29.     20.
2398        UI     20.     20.      7.      6.      6.      6.      6.      6.      6.      6.
2399        UI      6.      6.      0.      0.      0.      0.      0.      0.      0.      0.
2400        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2401        KK    R314
2402        KM        ROUTE FLOW FROM CP314 TO CP333
2403        RS      25              -1
2404        RC    .075    .075    .075    5770   .0040
2405        RX    1000    1001    1200    1690    2100    2788    2789    2790
2406        RY     967     967     966     964     964     966     966     966

2407        KK     333
2408        KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 333
2409        BA     .58
2410        LG     .50     .00    3.50     .47     .00
2411        UI     26.     26.     26.     59.     93.    112.    128.    143.    156.    172.
2412        UI    192.    212.    256.    316.    336.    283.    249.    224.    206.    184.
2413        UI    164.    149.    132.    119.     95.     75.     46.     46.     43.     43.
2414        UI     27.     26.     26.     17.      8.      8.      8.      8.      8.      8.
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2415          UI      8.      8.      8.      8.      0.      0.      0.      0.      0.      0.
2416          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2417          KK   CP333
2418          KM        ADD HYDROGRAPHS AT CP333
2419          HC       2     1.0

2420          KK    R333
2421          KM        ROUTE FLOW FROM CP333 TO  CP348A
2422          RS       8              -1
2423          RC     .06     .04     .06    2700   .0048
2424          RX    1000    1001    1005    1600    2210    2560    2900    3020
2425          RY     947     947     946     944     944     946     948     949

2426          KK    348A
2427          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 348A
2428          BA     .22
2429          LG     .50     .00    3.62     .46     .00
2430          UI     17.     18.     61.     81.     97.    115.    138.    190.    211.    164.
2431          UI    138.    114.     95.     77.     52.     30.     28.     20.     17.      8.
2432          UI      5.      5.      5.      5.      5.      0.      0.      0.      0.      0.
2433          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1                                                HEC-1 INPUT                                          PAGE 56

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


2434          KK  CP348A
2435          KM        ADD HYDROGRAPHS AT CP348A
2436          HC       2    1.22

2437          KK   R348A
2438          KM        ROUTE FLOW FROM CP348A TO CP348B
2439          RS       4              -1
2440          RC     .03     .03    .075    4050   .0077
2441          RX    1000    1005    1010    1040    1100    1370    1450    1470
2442          RY  1032.5  1032.5    1032    1030    1030    1032    1034  1034.5

2443          KK    348B
2444          KM        RUNOFF FROM SUBBASIN 348B
2445          BA     .66
2446          LG     .49     .04    3.59     .45     .00
2447          UI     24.     24.     24.     24.     60.     82.     94.    110.    120.    130.
2448          UI    138.    150.    163.    178.    192.    223.    268.    303.    293.    257.
2449          UI    230.    211.    196.    184.    166.    153.    140.    128.    117.    109.
2450          UI     92.     72.     60.     42.     42.     39.     39.     36.     24.     24.
2451          UI     24.     24.      9.      7.      7.      7.      7.      7.      7.      7.
2452          UI      7.      7.      7.      7.      7.      7.      0.      0.      0.      0.
2453          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

2454          KK  CP348B
2455          KM        ADD HYDROGRAPHS AT CP348B
2456          HC       2    1.88

2457          KK  SR348B
2458          KM        STORAGE ROUTE BEHIND S.P.R.R. AT CP348B
2459          RS       1    STOR       0       0
2460          SV       0     .08    8.33   14.16   23.37
2461          SQ       0      50     285     778    4586
2462          SE   908.5   910.1     914     915     916

2463          KK   R348B
2464          KM        ROUTE FLOW FROM CP348B TO CP363
2465          RS      10              -1       0
2466          RC    .075     .06    .075    3100   .0029
2467          RX    1000    1001    1040    1200    2040    2180    2239    2240
2468          RY     907     907     906     905     905     906     907     907

2469          KK   3I363
2470          KM        ADD HYDROGRAPHS AT CP363
2471          HC       2   50.76

2472          KK     348
2473          KM        RUNOFF HYDROGRAPH FROM SUB-BASIN 348
2474          BA     .34
2475          LG     .50     .00    3.70     .45     .00
2476          UI     20.     20.     35.     71.     90.    104.    117.    133.    153.    187.
2477          UI    244.    239.    196.    171.    152.    131.    114.     98.     83.     60.
2478          UI     37.     34.     33.     22.     20.     18.      6.      6.      6.      6.
2479          UI      6.      6.      6.      6.      0.      0.      0.      0.      0.      0.
2480          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1                                                HEC-1 INPUT                                          PAGE 57

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


2481          KK   SR348
2482          KM        STORAGE ROUTE BEHIND SOUTHERN PACIFIC RAILROAD
2483          RS       1    STOR       0       0
2484          SV       0       0     .72    2.12   15.51   22.03
2485          SQ       0      .5       5       9    3101    5661
2486          SE   906.6   907.6     908   908.3   909.6     910

2487          KK    D348
2488          KM        DIVERT FROM CP348 TO CP347
2489          DT   DI347
2490          DI       0    3083    5640
2491          DQ       0       0     165

2492          KK    R348
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2493          KM        ROUTE REMAINDER FROM CP348 TO CP363
2494          RS       8              -1
2495          RC    .075     .06    .075    1600   .0025
2496          RX    1000    1001    1040    1200    2040    2180    2239    2240
2497          RY     907     907     906     905     905     906     907     907

2498          KK   CP363
2499          KM        ADD HYDROGRAPHS AT CP363
2500          HC       2   51.10
2501          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   37        159
              V
              V
   44       R159
              .
              .
   50         .         160
              .           .
              .           .
   58      CP160............
              V
              V
   61       R160
              .
              .
   67         .         161
              .           .
              .           .
   77      CP161............
              V
              V
   80       R161
              .
              .
   86         .         162
              .           V
              .           V
   94         .        R162
              .           .
              .           .
  100         .           .         163
              .           .           .
              .           .           .
  110         .       1I163............
              .           .
              .           .
  113      CP163............
              .
              .
  118         .-------> DI176A
  116       D163
              .
              .
  123         .           .<-------  DI176A
  121         .        D163
              .           V
              .           V
  124         .        R163
              .           .
              .           .
  130         .           .        176A
              .           .           .
              .           .           .
  141         .      CP176A............
              .           .
              .           .
  146         .           .-------> DI191
  144         .       D176A
              .           .
              .           .
  149         .           .         174
              .           .           V
              .           .           V
  156         .           .        R174
              .           .           .
              .           .           .
  162         .           .           .         175
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  171         .           .           .           .-------> DI175A
  169         .           .           .        D175
              .           .           .           V
              .           .           .           V
  174         .           .           .        R175
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  180         .           .           .           .         176
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  188         .           .           .       1I176............
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  191         .           .       CP176............
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                 .          .          V
                 .          .          V
194              .          .       R176
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202              .          .          .<-------  DI175A
200              .          .          .       D175
                 .          .          .          V
                 .          .          .          V
203              .          .          .       R175
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209              .          .          .          .        175A
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217              .          .          .     CP175A............
                 .          .          .          V
                 .          .          .          V
220              .          .          .      R175A
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226              .          .          .          .         189
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234              .          .          .      CP189............
                 .          .          .          V
                 .          .          .          V
237              .          .          .       R189
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243              .          .          .          .         190
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253              .          .          .      CP190............
                 .          .          .          V
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256              .          .          .       R190
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264              .          .          .          .           .<-------   DI191
262              .          .          .          .      D176A
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                 .          .          .          .          V
265              .          .          .          .      R176A
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271              .          .       1I191.........................
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274              .          .          .        191
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285              .          .       CP191............
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290              .          .          .-------->   DI208
288              .          .       CP191
                 .          .          V
                 .          .          V
293              .          .       R191
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299              .          .          .       192A
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309              .          .      CP192A............
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312              .          .      R192A
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318              .          .          .        192
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328              .          .       CP192............
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333              .          .          .-------->   DI209
331              .          .       D192
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338              .          .          .-------->   DI210
336              .          .       D192
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341              .          .          .        188
                 .          .          .          V
                 .          .          .          V
348              .          .          .       R188
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354              .          .          .          .         207A
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361              .          .          .     CP207A............
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364              .          .          .      R207A
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370                                   214
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377                            CP214.....
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                                  V
380                             R214
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386                                  .      215A
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392                                  .     R215A
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398                                  .         .          215
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405                                  .     1I215.........
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408                            CP215.....
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411                             R215
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417                                  .       233
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425                            CP233.....
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428                             R233
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434                                  .       216
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443                                  .     R216
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449                                  .         .          234
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459                                  .     1I234.........
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462                            CP234.....
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467                                  .------->   1D248
465                             D234
                                  V
                                  V
470                             R234
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476                                  .       207
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489                                  .         .------->   2D208
487                                  .     D207
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492                                  .     R207
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498                                  .         .          217
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508                                  .    CP217.........
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513                                  .         .------->   DI218
511                                  .     D217
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                                  .         V
516                                  .     R217
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522                                  .         .          235
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533                                  .     1I235.........
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536                            CP235.....
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541                                  .------->   2D248
539                             D235
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544                             R235
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552                                  .         .<-------   DI208
550                                  .     D191
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553                                             R191
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559                                                .          208
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570                                             1I208............
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575                                                .          .<-------   2D208
573                                                .        D207
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576                                                .        R207
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582                                             CP208............
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587                                                .-------->   1D219
585                                             D208
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592                                                .-------->  DI209A
590                                             D208
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595                                             R208
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601                                                .          218
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612                                             1I218............
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617                                                .          .<-------   DI218
615                                                .        D217
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618                                                .        R217
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624                                             CP218............
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629                                                .-------->   DI237
627                                             D218
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634                                                .-------->   2D219
632                                             D218
                                                   V
                                                   V
637                                             R218
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643                                                .          236
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654                                             1I236............
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657                                          CP236............
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662                                             .-------->   DI249
660                                          D236
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667                                             .-------->   1D250
665                                          D236
                                                V
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670                                          R236
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676                                             209A
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688                                                .          .<-------  DI209A
686                                                .        D208
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689                                                .        R208
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695                                            CP209A............
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700                                                .-------->   1D220
698                                            D209A
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705                                                .-------->   2D209
703                                            D209A
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                                                   V
708                                            R209A
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716                                                   .<-------   1D219
714                                              D208
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717                                              R208
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736                                       2I219............
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741                                                 .<-------   2D219
739                                              D218
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742                                              R218
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748                                       CP219............
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753                                                 .------->   DI238
751                                       D219
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758                                                 .------->   2D220
756                                       D219
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761                                       R219
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769                                                 .<-------   DI237
767                                              D218
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770                                              R218
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776                                                 .          237
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787                                           1I237............
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790                                       2I237............
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793                                  CP237............
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798                                     .------->   2D250
796                                  D237
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803                                     .------->   1D250A
801                                  D237
                                        V
                                        V
806                                  R237
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814                                                 .<-------   DI209
812                                       1D192
                                                    V
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815                                       R192
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821                                                 .         209
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831                                       1I209............
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836                                                 .<-------   2D209
834                                           D209A
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837                                           R209A
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843                                       CP209............
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848                                                 .------->   1D221
846                                       D209
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853                                                 .------->   2D210
851                                       D209
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856                                  R209
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864                                    .<-------   1D220
862                                    .      D209A
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865                                    .      R209A
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871                                    .         .        220
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881                                    .      1I220............
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884                                 2I220.........
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890                                    .      R219
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896                                 CP220.........
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901                                    .-------> DI239
899                                 D220
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906                                    .-------> 2D221
904                                 D220
                                       V
                                       V
909                                 R220
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917                                    .         .<-------   DI238
915                                    .      D219
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918                                    .      R219
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924                                    .         .        238
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934                                    .      1I238............
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937                                 2I238.........
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940                              CP238.........
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945                                    .-------> 2D250A
943                              D238
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950                                    .-------> 1D251
948                              D238
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                                    V
953                              R238
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961                                    .<-------   DI210
959                                 2D192
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                                       V
962                                 R192
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968                                    .         210
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978                                 1I210.........
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983                                    .         .<-------   2D210
981                                    .      D209
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984                                    .      R209
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990                                 CP210.........
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993                                 R210
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1001                                   .         .<-------   1D221
999                                    .      D209
                                       .         V
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1021                                            2I221.........
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1026                                                    .<-------  2D221
1024                                                 D220
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                                                        V
1027                                                 R220
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1033                                            CP221.........
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1036                                             R221
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1044                                                    .<-------  DI239
1042                                                 D220
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1045                                                 R220
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1064                                            2I239.........
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1067                                        CP239.........
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1072                                             .------> 2D251
1070                                        D239
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1075                                        R239
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1081                                             .       240
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1091                                        CP240.........
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1094                                        R240
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1100                                             .       213
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1114                                             .        .       212
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1126                                             .        .     SR212
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1132                                            CP212.........
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1135                                             R212
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1141                                                    .       211
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1151                                                    .      R211
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1157                                                    .        .       221A
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1168                                                    .     1I221A.......
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1171                                                    .     SR221A
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1177                                            CP221A........
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1180                                            R221A
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1186                                                    .       222
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1198                CP222............
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                      V
1201                R222

1207                          226
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                               V
1214                        SR226
                               V
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1220                        R226

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1233                                    R201

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1247                                  1I223............

1250                        CP223............

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1253                        D223
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1258                        R223

1264                                     224

1271                        CP224............
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1274                        R224

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1288                        1I241............

1291                2I241............

1294          CP241............
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                 V
1297          SR241
                 V
                 V
1303           R241

1309                253

1319          1I253............

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1329                R253A

1335          2I253............

1338                247

1350                         -------> DI261
1348                D247
                      V
                      V
1353                R247

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1372                                     <-------  1D248
1370                                    D234
                                          V
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1373                                    R234
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1382                                          2I248............
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1387                                                    .<-------   2D248
1385                                                  D235
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1388                                                  R235
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1394                                          CP248............
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1399                                                    .------->   DI262
1397                                           D248
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1402                                           R248
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1408                                                  249
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1419                                          1I249............
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1424                                                    .<-------   DI249
1422                                                  D236
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1425                                                  R236
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1431                                          CP249............
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1436                                                    .------->   DI264
1434                                           D249
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1439                                           R249
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1447                                                    .<-------   1D250
1445                                                  D236
                                                        V
                                                        V
1448                                                  R236
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1454                                                    .         250
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1464                                                  1I250............
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1469                                                    .           .<-------   2D250
1467                                                    .         D237
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1470                                                    .         R237
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1476                                                  2I250............
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1479                                          CP250............
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1482                                           R250
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1490                                                    .<-------   1D250A
1488                                                  D237
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1491                                                  R237
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1497                                                    .         250A
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1508                                                  1I250A...........
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1513                                                    .           .<-------   2D250A
1511                                                    .         D238
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1514                                                    .         R238
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1520                                                  2I250A...........
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1523                                          CP250A...........
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1528                                  .-------> DI265A
1526                              D250A
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1533                                  .-------> 1D266
1531                              D250A
                                      V
                                      V
1536                              R250A
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1544                                  .<-------  1D251
1542                                  .      D238
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1545                                  .      R238
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1551                                  .        .        251
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1561                                  .     1I251.........
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1566                                  .        .         .<-------  2D251
1564                                  .        .      D239
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1567                                  .        .      R239
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1573                                  .     2I251.........
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1576                              CP251.........
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1581                                  .-------> 2D266
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                                      V
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1584                               R251
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1605                                  .-------> DI267
1603                               D252
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1608                               R252
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1614                          CP253.........
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1617                          SR253
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                                  V
1623                           R253
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1669                                  .      R251
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1675                              CP266.........
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1680                                  .-------> DI283
1678                               D266
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1683                                            R266
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1691                                               .<-------   DI267
1689                                               .       D252
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1692                                               .       R252
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1711                                            CP267............
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1714                                            D267
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1719                                            R267
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1728                                      SR268
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1734                                       R268
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1750                                      1I286............
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1753                                            .        288
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1764                                            .       R288
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1770                                      CP286............
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1788                                      1I287............
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1791                                            .       D266
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1794                                            .       R266
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1800                                            .          .        283
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1810                                            .     CP283............
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1813                                            .       R283
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1819                                            .          .       285B
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1826                                            .    CP285B............
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1829                                            .    SR285B
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1837                                            .------->   DI297
1835                                            .     D285B
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1840                                            .     R285B
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1848                                            .          .<-------   DI284
1846                                            .          .       D267
                                                .          .          V
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1849                                            .          .       R267
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1865             .         .         .         .         .      CP284.........
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1868             .         .         .         .         .      SR284
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1874             .         .         .         .         .       R284
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1880             .         .         .         .         .         .        285A
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1887             .         .         .         .         .     1I285A.........
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1890             .         .         .         .    CP285A.........
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1893             .         .         .         .    SR285A
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1901             .         .         .         .         .-------> 1D297A
1899             .         .         .         .     D285A
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1904             .         .         .         .     R285A
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1910             .         .         .         .         .       285
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1917             .         .         .         .     CP285.........
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1920             .         .         .         .     SR285
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1928             .         .         .         .         .-------> 2D297A
1926             .         .         .         .      D285
                 .         .         .         .         V
                 .         .         .         .         V
1931             .         .         .         .      R285
                 .         .         .         .         .
                 .         .         .         .         .
1937             .         .         .    CP287.........
                 .         .         .         V
                 .         .         .         V
1940             .         .         .    SR287
                 .         .         .         V
                 .         .         .         V
1946             .         .         .     R287
                 .         .         .         .
                 .         .         .         .
1952             .         .         .         .       298
                 .         .         .         .         .
                 .         .         .         .         .
1962             .         .         .    CP298.........
                 .         .         .         V
                 .         .         .         V
1965             .         .         .    SR298
                 .         .         .         V
                 .         .         .         V
1971             .         .         .     R298
                 .         .         .         .
                 .         .         .         .
1977             .         .         .         .       316
                 .         .         .         .         .
                 .         .         .         .         .
1988             .         .         .    CP316.........
                 .         .         .         V
                 .         .         .         V
1991             .         .         .     R316
                 .         .         .         .
                 .         .         .         .
1997             .         .         .         .       334
                 .         .         .         .         .
                 .         .         .         .         .
2007             .         .         .    1I334.........
                 .         .         .         .
                 .         .         .         .
2012             .         .         .         .<------- 2D297A
2010             .         .         .      D285
                 .         .         .         V
                 .         .         .         V
2013             .         .         .      R285
                 .         .         .         .
                 .         .         .         .
2021             .         .         .         .         .<------- 1D297A
2019             .         .         .         .      D285A
                 .         .         .         .         V
                 .         .         .         .         V
2022             .         .         .         .      R285A
                 .         .         .         .         .
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2028             .         .         .         .         .        297A
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2037             .         .         .         .         .     1I297A.........
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2040                CP297A............
                       V
                       V
2043                R297A

2049                                     315

2060                CP315............
                       V
                       V
2063                R315

2069          CP334............
                 V
                 V
2072          R334

2078                 335

2087          CP335............
                 V
                 V
2090          R335

2096                 299
                       V
                       V
2106                R299

2112                                     317

2123                CP317............
                       V
                       V
2126                R317

2132                                     300
                                           V
                                           V
2141                                     R300

2147                                                 318

2156                                     CP318............
                                           V
                                           V
2159                                     R318

2165                                                 301
                                                       V
                                                       V
2172                                                 R301

2178                                                                 319

2186                                                 CP319............
                                                       V
                                                       V
2189                                                 R319

2195                                                                 337

2202                                     CP337.......................
                                           V
                                           V
2205                                     SR337

2213                                                 -------> DI367
2211                                     D337
                                           V
                                           V
2216                                     R337

2222                I1336............

2225          2I336............

2228                 336
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2242            .         .         .   CP336............
                .         .         .       V
                .         .         .       V
2245            .         .         .   SR336
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2251            .         .         .         .       336A
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2265            .         .         .  CP336A............
                .         .         .       V
                .         .         .       V
2268            .         .         .  R336A
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2274            .         .         .         .       364A
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2281            .         .         .  1I364A............
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2284            .         .         .         .       336B
                .         .         .         .         V
                .         .         .         .         V
2290            .         .         .         .     SR336B
                .         .         .         .         V
                .         .         .         .         V
2296            .         .         .         .      R336B
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2302            .         .         .  CP364A............
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2308            .         .         .         .-------> DI363
2306            .         .         .   D364A
                .         .         .       V
                .         .         .       V
2311            .         .         .   R364A
                .         .         .         .
                .         .         .         .
2317            .         .         .         .        365
                .         .         .         .          V
                .         .         .         .          V
2326            .         .         .         .       R365
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2332            .         .         .         .         .         364
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2342            .         .         .         .      1I364............
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2345            .         .         .   CP364............
                .         .         .       V
                .         .         .       V
2348            .         .         .   SR364
                .         .         .         .
                .         .         .         .
2356            .         .         .         .-------> DIGILA
2354            .         .         .    D364
                .         .         .       V
                .         .         .       V
2359            .         .         .    R364
                .         .         .         .
                .         .         .         .
2367            .         .         .         .         .<-------   DI363
2365            .         .         .         .      D364A
                .         .         .         .         V
                .         .         .         .         V
2368            .         .         .         .      R364A
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2374            .         .         .         .         .         363
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2385            .         .         .         .      1I363............
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2388            .         .         .   2I363............
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2391            .         .         .         .        314
                .         .         .         .          V
                .         .         .         .          V
2401            .         .         .         .       R314
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2407            .         .         .         .         .         333
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2417            .         .         .         .      CP333............
                .         .         .         .         V
                .         .         .         .         V
2420            .         .         .         .       R333
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2426            .         .         .         .         .         348A
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2434                                  CP348A............
                                         V
                                         V
2437                                   R348A
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2443                                     .          348B
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2454                                  CP348B............
                                         V
                                         V
2457                                  SR348B
                                         V
                                         V
2463                                   R348B
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                                         .
2469                            3I363............
                                         .
                                         .
2472                                     348
                                         V
                                         V
2481                                   SR348
                                         .
                                         .
2489                                     .-------->   DI347
2487                                   D348
                                         V
                                         V
2492                                   R348
                                         .
                                         .
2498                            CP363............
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(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*          SEPTEMBER 1990               *
*           VERSION 4.0                 *
*                                       *
*  RUN DATE  10/29/1994  TIME  10:38:33 *
*                                       *
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*****************************************
*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   HYDROLOGIC ENGINEERING CENTER       *
*         609 SECOND STREET             *
*      DAVIS, CALIFORNIA 95616          *
*          (916) 756-1104               *
*                                       *
*****************************************
```

BULLARD WASH OUTFALL FEASIBILITY STUDY — STANLEY CONSULTANTS, INC.
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY — SCI #12278
(FCD #94-06) — INPUT FILE: 12278H1A

100-YEAR, 24-HOUR STORM
SCS TYPE II RAINFALL DISTRIBUTION
NOAA ATLAS 2, VOLUME VIII-ARIZONA DEPTH-AREA REDUCTION
ONLY BULLARD WASH CONTRIB AREA CONSIDERED; HC FIELD 2, TAREA ADJUSTED

****
THIS MODEL IS DERIVED FROM THE WHITE TANKS/AGUA FRIA AREA DRAINAGE MASTER STUDY (ADMS) CONDUCTED BY THE WLB GROUP FOR FCDMC AND DATED OCTOBER 1992. THE BASIC ADMS MODEL PARAMETERS AND METHODOLGY HAVE NOT BEEN CHANGED. THE SUB-BASINS CONTRIBUTING TO BULLARD WASH HAVE BEEN ISOLATED FROM THE REST OF THE ORIGINAL WLB MODEL. THIS MODEL REFLECTS PROPOSED DYSART DRAIN AND WHITE TANKS #3 FLOOD CONTROL IMPROVEMENTS.
****

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20 IO        OUTPUT CONTROL VARIABLES
                  IPRNT          5  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT        HYDROGRAPH TIME DATA
                   NMIN          5  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1   0  STARTING DATE
                  ITIME       0000  STARTING TIME
                     NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      2   0  ENDING DATE
                 NDTIME       0055  ENDING TIME
                  ICENT         19  CENTURY MARK

             COMPUTATION INTERVAL     .08 HOURS
                  TOTAL TIME BASE   24.92 HOURS

      ENGLISH UNITS
           DRAINAGE AREA          SQUARE MILES
           PRECIPITATION DEPTH    INCHES
           LENGTH, ELEVATION      FEET
           FLOW                   CUBIC FEET PER SECOND
           STORAGE VOLUME         ACRE-FEET
           SURFACE AREA           ACRES
           TEMPERATURE            DEGREES FAHRENHEIT

22 JD        INDEX STORM NO. 1
                  STRM        4.03  PRECIPITATION DEPTH
                  TRDA         .00  TRANSPOSITION DRAINAGE AREA
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23 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
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33 JD INDEX STORM NO. 2

STRM 3.99 PRECIPITATION DEPTH
TRDA 10.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
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34 JD INDEX STORM NO. 3

STRM 3.83 PRECIPITATION DEPTH
TRDA 50.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

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.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
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35 JD INDEX STORM NO. 4
STRM 3.76 PRECIPITATION DEPTH
TRDA 100.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

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.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
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36 JD INDEX STORM NO. 5
STRM 3.70 PRECIPITATION DEPTH
TRDA 200.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

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.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
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2302 KK   *   CP364A    *
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2304 KO OUTPUT CONTROL VARIABLES
IPRNT 1 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

2305 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

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HYDROGRAPH AT CP364A
TRANSPOSITION AREA .0 SQ MI

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	7.	1		1230	151	270.	1		1845	226	3289.
1		0005	2	0.	1		0620	77	7.	1		1235	152	295.	1		1850	227	3304.
1		0010	3	0.	1		0625	78	7.	1		1240	153	335.	1		1855	228	3320.
1		0015	4	0.	1		0630	79	7.	1		1245	154	389.	1		1900	229	3337.
1		0020	5	0.	1		0635	80	7.	1		1250	155	468.	1		1905	230	[illegible]
1		0025	6	0.	1		0640	81	7.	1		1255	156	552.	1		1910	231	[illegible]
1		0030	7	0.	1		0645	82	7.	1		1300	157	637.	1		1915	232	[illegible]
1		0035	8	0.	1		0650	83	7.	1		1305	158	726.	1		1920	233	[illegible]
1		0040	9	0.	1		0655	84	7.	1		1310	159	821.	1		1925	234	[illegible]
1		0045	10	0.	1		0700	85	7.	1		1315	160	927.	1		1930	235	3420.
1		0050	11	0.	1		0705	86	7.	1		1320	161	1046.	1		1935	236	3428.
1		0055	12	0.	1		0710	87	7.	1		1325	162	1171.	1		1940	237	3434.
1		0100	13	0.	1		0715	88	7.	1		1330	163	1291.	1		1945	238	3437.
1		0105	14	0.	1		0720	89	7.	1		1335	164	1399.	1		1950	239	3438.
1		0110	15	0.	1		0725	90	8.	1		1340	165	1506.	1		1955	240	3437.
1		0115	16	1.	1		0730	91	8.	1		1345	166	1637.	1		2000	241	3432.
1		0120	17	1.	1		0735	92	8.	1		1350	167	1719.	1		2005	242	3426.
1		0125	18	1.	1		0740	93	8.	1		1355	168	1777.	1		2010	243	3417.
1		0130	19	1.	1		0745	94	8.	1		1400	169	1814.	1		2015	244	3405.
1		0135	20	1.	1		0750	95	8.	1		1405	170	1824.	1		2020	245	3392.
1		0140	21	1.	1		0755	96	8.	1		1410	171	1810.	1		2025	246	3376.
1		0145	22	1.	1		0800	97	8.	1		1415	172	1782.	1		2030	247	3358.
1		0150	23	1.	1		0805	98	8.	1		1420	173	1757.	1		2035	248	3337.
1		0155	24	1.	1		0810	99	8.	1		1425	174	1743.	1		2040	249	3313.
1		0200	25	2.	1		0815	100	8.	1		1430	175	1738.	1		2045	250	3286.
1		0205	26	2.	1		0820	101	8.	1		1435	176	1738.	1		2050	251	3257.
1		0210	27	2.	1		0825	102	8.	1		1440	177	1743.	1		2055	252	3225.
1		0215	28	2.	1		0830	103	8.	1		1445	178	1749.	1		2100	253	3191.
1		0220	29	2.	1		0835	104	9.	1		1450	179	1753.	1		2105	254	3154.
1		0225	30	3.	1		0840	105	9.	1		1455	180	1749.	1		2110	255	3115.
1		0230	31	3.	1		0845	106	9.	1		1500	181	1732.	1		2115	256	3071.
1		0235	32	3.	1		0850	107	9.	1		1505	182	1702.	1		2120	257	3021.
1		0240	33	3.	1		0855	108	9.	1		1510	183	1661.	1		2125	258	2965.
1		0245	34	3.	1		0900	109	9.	1		1515	184	1617.	1		2130	259	2900.
1		0250	35	3.	1		0905	110	9.	1		1520	185	1576.	1		2135	260	2837.
1		0255	36	4.	1		0910	111	9.	1		1525	186	1543.	1		2140	261	2793.
1		0300	37	4.	1		0915	112	9.	1		1530	187	1523.	1		2145	262	2757.
1		0305	38	4.	1		0920	113	9.	1		1535	188	1525.	1		2150	263	2713.
1		0310	39	4.	1		0925	114	9.	1		1540	189	1560.	1		2155	264	2658.
1		0315	40	4.	1		0930	115	10.	1		1545	190	1637.	1		2200	265	2594.
1		0320	41	4.	1		0935	116	10.	1		1550	191	1758.	1		2205	266	2523.
1		0325	42	4.	1		0940	117	10.	1		1555	192	1913.	1		2210	267	2440.
1		0330	43	5.	1		0945	118	10.	1		1600	193	2066.	1		2215	268	2329.
1		0335	44	5.	1		0950	119	10.	1		1605	194	2196.	1		2220	269	2185.
1		0340	45	5.	1		0955	120	10.	1		1610	195	2320.	1		2225	270	2014.
1		0345	46	5.	1		1000	121	10.	1		1615	196	2433.	1		2230	271	[illegible]
1		0350	47	5.	1		1005	122	10.	1		1620	197	2531.	1		2235	272	[illegible]
1		0355	48	5.	1		1010	123	11.	1		1625	198	2624.	1		2240	273	[illegible]
1		0400	49	5.	1		1015	124	11.	1		1630	199	2715.	1		2245	274	[illegible]
1		0405	50	5.	1		1020	125	11.	1		1635	200	2856.	1		2250	275	[illegible]
1		0410	51	5.	1		1025	126	11.	1		1640	201	3035.	1		2255	276	1516.
1		0415	52	5.	1		1030	127	11.	1		1645	202	3133.	1		2300	277	1477.
1		0420	53	5.	1		1035	128	12.	1		1650	203	3150.	1		2305	278	1441.
1		0425	54	5.	1		1040	129	12.	1		1655	204	3149.	1		2310	279	1395.
1		0430	55	5.	1		1045	130	12.	1		1700	205	3139.	1		2315	280	1349.
1		0435	56	5.	1		1050	131	12.	1		1705	206	3127.	1		2320	281	1305.
1		0440	57	5.	1		1055	132	13.	1		1710	207	3115.	1		2325	282	1263.
1		0445	58	6.	1		1100	133	13.	1		1715	208	3106.	1		2330	283	1223.
1		0450	59	6.	1		1105	134	13.	1		1720	209	3098.	1		2335	284	1184.
1		0455	60	6.	1		1110	135	14.	1		1725	210	3093.	1		2340	285	1147.
1		0500	61	6.	1		1115	136	14.	1		1730	211	3090.	1		2345	286	1112.
1		0505	62	6.	1		1120	137	14.	1		1735	212	3091.	1		2350	287	1077.
1		0510	63	6.	1		1125	138	15.	1		1740	213	3095.	1		2355	288	1044.
1		0515	64	6.	1		1130	139	15.	1		1745	214	3103.	2		0000	289	1012.
1		0520	65	6.	1		1135	140	17.	1		1750	215	3115.	2		0005	290	982.
1		0525	66	6.	1		1140	141	21.	1		1755	216	3129.	2		0010	291	955.
1		0530	67	6.	1		1145	142	29.	1		1800	217	3145.	2		0015	292	930.
1		0535	68	6.	1		1150	143	44.	1		1805	218	3163.	2		0020	293	907.
1		0540	69	6.	1		1155	144	72.	1		1810	219	3181.	2		0025	294	886.
1		0545	70	6.	1		1200	145	109.	1		1815	220	3199.	2		0030	295	866.
1		0550	71	6.	1		1205	146	153.	1		1820	221	3217.	2		0035	296	848.
1		0555	72	6.	1		1210	147	205.	1		1825	222	3233.	2		0040	297	831.
1		0600	73	6.	1		1215	148	254.	1		1830	223	3249.	2		0045	298	814.
1		0605	74	6.	1		1220	149	281.	1		1835	224	3262.	2		0050	299	797.
1		0610	75	6.	1		1225	150	271.	1		1840	225	3275.	2		0055	300	781.

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ 3438.	19.83	(CFS)	3132.	1160.	1118.	1118.
		(INCHES)	.618	.916	.916	.916
		(AC-FT)	1553.	2301.	2301.	2301.

CUMULATIVE AREA = 47.09 SQ MI

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HYDROGRAPH AT CP364A
TRANSPOSITION AREA 10.0 SQ MI

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	7.	1		1230	151	266.	1		1845	226	3239.
1		0005	2	0.	1		0620	77	7.	1		1235	152	291.	1		1850	227	3253.
1		0010	3	0.	1		0625	78	7.	1		1240	153	330.	1		1855	228	3267.
1		0015	4	0.	1		0630	79	7.	1		1245	154	383.	1		1900	229	3282.
1		0020	5	0.	1		0635	80	7.	1		1250	155	459.	1		1905	230	3297.
1		0025	6	0.	1		0640	81	7.	1		1255	156	543.	1		1910	231	3311.
1		0030	7	0.	1		0645	82	7.	1		1300	157	627.	1		1915	232	3325.
1		0035	8	0.	1		0650	83	7.	1		1305	158	715.	1		1920	233	3339.
1		0040	9	0.	1		0655	84	7.	1		1310	159	808.	1		1925	234	3351.
1		0045	10	0.	1		0700	85	7.	1		1315	160	912.	1		1930	235	3362.
1		0050	11	0.	1		0705	86	7.	1		1320	161	1029.	1		1935	236	3370.
1		0055	12	0.	1		0710	87	7.	1		1325	162	1152.	1		1940	237	3377.
1		0100	13	0.	1		0715	88	7.	1		1330	163	1271.	1		1945	238	3381.
1		0105	14	0.	1		0720	89	7.	1		1335	164	1378.	1		1950	239	3383.
1		0110	15	0.	1		0725	90	7.	1		1340	165	1480.	1		1955	240	3383.
1		0115	16	1.	1		0730	91	7.	1		1345	166	1605.	1		2000	241	3380.
1		0120	17	1.	1		0735	92	8.	1		1350	167	1693.	1		2005	242	3375.
1		0125	18	1.	1		0740	93	8.	1		1355	168	1753.	1		2010	243	3367.
1		0130	19	1.	1		0745	94	8.	1		1400	169	1788.	1		2015	244	3357.
1		0135	20	1.	1		0750	95	8.	1		1405	170	1797.	1		2020	245	3344.
1		0140	21	1.	1		0755	96	8.	1		1410	171	1782.	1		2025	246	3329.
1		0145	22	1.	1		0800	97	8.	1		1415	172	1754.	1		2030	247	3311.
1		0150	23	1.	1		0805	98	8.	1		1420	173	1728.	1		2035	248	3290.
1		0155	24	1.	1		0810	99	8.	1		1425	174	1713.	1		2040	249	3266.
1		0200	25	2.	1		0815	100	8.	1		1430	175	1706.	1		2045	250	3240.
1		0205	26	2.	1		0820	101	8.	1		1435	176	1706.	1		2050	251	3211.
1		0210	27	2.	1		0825	102	8.	1		1440	177	1710.	1		2055	252	3180.
1		0215	28	2.	1		0830	103	8.	1		1445	178	1716.	1		2100	253	3147.
1		0220	29	2.	1		0835	104	8.	1		1450	179	1719.	1		2105	254	3111.
1		0225	30	3.	1		0840	105	9.	1		1455	180	1716.	1		2110	255	3072.
1		0230	31	3.	1		0845	106	9.	1		1500	181	1701.	1		2115	256	3028.
1		0235	32	3.	1		0850	107	9.	1		1505	182	1673.	1		2120	257	2977.
1		0240	33	3.	1		0855	108	9.	1		1510	183	1634.	1		2125	258	2918.
1		0245	34	3.	1		0900	109	9.	1		1515	184	1591.	1		2130	259	2857.
1		0250	35	3.	1		0905	110	9.	1		1520	185	1551.	1		2135	260	2807.
1		0255	36	4.	1		0910	111	9.	1		1525	186	1517.	1		2140	261	2771.
1		0300	37	4.	1		0915	112	9.	1		1530	187	1496.	1		2145	262	2732.
1		0305	38	4.	1		0920	113	9.	1		1535	188	1493.	1		2150	263	2683.
1		0310	39	4.	1		0925	114	9.	1		1540	189	1520.	1		2155	264	2624.
1		0315	40	4.	1		0930	115	9.	1		1545	190	1589.	1		2200	265	2557.
1		0320	41	4.	1		0935	116	10.	1		1550	191	1702.	1		2205	266	2482.
1		0325	42	4.	1		0940	117	10.	1		1555	192	1857.	1		2210	267	2388.
1		0330	43	5.	1		0945	118	10.	1		1600	193	2019.	1		2215	268	2266.
1		0335	44	5.	1		0950	119	10.	1		1605	194	2153.	1		2220	269	2111.
1		0340	45	5.	1		0955	120	10.	1		1610	195	2277.	1		2225	270	1941.
1		0345	46	5.	1		1000	121	10.	1		1615	196	2396.	1		2230	271	1816.
1		0350	47	5.	1		1005	122	10.	1		1620	197	2496.	1		2235	272	1735.
1		0355	48	5.	1		1010	123	11.	1		1625	198	2586.	1		2240	273	1668.
1		0400	49	5.	1		1015	124	11.	1		1630	199	2674.	1		2245	274	1608.
1		0405	50	5.	1		1020	125	11.	1		1635	200	2780.	1		2250	275	1553.
1		0410	51	5.	1		1025	126	11.	1		1640	201	2927.	1		2255	276	1504.
1		0415	52	5.	1		1030	127	11.	1		1645	202	3055.	1		2300	277	1469.
1		0420	53	5.	1		1035	128	12.	1		1650	203	3106.	1		2305	278	1430.
1		0425	54	5.	1		1040	129	12.	1		1655	204	3110.	1		2310	279	1385.
1		0430	55	5.	1		1045	130	12.	1		1700	205	3102.	1		2315	280	1339.
1		0435	56	5.	1		1050	131	12.	1		1705	206	3091.	1		2320	281	1296.
1		0440	57	5.	1		1055	132	13.	1		1710	207	3081.	1		2325	282	1255.
1		0445	58	5.	1		1100	133	13.	1		1715	208	3072.	1		2330	283	1215.
1		0450	59	5.	1		1105	134	13.	1		1720	209	3065.	1		2335	284	1177.
1		0455	60	6.	1		1110	135	13.	1		1725	210	3059.	1		2340	285	1141.
1		0500	61	6.	1		1115	136	14.	1		1730	211	3056.	1		2345	286	1106.
1		0505	62	6.	1		1120	137	14.	1		1735	212	3055.	1		2350	287	1072.
1		0510	63	6.	1		1125	138	15.	1		1740	213	3058.	1		2355	288	1039.
1		0515	64	6.	1		1130	139	15.	1		1745	214	3064.	2		0000	289	1007.
1		0520	65	6.	1		1135	140	17.	1		1750	215	3074.	2		0005	290	978.
1		0525	66	6.	1		1140	141	21.	1		1755	216	3087.	2		0010	291	951.
1		0530	67	6.	1		1145	142	29.	1		1800	217	3102.	2		0015	292	926.
1		0535	68	6.	1		1150	143	43.	1		1805	218	3119.	2		0020	293	903.
1		0540	69	6.	1		1155	144	71.	1		1810	219	3137.	2		0025	294	883.
1		0545	70	6.	1		1200	145	107.	1		1815	220	3154.	2		0030	295	864.
1		0550	71	6.	1		1205	146	150.	1		1820	221	3171.	2		0035	296	845.
1		0555	72	6.	1		1210	147	201.	1		1825	222	3187.	2		0040	297	828.
1		0600	73	6.	1		1215	148	249.	1		1830	223	3202.	2		0045	298	811.
1		0605	74	6.	1		1220	149	277.	1		1835	224	3215.	2		0050	299	795.
1		0610	75	6.	1		1225	150	267.	1		1840	225	3227.	2		0055	300	779.

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ 3383.	19.83	(CFS)	3086.	1143.	1101.	1101.
		(INCHES)	.609	.903	.903	.903
		(AC-FT)	1530.	2267.	2267.	2267.

CUMULATIVE AREA = 47.09 SQ MI

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HYDROGRAPH AT CP364A
TRANSPOSITION AREA 50.0 SQ MI

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6.	1		1230	151	251.	1		1845	226	3047.
1		0005	2	0.	1		0620	77	6.	1		1235	152	275.	1		1850	227	3059.

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0010	3	0.	1		0625	78	6.	1		1240	153	310.	1		1855	228	3070.
1		0015	4	0.	1		0630	79	6.	1		1245	154	358.	1		1900	229	3082.
1		0020	5	0.	1		0635	80	7.	1		1250	155	424.	1		1905	230	3094.
1		0025	6	0.	1		0640	81	7.	1		1255	156	508.	1		1910	231	3106.
1		0030	7	0.	1		0645	82	7.	1		1300	157	588.	1		1915	232	3117.
1		0035	8	0.	1		0650	83	7.	1		1305	158	671.	1		1920	233	3127.
1		0040	9	0.	1		0655	84	7.	1		1310	159	758.	1		1925	234	3137.
1		0045	10	0.	1		0700	85	7.	1		1315	160	853.	1		1930	235	[illegible]
1		0050	11	0.	1		0705	86	7.	1		1320	161	960.	1		1935	236	[illegible]
1		0055	12	0.	1		0710	87	7.	1		1325	162	1076.	1		1940	237	[illegible]
1		0100	13	0.	1		0715	88	7.	1		1330	163	1189.	1		1945	238	3[illegible]
1		0105	14	0.	1		0720	89	7.	1		1335	164	1294.	1		1950	239	3166.
1		0110	15	0.	1		0725	90	7.	1		1340	165	1387.	1		1955	240	3167.
1		0115	16	0.	1		0730	91	7.	1		1345	166	1476.	1		2000	241	3165.
1		0120	17	1.	1		0735	92	7.	1		1350	167	1582.	1		2005	242	3162.
1		0125	18	1.	1		0740	93	7.	1		1355	168	1652.	1		2010	243	3156.
1		0130	19	1.	1		0745	94	7.	1		1400	169	1687.	1		2015	244	3148.
1		0135	20	1.	1		0750	95	7.	1		1405	170	1693.	1		2020	245	3137.
1		0140	21	1.	1		0755	96	7.	1		1410	171	1676.	1		2025	246	3125.
1		0145	22	1.	1		0800	97	8.	1		1415	172	1646.	1		2030	247	3110.
1		0150	23	1.	1		0805	98	8.	1		1420	173	1617.	1		2035	248	3093.
1		0155	24	1.	1		0810	99	8.	1		1425	174	1596.	1		2040	249	3074.
1		0200	25	2.	1		0815	100	8.	1		1430	175	1584.	1		2045	250	3053.
1		0205	26	2.	1		0820	101	8.	1		1435	176	1579.	1		2050	251	3030.
1		0210	27	2.	1		0825	102	8.	1		1440	177	1580.	1		2055	252	3003.
1		0215	28	2.	1		0830	103	8.	1		1445	178	1583.	1		2100	253	2971.
1		0220	29	2.	1		0835	104	8.	1		1450	179	1585.	1		2105	254	2934.
1		0225	30	2.	1		0840	105	8.	1		1455	180	1582.	1		2110	255	2890.
1		0230	31	3.	1		0845	106	8.	1		1500	181	1572.	1		2115	256	2843.
1		0235	32	3.	1		0850	107	8.	1		1505	182	1553.	1		2120	257	2805.
1		0240	33	3.	1		0855	108	8.	1		1510	183	1525.	1		2125	258	2775.
1		0245	34	3.	1		0900	109	8.	1		1515	184	1492.	1		2130	259	2743.
1		0250	35	3.	1		0905	110	9.	1		1520	185	1465.	1		2135	260	2702.
1		0255	36	3.	1		0910	111	9.	1		1525	186	1433.	1		2140	261	2651.
1		0300	37	4.	1		0915	112	9.	1		1530	187	1403.	1		2145	262	2593.
1		0305	38	4.	1		0920	113	9.	1		1535	188	1383.	1		2150	263	2530.
1		0310	39	4.	1		0925	114	9.	1		1540	189	1381.	1		2155	264	2458.
1		0315	40	4.	1		0930	115	9.	1		1545	190	1404.	1		2200	265	2367.
1		0320	41	4.	1		0935	116	9.	1		1550	191	1462.	1		2205	266	2253.
1		0325	42	4.	1		0940	117	9.	1		1555	192	1598.	1		2210	267	2116.
1		0330	43	4.	1		0945	118	9.	1		1600	193	1781.	1		2215	268	1968.
1		0335	44	4.	1		0950	119	10.	1		1605	194	1960.	1		2220	269	1851.
1		0340	45	5.	1		0955	120	10.	1		1610	195	2109.	1		2225	270	1774.
1		0345	46	5.	1		1000	121	10.	1		1615	196	2234.	1		2230	271	1709.
1		0350	47	5.	1		1005	122	10.	1		1620	197	2349.	1		2235	272	1650.
1		0355	48	5.	1		1010	123	10.	1		1625	198	2446.	1		2240	273	1596.
1		0400	49	5.	1		1015	124	10.	1		1630	199	2526.	1		2245	274	1546.
1		0405	50	5.	1		1020	125	10.	1		1635	200	2600.	1		2250	275	1[illegible]
1		0410	51	5.	1		1025	126	11.	1		1640	201	2670.	1		2255	276	[illegible]
1		0415	52	5.	1		1030	127	11.	1		1645	202	2732.	1		2300	277	[illegible]
1		0420	53	5.	1		1035	128	11.	1		1650	203	2805.	1		2305	278	[illegible]
1		0425	54	5.	1		1040	129	11.	1		1655	204	2891.	1		2310	279	1[illegible]
1		0430	55	5.	1		1045	130	12.	1		1700	205	2944.	1		2315	280	1303.
1		0435	56	5.	1		1050	131	12.	1		1705	206	2951.	1		2320	281	1263.
1		0440	57	5.	1		1055	132	12.	1		1710	207	2943.	1		2325	282	1225.
1		0445	58	5.	1		1100	133	12.	1		1715	208	2934.	1		2330	283	1187.
1		0450	59	5.	1		1105	134	13.	1		1720	209	2925.	1		2335	284	1151.
1		0455	60	5.	1		1110	135	13.	1		1725	210	2916.	1		2340	285	1116.
1		0500	61	5.	1		1115	136	13.	1		1730	211	2909.	1		2345	286	1082.
1		0505	62	5.	1		1120	137	14.	1		1735	212	2904.	1		2350	287	1049.
1		0510	63	5.	1		1125	138	14.	1		1740	213	2902.	1		2355	288	1018.
1		0515	64	6.	1		1130	139	14.	1		1745	214	2904.	2		0000	289	988.
1		0520	65	6.	1		1135	140	16.	1		1750	215	2910.	2		0005	290	960.
1		0525	66	6.	1		1140	141	20.	1		1755	216	2918.	2		0010	291	935.
1		0530	67	6.	1		1145	142	27.	1		1800	217	2930.	2		0015	292	912.
1		0535	68	6.	1		1150	143	40.	1		1805	218	2944.	2		0020	293	890.
1		0540	69	6.	1		1155	144	66.	1		1810	219	2959.	2		0025	294	871.
1		0545	70	6.	1		1200	145	101.	1		1815	220	2974.	2		0030	295	852.
1		0550	71	6.	1		1205	146	141.	1		1820	221	2989.	2		0035	296	835.
1		0555	72	6.	1		1210	147	188.	1		1825	222	3003.	2		0040	297	818.
1		0600	73	6.	1		1215	148	229.	1		1830	223	3015.	2		0045	298	801.
1		0605	74	6.	1		1220	149	261.	1		1835	224	3026.	2		0050	299	785.
1		0610	75	6.	1		1225	150	252.	1		1840	225	3037.	2		0055	300	770.

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ 3167.	19.92	(CFS)	2901.	1074.	1034.	1034.
		(INCHES)	.573	.848	.848	.848
		(AC-FT)	1438.	2130.	2130.	2130.

CUMULATIVE AREA = 47.09 SQ MI

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HYDROGRAPH AT CP364A
TRANSPOSITION AREA 100.0 SQ MI

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6.	1		1230	151	245.	1		1845	226	2962.
1		0005	2	0.	1		0620	77	6.	1		1235	152	268.	1		1850	227	2972.
1		0010	3	0.	1		0625	78	6.	1		1240	153	302.	1		1855	228	2983.
1		0015	4	0.	1		0630	79	6.	1		1245	154	348.	1		1900	229	2994.

1	0020	5	0.	*	1	0635	80	6.	*	1	1250	155	409.	*	1	1905	230	3005.
1	0025	6	0.	*	1	0640	81	6.	*	1	1255	156	492.	*	1	1910	231	3015.
1	0030	7	0.	*	1	0645	82	7.	*	1	1300	157	572.	*	1	1915	232	3026.
1	0035	8	0.	*	1	0650	83	7.	*	1	1305	158	652.	*	1	1920	233	3036.
1	0040	9	0.	*	1	0655	84	7.	*	1	1310	159	736.	*	1	1925	234	3045.
1	0045	10	0.	*	1	0700	85	7.	*	1	1315	160	828.	*	1	1930	235	3053.
1	0050	11	0.	*	1	0705	86	7.	*	1	1320	161	931.	*	1	1935	236	3059.
1	0055	12	0.	*	1	0710	87	7.	*	1	1325	162	1042.	*	1	1940	237	3065.
1	0100	13	0.	*	1	0715	88	7.	*	1	1330	163	1154.	*	1	1945	238	3069.
1	0105	14	0.	*	1	0720	89	7.	*	1	1335	164	1257.	*	1	1950	239	3071.
1	0110	15	0.	*	1	0725	90	7.	*	1	1340	165	1350.	*	1	1955	240	3072.
1	0115	16	0.	*	1	0730	91	7.	*	1	1345	166	1435.	*	1	2000	241	3071.
1	0120	17	1.	*	1	0735	92	7.	*	1	1350	167	1522.	*	1	2005	242	3068.
1	0125	18	1.	*	1	0740	93	7.	*	1	1355	168	1606.	*	1	2010	243	3062.
1	0130	19	1.	*	1	0745	94	7.	*	1	1400	169	1642.	*	1	2015	244	3055.
1	0135	20	1.	*	1	0750	95	7.	*	1	1405	170	1648.	*	1	2020	245	3046.
1	0140	21	1.	*	1	0755	96	7.	*	1	1410	171	1630.	*	1	2025	246	3036.
1	0145	22	1.	*	1	0800	97	7.	*	1	1415	172	1600.	*	1	2030	247	3023.
1	0150	23	1.	*	1	0805	98	7.	*	1	1420	173	1569.	*	1	2035	248	3009.
1	0155	24	1.	*	1	0810	99	8.	*	1	1425	174	1547.	*	1	2040	249	2991.
1	0200	25	1.	*	1	0815	100	8.	*	1	1430	175	1533.	*	1	2045	250	2971.
1	0205	26	2.	*	1	0820	101	8.	*	1	1435	176	1527.	*	1	2050	251	2947.
1	0210	27	2.	*	1	0825	102	8.	*	1	1440	177	1526.	*	1	2055	252	2918.
1	0215	28	2.	*	1	0830	103	8.	*	1	1445	178	1528.	*	1	2100	253	2883.
1	0220	29	2.	*	1	0835	104	8.	*	1	1450	179	1529.	*	1	2105	254	2844.
1	0225	30	2.	*	1	0840	105	8.	*	1	1455	180	1526.	*	1	2110	255	2810.
1	0230	31	3.	*	1	0845	106	8.	*	1	1500	181	1517.	*	1	2115	256	2784.
1	0235	32	3.	*	1	0850	107	8.	*	1	1505	182	1501.	*	1	2120	257	2758.
1	0240	33	3.	*	1	0855	108	8.	*	1	1510	183	1482.	*	1	2125	258	2724.
1	0245	34	3.	*	1	0900	109	8.	*	1	1515	184	1457.	*	1	2130	259	2680.
1	0250	35	3.	*	1	0905	110	8.	*	1	1520	185	1425.	*	1	2135	260	2630.
1	0255	36	3.	*	1	0910	111	9.	*	1	1525	186	1390.	*	1	2140	261	2573.
1	0300	37	4.	*	1	0915	112	9.	*	1	1530	187	1358.	*	1	2145	262	2511.
1	0305	38	4.	*	1	0920	113	9.	*	1	1535	188	1334.	*	1	2150	263	2441.
1	0310	39	4.	*	1	0925	114	9.	*	1	1540	189	1325.	*	1	2155	264	2351.
1	0315	40	4.	*	1	0930	115	9.	*	1	1545	190	1341.	*	1	2200	265	2240.
1	0320	41	4.	*	1	0935	116	9.	*	1	1550	191	1387.	*	1	2205	266	2114.
1	0325	42	4.	*	1	0940	117	9.	*	1	1555	192	1475.	*	1	2210	267	1977.
1	0330	43	4.	*	1	0945	118	9.	*	1	1600	193	1655.	*	1	2215	268	1868.
1	0335	44	4.	*	1	0950	119	9.	*	1	1605	194	1856.	*	1	2220	269	1794.
1	0340	45	4.	*	1	0955	120	9.	*	1	1610	195	2030.	*	1	2225	270	1731.
1	0345	46	5.	*	1	1000	121	10.	*	1	1615	196	2160.	*	1	2230	271	1672.
1	0350	47	5.	*	1	1005	122	10.	*	1	1620	197	2273.	*	1	2235	272	1618.
1	0355	48	5.	*	1	1010	123	10.	*	1	1625	198	2380.	*	1	2240	273	1569.
1	0400	49	5.	*	1	1015	124	10.	*	1	1630	199	2465.	*	1	2245	274	1522.
1	0405	50	5.	*	1	1020	125	10.	*	1	1635	200	2537.	*	1	2250	275	1485.
1	0410	51	5.	*	1	1025	126	11.	*	1	1640	201	2603.	*	1	2255	276	1454.
1	0415	52	5.	*	1	1030	127	11.	*	1	1645	202	2664.	*	1	2300	277	1415.
1	0420	53	5.	*	1	1035	128	11.	*	1	1650	203	2716.	*	1	2305	278	1372.
1	0425	54	5.	*	1	1040	129	11.	*	1	1655	204	2759.	*	1	2310	279	1329.
1	0430	55	5.	*	1	1045	130	11.	*	1	1700	205	2800.	*	1	2315	280	1288.
1	0435	56	5.	*	1	1050	131	12.	*	1	1705	206	2844.	*	1	2320	281	1249.
1	0440	57	5.	*	1	1055	132	12.	*	1	1710	207	2870.	*	1	2325	282	1212.
1	0445	58	5.	*	1	1100	133	12.	*	1	1715	208	2872.	*	1	2330	283	1175.
1	0450	59	5.	*	1	1105	134	12.	*	1	1720	209	2863.	*	1	2335	284	1140.
1	0455	60	5.	*	1	1110	135	13.	*	1	1725	210	2854.	*	1	2340	285	1105.
1	0500	61	5.	*	1	1115	136	13.	*	1	1730	211	2845.	*	1	2345	286	1072.
1	0505	62	5.	*	1	1120	137	13.	*	1	1735	212	2839.	*	1	2350	287	1040.
1	0510	63	5.	*	1	1125	138	14.	*	1	1740	213	2835.	*	1	2355	288	1009.
1	0515	64	5.	*	1	1130	139	14.	*	1	1745	214	2835.	*	2	0000	289	979.
1	0520	65	5.	*	1	1135	140	16.	*	1	1750	215	2839.	*	2	0005	290	952.
1	0525	66	6.	*	1	1140	141	20.	*	1	1755	216	2846.	*	2	0010	291	928.
1	0530	67	6.	*	1	1145	142	26.	*	1	1800	217	2857.	*	2	0015	292	905.
1	0535	68	6.	*	1	1150	143	39.	*	1	1805	218	2870.	*	2	0020	293	885.
1	0540	69	6.	*	1	1155	144	64.	*	1	1810	219	2884.	*	2	0025	294	865.
1	0545	70	6.	*	1	1200	145	97.	*	1	1815	220	2899.	*	2	0030	295	847.
1	0550	71	6.	*	1	1205	146	137.	*	1	1820	221	2913.	*	2	0035	296	830.
1	0555	72	6.	*	1	1210	147	182.	*	1	1825	222	2925.	*	2	0040	297	813.
1	0600	73	6.	*	1	1215	148	221.	*	1	1830	223	2936.	*	2	0045	298	797.
1	0605	74	6.	*	1	1220	149	253.	*	1	1835	224	2945.	*	2	0050	299	781.
1	0610	75	6.	*	1	1225	150	245.	*	1	1840	225	2954.	*	2	0055	300	766.

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ 3072.	19.92	(CFS)	2817.	1043.	1005.	1005.
		(INCHES)	.556	.824	.824	.824
		(AC-FT)	1397.	2069.	2070.	2070.

CUMULATIVE AREA = 47.09 SQ MI

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HYDROGRAPH AT CP364A
TRANSPOSITION AREA 200.0 SQ MI

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DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW	*	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	*	1		0615	76	6.	*	1		1230	151	240.	*	1		1845	226	2892.
1		0005	2	0.	*	1		0620	77	6.	*	1		1235	152	262.	*	1		1850	227	2901.
1		0010	3	0.	*	1		0625	78	6.	*	1		1240	153	295.	*	1		1855	228	2910.
1		0015	4	0.	*	1		0630	79	6.	*	1		1245	154	339.	*	1		1900	229	2919.
1		0020	5	0.	*	1		0635	80	6.	*	1		1250	155	396.	*	1		1905	230	2928.
1		0025	6	0.	*	1		0640	81	6.	*	1		1255	156	479.	*	1		1910	231	2937.

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0030	7	0.	1		0645	82	6.	1		1300	157	557.	1		1915	232	2946.
1		0035	8	0.	1		0650	83	6.	1		1305	158	636.	1		1920	233	2955.
1		0040	9	0.	1		0655	84	7.	1		1310	159	718.	1		1925	234	2963.
1		0045	10	0.	1		0700	85	7.	1		1315	160	807.	1		1930	235	2970.
1		0050	11	0.	1		0705	86	7.	1		1320	161	906.	1		1935	236	2977.
1		0055	12	0.	1		0710	87	7.	1		1325	162	1014.	1		1940	237	2982.
1		0100	13	0.	1		0715	88	7.	1		1330	163	1124.	1		1945	238	2987.
1		0105	14	0.	1		0720	89	7.	1		1335	164	1226.	1		1950	239	[illegible]
1		0110	15	0.	1		0725	90	7.	1		1340	165	1318.	1		1955	240	[illegible]
1		0115	16	0.	1		0730	91	7.	1		1345	166	1401.	1		2000	241	[illegible]
1		0120	17	1.	1		0735	92	7.	1		1350	167	1478.	1		2005	242	2.
1		0125	18	1.	1		0740	93	7.	1		1355	168	1561.	1		2010	243	2986.
1		0130	19	1.	1		0745	94	7.	1		1400	169	1605.	1		2015	244	2980.
1		0135	20	1.	1		0750	95	7.	1		1405	170	1611.	1		2020	245	2972.
1		0140	21	1.	1		0755	96	7.	1		1410	171	1592.	1		2025	246	2962.
1		0145	22	1.	1		0800	97	7.	1		1415	172	1560.	1		2030	247	2950.
1		0150	23	1.	1		0805	98	7.	1		1420	173	1527.	1		2035	248	2935.
1		0155	24	1.	1		0810	99	7.	1		1425	174	1503.	1		2040	249	2917.
1		0200	25	1.	1		0815	100	8.	1		1430	175	1491.	1		2045	250	2895.
1		0205	26	2.	1		0820	101	8.	1		1435	176	1487.	1		2050	251	2869.
1		0210	27	2.	1		0825	102	8.	1		1440	177	1484.	1		2055	252	2838.
1		0215	28	2.	1		0830	103	8.	1		1445	178	1484.	1		2100	253	2810.
1		0220	29	2.	1		0835	104	8.	1		1450	179	1484.	1		2105	254	2789.
1		0225	30	2.	1		0840	105	8.	1		1455	180	1483.	1		2110	255	2768.
1		0230	31	3.	1		0845	106	8.	1		1500	181	1477.	1		2115	256	2740.
1		0235	32	3.	1		0850	107	8.	1		1505	182	1465.	1		2120	257	2703.
1		0240	33	3.	1		0855	108	8.	1		1510	183	1447.	1		2125	258	2660.
1		0245	34	3.	1		0900	109	8.	1		1515	184	1420.	1		2130	259	2610.
1		0250	35	3.	1		0905	110	8.	1		1520	185	1389.	1		2135	260	2555.
1		0255	36	3.	1		0910	111	8.	1		1525	186	1354.	1		2140	261	2496.
1		0300	37	4.	1		0915	112	8.	1		1530	187	1320.	1		2145	262	2428.
1		0305	38	4.	1		0920	113	9.	1		1535	188	1292.	1		2150	263	2340.
1		0310	39	4.	1		0925	114	9.	1		1540	189	1277.	1		2155	264	2235.
1		0315	40	4.	1		0930	115	9.	1		1545	190	1284.	1		2200	265	2120.
1		0320	41	4.	1		0935	116	9.	1		1550	191	1321.	1		2205	266	1996.
1		0325	42	4.	1		0940	117	9.	1		1555	192	1392.	1		2210	267	1891.
1		0330	43	4.	1		0945	118	9.	1		1600	193	1521.	1		2215	268	1817.
1		0335	44	4.	1		0950	119	9.	1		1605	194	1741.	1		2220	269	1756.
1		0340	45	4.	1		0955	120	9.	1		1610	195	1933.	1		2225	270	1698.
1		0345	46	4.	1		1000	121	9.	1		1615	196	2088.	1		2230	271	1644.
1		0350	47	5.	1		1005	122	10.	1		1620	197	2210.	1		2235	272	1594.
1		0355	48	5.	1		1010	123	10.	1		1625	198	2320.	1		2240	273	1548.
1		0400	49	5.	1		1015	124	10.	1		1630	199	2413.	1		2245	274	1505.
1		0405	50	5.	1		1020	125	10.	1		1635	200	2485.	1		2250	275	1474.
1		0410	51	5.	1		1025	126	10.	1		1640	201	2548.	1		2255	276	1440.
1		0415	52	5.	1		1030	127	11.	1		1645	202	2607.	1		2300	277	1399.
1		0420	53	5.	1		1035	128	11.	1		1650	203	2659.	1		2305	278	1357.
1		0425	54	5.	1		1040	129	11.	1		1655	204	2702.	1		2310	279	1315.
1		0430	55	5.	1		1045	130	11.	1		1700	205	2735.	1		2315	280	[illegible]
1		0435	56	5.	1		1050	131	11.	1		1705	206	2758.	1		2320	281	[illegible]
1		0440	57	5.	1		1055	132	12.	1		1710	207	2775.	1		2325	282	[illegible]
1		0445	58	5.	1		1100	133	12.	1		1715	208	2786.	1		2330	283	[illegible]
1		0450	59	5.	1		1105	134	12.	1		1720	209	2792.	1		2335	284	1130.
1		0455	60	5.	1		1110	135	12.	1		1725	210	2795.	1		2340	285	1096.
1		0500	61	5.	1		1115	136	13.	1		1730	211	2795.	1		2345	286	1063.
1		0505	62	5.	1		1120	137	13.	1		1735	212	2793.	1		2350	287	1031.
1		0510	63	5.	1		1125	138	14.	1		1740	213	2790.	1		2355	288	1001.
1		0515	64	5.	1		1130	139	14.	1		1745	214	2788.	2		0000	289	972.
1		0520	65	5.	1		1135	140	15.	1		1750	215	2787.	2		0005	290	946.
1		0525	66	5.	1		1140	141	19.	1		1755	216	2788.	2		0010	291	922.
1		0530	67	5.	1		1145	142	26.	1		1800	217	2790.	2		0015	292	900.
1		0535	68	6.	1		1150	143	38.	1		1805	218	2795.	2		0020	293	880.
1		0540	69	6.	1		1155	144	62.	1		1810	219	2806.	2		0025	294	861.
1		0545	70	6.	1		1200	145	95.	1		1815	220	2826.	2		0030	295	843.
1		0550	71	6.	1		1205	146	133.	1		1820	221	2846.	2		0035	296	826.
1		0555	72	6.	1		1210	147	178.	1		1825	222	2860.	2		0040	297	809.
1		0600	73	6.	1		1215	148	215.	1		1830	223	2870.	2		0045	298	793.
1		0605	74	6.	1		1220	149	245.	1		1835	224	2878.	2		0050	299	777.
1		0610	75	6.	1		1225	150	239.	1		1840	225	2885.	2		0055	300	762.

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ 2992.	19.92	(CFS)	2745.	1018.	980.	980.
		(INCHES)	.542	.804	.804	.804
		(AC-FT)	1361.	2018.	2018.	2018.

CUMULATIVE AREA = 47.09 SQ MI

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INTERPOLATED HYDROGRAPH AT CP364A

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DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	6.	1		1230	151	252.	1		1845	226	[illegible]
1		0005	2	0.	1		0620	77	6.	1		1235	152	275.	1		1850	227	[illegible]
1		0010	3	0.	1		0625	78	6.	1		1240	153	311.	1		1855	228	3078.
1		0015	4	0.	1		0630	79	6.	1		1245	154	359.	1		1900	229	3090.
1		0020	5	0.	1		0635	80	7.	1		1250	155	425.	1		1905	230	3102.
1		0025	6	0.	1		0640	81	7.	1		1255	156	509.	1		1910	231	3114.
1		0030	7	0.	1		0645	82	7.	1		1300	157	590.	1		1915	232	3125.
1		0035	8	0.	1		0650	83	7.	1		1305	158	673.	1		1920	233	3136.
1		0040	9	0.	1		0655	84	7.	1		1310	159	760.	1		1925	234	3145.

1	0045	10	0.	*	1	0700	85	7.	*	1	1315	160	855.	*	1	1930	235	3154.
1	0050	11	0.	*	1	0705	86	7.	*	1	1320	161	963.	*	1	1935	236	3162.
1	0055	12	0.	*	1	0710	87	7.	*	1	1325	162	1079.	*	1	1940	237	3168.
1	0100	13	0.	*	1	0715	88	7.	*	1	1330	163	1193.	*	1	1945	238	3172.
1	0105	14	0.	*	1	0720	89	7.	*	1	1335	164	1297.	*	1	1950	239	3175.
1	0110	15	0.	*	1	0725	90	7.	*	1	1340	165	1391.	*	1	1955	240	3175.
1	0115	16	0.	*	1	0730	91	7.	*	1	1345	166	1481.	*	1	2000	241	3174.
1	0120	17	1.	*	1	0735	92	7.	*	1	1350	167	1587.	*	1	2005	242	3170.
1	0125	18	1.	*	1	0740	93	7.	*	1	1355	168	1656.	*	1	2010	243	3164.
1	0130	19	1.	*	1	0745	94	7.	*	1	1400	169	1691.	*	1	2015	244	3156.
1	0135	20	1.	*	1	0750	95	7.	*	1	1405	170	1697.	*	1	2020	245	3145.
1	0140	21	1.	*	1	0755	96	7.	*	1	1410	171	1681.	*	1	2025	246	3133.
1	0145	22	1.	*	1	0800	97	8.	*	1	1415	172	1650.	*	1	2030	247	3118.
1	0150	23	1.	*	1	0805	98	8.	*	1	1420	173	1621.	*	1	2035	248	3101.
1	0155	24	1.	*	1	0810	99	8.	*	1	1425	174	1600.	*	1	2040	249	3082.
1	0200	25	2.	*	1	0815	100	8.	*	1	1430	175	1588.	*	1	2045	250	3061.
1	0205	26	2.	*	1	0820	101	8.	*	1	1435	176	1584.	*	1	2050	251	3037.
1	0210	27	2.	*	1	0825	102	8.	*	1	1440	177	1585.	*	1	2055	252	3010.
1	0215	28	2.	*	1	0830	103	8.	*	1	1445	178	1588.	*	1	2100	253	2978.
1	0220	29	2.	*	1	0835	104	8.	*	1	1450	179	1590.	*	1	2105	254	2941.
1	0225	30	2.	*	1	0840	105	8.	*	1	1455	180	1587.	*	1	2110	255	2897.
1	0230	31	3.	*	1	0845	106	8.	*	1	1500	181	1577.	*	1	2115	256	2850.
1	0235	32	3.	*	1	0850	107	8.	*	1	1505	182	1558.	*	1	2120	257	2812.
1	0240	33	3.	*	1	0855	108	8.	*	1	1510	183	1530.	*	1	2125	258	2781.
1	0245	34	3.	*	1	0900	109	9.	*	1	1515	184	1496.	*	1	2130	259	2748.
1	0250	35	3.	*	1	0905	110	9.	*	1	1520	185	1469.	*	1	2135	260	2706.
1	0255	36	3.	*	1	0910	111	9.	*	1	1525	186	1436.	*	1	2140	261	2656.
1	0300	37	4.	*	1	0915	112	9.	*	1	1530	187	1406.	*	1	2145	262	2599.
1	0305	38	4.	*	1	0920	113	9.	*	1	1535	188	1387.	*	1	2150	263	2536.
1	0310	39	4.	*	1	0925	114	9.	*	1	1540	189	1386.	*	1	2155	264	2465.
1	0315	40	4.	*	1	0930	115	9.	*	1	1545	190	1411.	*	1	2200	265	2374.
1	0320	41	4.	*	1	0935	116	9.	*	1	1550	191	1472.	*	1	2205	266	2262.
1	0325	42	4.	*	1	0940	117	9.	*	1	1555	192	1608.	*	1	2210	267	2127.
1	0330	43	4.	*	1	0945	118	9.	*	1	1600	193	1791.	*	1	2215	268	1979.
1	0335	44	4.	*	1	0950	119	10.	*	1	1605	194	1968.	*	1	2220	269	1862.
1	0340	45	5.	*	1	0955	120	10.	*	1	1610	195	2116.	*	1	2225	270	1781.
1	0345	46	5.	*	1	1000	121	10.	*	1	1615	196	2240.	*	1	2230	271	1714.
1	0350	47	5.	*	1	1005	122	10.	*	1	1620	197	2355.	*	1	2235	272	1654.
1	0355	48	5.	*	1	1010	123	10.	*	1	1625	198	2452.	*	1	2240	273	1599.
1	0400	49	5.	*	1	1015	124	10.	*	1	1630	199	2532.	*	1	2245	274	1549.
1	0405	50	5.	*	1	1020	125	11.	*	1	1635	200	2608.	*	1	2250	275	1504.
1	0410	51	5.	*	1	1025	126	11.	*	1	1640	201	2680.	*	1	2255	276	1471.
1	0415	52	5.	*	1	1030	127	11.	*	1	1645	202	2745.	*	1	2300	277	1434.
1	0420	53	5.	*	1	1035	128	11.	*	1	1650	203	2817.	*	1	2305	278	1391.
1	0425	54	5.	*	1	1040	129	11.	*	1	1655	204	2900.	*	1	2310	279	1347.
1	0430	55	5.	*	1	1045	130	12.	*	1	1700	205	2950.	*	1	2315	280	1305.
1	0435	56	5.	*	1	1050	131	12.	*	1	1705	206	2956.	*	1	2320	281	1264.
1	0440	57	5.	*	1	1055	132	12.	*	1	1710	207	2948.	*	1	2325	282	1226.
1	0445	58	5.	*	1	1100	133	12.	*	1	1715	208	2939.	*	1	2330	283	1189.
1	0450	59	5.	*	1	1105	134	13.	*	1	1720	209	2930.	*	1	2335	284	1152.
1	0455	60	5.	*	1	1110	135	13.	*	1	1725	210	2922.	*	1	2340	285	1117.
1	0500	61	5.	*	1	1115	136	13.	*	1	1730	211	2915.	*	1	2345	286	1083.
1	0505	62	5.	*	1	1120	137	14.	*	1	1735	212	2910.	*	1	2350	287	1050.
1	0510	63	5.	*	1	1125	138	14.	*	1	1740	213	2909.	*	1	2355	288	1019.
1	0515	64	6.	*	1	1130	139	14.	*	1	1745	214	2910.	*	2	0000	289	989.
1	0520	65	6.	*	1	1135	140	16.	*	1	1750	215	2916.	*	2	0005	290	961.
1	0525	66	6.	*	1	1140	141	20.	*	1	1755	216	2925.	*	2	0010	291	935.
1	0530	67	6.	*	1	1145	142	27.	*	1	1800	217	2937.	*	2	0015	292	912.
1	0535	68	6.	*	1	1150	143	40.	*	1	1805	218	2951.	*	2	0020	293	891.
1	0540	69	6.	*	1	1155	144	66.	*	1	1810	219	2966.	*	2	0025	294	871.
1	0545	70	6.	*	1	1200	145	101.	*	1	1815	220	2981.	*	2	0030	295	853.
1	0550	71	6.	*	1	1205	146	141.	*	1	1820	221	2996.	*	2	0035	296	835.
1	0555	72	6.	*	1	1210	147	188.	*	1	1825	222	3010.	*	2	0040	297	818.
1	0600	73	6.	*	1	1215	148	230.	*	1	1830	223	3023.	*	2	0045	298	802.
1	0605	74	6.	*	1	1220	149	262.	*	1	1835	224	3034.	*	2	0050	299	785.
1	0610	75	6.	*	1	1225	150	252.	*	1	1840	225	3044.	*	2	0055	300	770.
				*					*					*				

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PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ 3175.	19.92	(CFS)	2908.	1076.	1037.	1037.
		(INCHES)	.574	.850	.850	.850
		(AC-FT)	1442.	2135.	2135.	2135.

CUMULATIVE AREA = 47.09 SQ MI

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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	159	531.	12.33	51.	13.	12.	.58		
+	ROUTED TO	R159	525.	12.42	51.	13.	12.	.58		
+	HYDROGRAPH AT	160	432.	12.42	47.	12.	11.	.39		
+	2 COMBINED AT	CP160	955.	12.42	98.	25.	24.	.97		

+	ROUTED TO	R160	847.	12.58	98.	25.	24.	.97
+	HYDROGRAPH AT	161	294.	13.00	58.	14.	14.	.50
+	2 COMBINED AT	CP161	1032.	12.58	156.	39.	38.	1.47
+	ROUTED TO	R161	877.	13.08	156.	39.	38.	1.47
+	HYDROGRAPH AT	162	268.	12.50	34.	8.	8.	.25
+	ROUTED TO	R162	197.	13.17	34.	8.	8.	.25
+	HYDROGRAPH AT	163	551.	12.92	112.	28.	27.	.75
+	2 COMBINED AT	1I163	726.	13.00	146.	36.	35.	1.00
+	2 COMBINED AT	CP163	1575.	13.00	301.	75.	72.	2.47
+	DIVERSION TO	DI176A	0.	.08	0.	0.	0.	2.47
+	HYDROGRAPH AT	D163	1575.	13.00	301.	75.	72.	2.47
+	HYDROGRAPH AT	D163	0.	.08	0.	0.	0.	2.47
+	ROUTED TO	R163	0.	.08	0.	0.	0.	2.47
+	HYDROGRAPH AT	176A	378.	13.25	92.	23.	22.	.62
+	2 COMBINED AT	CP176A	378.	13.25	92.	23.	22.	3.09
+	DIVERSION TO	DI191	0.	.08	0.	0.	0.	3.09
+	HYDROGRAPH AT	D176A	378.	13.25	92.	23.	22.	3.09
+	HYDROGRAPH AT	174	612.	12.25	55.	14.	13.	.45
+	ROUTED TO	R174	410.	12.75	55.	14.	13.	.45
+	HYDROGRAPH AT	175	375.	12.25	34.	9.	8.	.28
+	DIVERSION TO	DI175A	375.	12.25	34.	9.	8.	.28
+	HYDROGRAPH AT	D175	0.	.08	0.	0.	0.	.28
+	ROUTED TO	R175	0.	.08	0.	0.	0.	.28
+	HYDROGRAPH AT	176	701.	12.42	79.	20.	19.	.67
+	2 COMBINED AT	1I176	700.	12.42	79.	20.	19.	.95
+	2 COMBINED AT	CP176	792.	12.50	134.	34.	32.	1.40
+	ROUTED TO	R176	708.	12.92	134.	34.	32.	1.40
+	HYDROGRAPH AT	D175	375.	12.25	34.	9.	8.	.28
+	ROUTED TO	R175	342.	12.42	34.	9.	8.	.28
+	HYDROGRAPH AT	175A	362.	12.50	42.	10.	10.	.47
+	2 COMBINED AT	CP175A	687.	12.42	76.	19.	18.	.75
+	ROUTED TO	R175A	650.	12.67	76.	19.	18.	.75
+	HYDROGRAPH AT	189	521.	12.42	57.	14.	14.	.51
	2 COMBINED AT							

+		CP189	942.	12.58	133.	33.	32.	1.26
+	ROUTED TO	R189	777.	13.17	133.	33.	32.	1.26
+	HYDROGRAPH AT	190	657.	12.92	128.	32.	31.	.86
+	2 COMBINED AT	CP190	1336.	13.00	260.	65.	63.	2.12
+	ROUTED TO	R190	1271.	13.33	260.	65.	63.	2.12
+	HYDROGRAPH AT	D176A	0.	.08	0.	0.	0.	3.09
+	ROUTED TO	R176A	0.	.08	0.	0.	0.	3.09
+	3 COMBINED AT	1I191	1771.	13.25	393.	99.	95.	6.33
+	HYDROGRAPH AT	191	610.	13.25	149.	37.	36.	.99
+	2 COMBINED AT	CP191	2379.	13.25	541.	136.	131.	7.32
+	DIVERSION TO	DI208	1339.	12.83	440.	110.	106.	7.32
+	HYDROGRAPH AT	CP191	1040.	13.25	101.	25.	24.	7.32
+	ROUTED TO	R191	949.	13.50	101.	25.	24.	7.32
+	HYDROGRAPH AT	192A	345.	13.08	75.	19.	18.	.50
+	2 COMBINED AT	CP192A	1164.	13.50	176.	44.	42.	7.82
+	ROUTED TO	R192A	1116.	13.75	176.	44.	42.	7.82
+	HYDROGRAPH AT	192	346.	13.08	75.	19.	18.	.50
+	2 COMBINED AT	CP192	1280.	13.67	251.	63.	60.	8.32
+	DIVERSION TO	DI209	1146.	13.67	225.	56.	54.	8.32
+	HYDROGRAPH AT	D192	134.	13.67	26.	7.	6.	8.32
+	DIVERSION TO	DI210	0.	.08	0.	0.	0.	8.32
+	HYDROGRAPH AT	D192	134.	13.67	26.	7.	6.	8.32
+	HYDROGRAPH AT	188	240.	12.25	19.	5.	5.	.19
+	ROUTED TO	R188	188.	12.42	19.	5.	5.	.19
+	HYDROGRAPH AT	207A	469.	12.42	48.	12.	12.	.50
+	2 COMBINED AT	CP207A	656.	12.42	67.	17.	16.	.69
+	ROUTED TO	R207A	626.	12.50	67.	17.	16.	.69
+	HYDROGRAPH AT	214	208.	12.25	18.	5.	4.	.16
+	2 COMBINED AT	CP214	729.	12.42	85.	21.	21.	.85
+	ROUTED TO	R214	688.	12.50	85.	21.	21.	.85
+	HYDROGRAPH AT	215A	528.	12.17	42.	11.	10.	.35
+	ROUTED TO	R215A	493.	12.25	42.	11.	10.	.35
+	HYDROGRAPH AT	215	419.	12.33	44.	11.	11.	.35
+	2 COMBINED AT	1I215	901.	12.33	87.	22.	21.	.70

+	2 COMBINED AT	CP215	1417.	12.42	172.	43.	41.	1.55
+	ROUTED TO	R215	1296.	12.58	172.	43.	41.	1.55
+	HYDROGRAPH AT	233	496.	12.42	56.	14.	13.	.50
+	2 COMBINED AT	CP233	1710.	12.50	227.	57.	55.	2.05
+	ROUTED TO	R233	1576.	12.67	227.	57.	55.	2.05
+	HYDROGRAPH AT	216	366.	12.92	69.	17.	17.	.51
+	ROUTED TO	R216	350.	13.08	69.	17.	17.	.51
+	HYDROGRAPH AT	234	347.	13.17	81.	20.	19.	.53
+	2 COMBINED AT	1I234	689.	13.08	150.	37.	36.	1.04
+	2 COMBINED AT	CP234	2026.	12.75	377.	94.	91.	3.09
+	DIVERSION TO	1D248	957.	12.75	136.	34.	33.	3.09
+	HYDROGRAPH AT	D234	1069.	12.75	240.	60.	58.	3.09
+	ROUTED TO	R234	932.	13.25	240.	60.	58.	3.09
+	HYDROGRAPH AT	207	619.	13.25	153.	38.	37.	1.00
+	DIVERSION TO	2D208	476.	13.25	118.	29.	28.	1.00
+	HYDROGRAPH AT	D207	143.	13.25	35.	9.	9.	1.00
+	ROUTED TO	R207	122.	13.92	35.	9.	9.	1.00
+	HYDROGRAPH AT	217	350.	13.00	76.	19.	18.	.49
+	2 COMBINED AT	CP217	372.	13.08	111.	28.	27.	1.49
+	DIVERSION TO	DI218	91.	13.08	38.	9.	9.	1.49
+	HYDROGRAPH AT	D217	281.	13.08	73.	18.	18.	1.49
+	ROUTED TO	R217	258.	13.58	73.	18.	18.	1.49
+	HYDROGRAPH AT	235	303.	13.17	71.	18.	17.	.47
+	2 COMBINED AT	1I235	483.	13.42	144.	36.	35.	1.96
+	2 COMBINED AT	CP235	1411.	13.25	383.	96.	93.	5.05
+	DIVERSION TO	2D248	740.	13.25	182.	46.	44.	5.05
+	HYDROGRAPH AT	D235	671.	13.25	201.	51.	49.	5.05
+	ROUTED TO	R235	635.	13.67	200.	51.	49.	5.05
+	HYDROGRAPH AT	D191	1339.	12.83	440.	110.	106.	7.32
+	ROUTED TO	R191	1339.	13.75	438.	110.	106.	7.32
+	HYDROGRAPH AT	208	632.	13.17	149.	37.	36.	1.00
+	2 COMBINED AT	1I208	1929.	13.25	585.	147.	142.	8.32
+	HYDROGRAPH AT	D207	476.	13.25	118.	29.	28.	1.00

+	ROUTED TO	R207	428.	13.75	118.	29.	28.	1.00
+	2 COMBINED AT	CP208	2188.	13.33	702.	177.	170.	9.32
+	DIVERSION TO	1D219	628.	13.33	277.	70.	68.	9.32
+	HYDROGRAPH AT	D208	1560.	13.33	424.	107.	103.	9.32
+	DIVERSION TO	DI209A	1551.	13.33	422.	106.	102.	9.32
+	HYDROGRAPH AT	D208	8.	13.33	2.	0.	0.	9.32
+	ROUTED TO	R208	8.	14.17	2.	0.	0.	9.32
+	HYDROGRAPH AT	218	624.	13.25	153.	38.	37.	1.00
+	2 COMBINED AT	1I218	621.	13.25	154.	39.	37.	10.32
+	HYDROGRAPH AT	D217	91.	13.08	38.	9.	9.	1.49
+	ROUTED TO	R217	86.	13.83	38.	9.	9.	1.49
+	2 COMBINED AT	CP218	676.	13.25	191.	48.	46.	10.81
+	DIVERSION TO	DI237	424.	13.25	133.	33.	32.	10.81
+	HYDROGRAPH AT	D218	252.	13.25	58.	14.	14.	10.81
+	DIVERSION TO	2D219	59.	13.25	14.	3.	3.	10.81
+	HYDROGRAPH AT	D218	193.	13.25	44.	11.	11.	10.81
+	ROUTED TO	R218	181.	13.50	44.	11.	11.	10.81
+	HYDROGRAPH AT	236	582.	13.25	146.	37.	35.	1.00
+	2 COMBINED AT	1I236	718.	13.33	189.	47.	46.	11.87
+	2 COMBINED AT	CP236	1228.	13.50	383.	97.	93.	15.37
+	DIVERSION TO	DI249	327.	13.50	69.	17.	17.	15.37
+	HYDROGRAPH AT	D236	902.	13.50	314.	79.	77.	15.37
+	DIVERSION TO	1D250	405.	13.50	102.	26.	25.	15.37
+	HYDROGRAPH AT	D236	497.	13.50	212.	54.	52.	15.37
+	ROUTED TO	R236	493.	13.67	211.	54.	52.	15.37
+	HYDROGRAPH AT	209A	335.	13.08	75.	19.	18.	.50
+	HYDROGRAPH AT	D208	1551.	13.33	422.	106.	102.	9.32
+	ROUTED TO	R208	1526.	13.67	422.	106.	102.	9.32
+	2 COMBINED AT	CP209A	1720.	13.50	496.	125.	120.	9.82
+	DIVERSION TO	1D220	641.	13.50	195.	49.	48.	9.82
+	HYDROGRAPH AT	D209A	1079.	13.50	301.	75.	73.	9.82
+	DIVERSION TO	2D209	290.	13.50	78.	20.	19.	9.82
+	HYDROGRAPH AT	D209A	789.	13.50	223.	56.	54.	9.82
	ROUTED TO							

+	R209A	775.	14.00	222.	56.	54.	9.82
+ HYDROGRAPH AT	D208	628.	13.33	277.	70.	68.	9.32
+ ROUTED TO	R208	613.	14.83	260.	69.	66.	9.32
+ HYDROGRAPH AT	219	343.	13.08	76.	19.	18.	.50
+ 2 COMBINED AT	1I219	631.	14.75	309.	88.	85.	9.80
+ 2 COMBINED AT	2I219	1237.	14.58	530.	144.	138.	10.30
+ HYDROGRAPH AT	D218	59.	13.25	14.	3.	3.	10.81
+ ROUTED TO	R218	52.	14.00	14.	3.	3.	10.81
+ 2 COMBINED AT	CP219	1268.	14.58	542.	147.	141.	11.81
+ DIVERSION TO	DI238	892.	14.58	393.	109.	105.	11.81
+ HYDROGRAPH AT	D219	376.	14.58	149.	38.	37.	11.81
+ DIVERSION TO	2D220	156.	14.58	61.	15.	15.	11.81
+ HYDROGRAPH AT	D219	220.	14.58	88.	22.	22.	11.81
+ ROUTED TO	R219	199.	15.42	87.	22.	22.	11.81
+ HYDROGRAPH AT	D218	424.	13.25	133.	33.	32.	10.81
+ ROUTED TO	R218	383.	14.00	130.	33.	32.	10.81
+ HYDROGRAPH AT	237	300.	13.25	73.	18.	18.	.50
+ 2 COMBINED AT	1I237	519.	13.83	197.	51.	50.	11.31
+ 2 COMBINED AT	2I237	525.	13.92	274.	74.	71.	12.31
+ 2 COMBINED AT	CP237	993.	13.83	482.	127.	122.	16.87
+ DIVERSION TO	2D250	301.	13.83	83.	21.	20.	16.87
+ HYDROGRAPH AT	D237	692.	13.83	399.	106.	102.	16.87
+ DIVERSION TO	1D250A	307.	13.83	123.	31.	30.	16.87
+ HYDROGRAPH AT	D237	386.	13.83	276.	75.	73.	16.87
+ ROUTED TO	R237	385.	13.83	275.	75.	73.	16.87
+ HYDROGRAPH AT	1D192	1146.	13.67	225.	56.	54.	8.32
+ ROUTED TO	R192	990.	14.08	225.	56.	54.	8.32
+ HYDROGRAPH AT	209	336.	13.08	73.	18.	17.	.50
+ 2 COMBINED AT	1I209	1053.	14.08	297.	74.	72.	8.82
+ HYDROGRAPH AT	D209A	290.	13.50	78.	20.	19.	9.82
+ ROUTED TO	R209A	286.	13.92	78.	20.	19.	9.82
+ 2 COMBINED AT	CP209	1320.	14.08	372.	93.	90.	11.32
+ DIVERSION TO	1D221	564.	14.08	170.	43.	41.	11.32
+ HYDROGRAPH AT	D209	756.	14.08	202.	51.	49.	11.32

+	DIVERSION TO	2D210	228.	14.08	60.	15.	14.	11.32
+	HYDROGRAPH AT	D209	527.	14.08	142.	36.	34.	11.32
+	ROUTED TO	R209	487.	14.58	142.	36.	34.	11.32
+	HYDROGRAPH AT	D209A	641.	13.50	195.	49.	48.	9.82
+	ROUTED TO	R209A	614.	14.50	195.	49.	48.	9.82
+	HYDROGRAPH AT	220	335.	13.08	75.	19.	18.	.50
+	2 COMBINED AT	1I220	655.	14.42	268.	68.	66.	10.32
+	2 COMBINED AT	2I220	1132.	14.50	407.	103.	99.	11.82
+	HYDROGRAPH AT	D219	156.	14.58	61.	15.	15.	11.81
+	ROUTED TO	R219	154.	14.75	61.	15.	15.	11.81
+	2 COMBINED AT	CP220	1253.	14.58	465.	118.	114.	13.81
+	DIVERSION TO	DI239	737.	14.58	311.	79.	76.	13.81
+	HYDROGRAPH AT	D220	516.	14.58	154.	39.	37.	13.81
+	DIVERSION TO	2D221	412.	14.58	129.	33.	31.	13.81
+	HYDROGRAPH AT	D220	103.	14.58	25.	6.	6.	13.81
+	ROUTED TO	R220	93.	15.50	25.	6.	6.	13.81
+	HYDROGRAPH AT	D219	892.	14.58	393.	109.	105.	11.81
+	ROUTED TO	R219	827.	15.17	389.	108.	104.	11.81
+	HYDROGRAPH AT	238	314.	13.17	72.	18.	17.	.50
+	2 COMBINED AT	1I238	834.	15.17	440.	125.	121.	12.31
+	2 COMBINED AT	2I238	907.	15.17	463.	131.	126.	14.31
+	2 COMBINED AT	CP238	1220.	15.17	733.	206.	198.	19.37
+	DIVERSION TO	2D250A	56.	15.17	19.	5.	5.	19.37
+	HYDROGRAPH AT	D238	1164.	15.17	714.	201.	193.	19.37
+	DIVERSION TO	1D251	159.	15.17	54.	13.	13.	19.37
+	HYDROGRAPH AT	D238	1005.	15.17	660.	187.	180.	19.37
+	ROUTED TO	R238	982.	15.58	659.	187.	180.	19.37
+	HYDROGRAPH AT	2D192	0.	.08	0.	0.	0.	8.32
+	ROUTED TO	R192	0.	.08	0.	0.	0.	8.32
+	HYDROGRAPH AT	210	296.	13.08	64.	16.	16.	.46
+	2 COMBINED AT	1I210	295.	13.08	64.	16.	15.	8.78
+	HYDROGRAPH AT	D209	228.	14.08	60.	15.	14.	11.32
+	ROUTED TO	R209	217.	14.42	60.	15.	14.	11.32

+	2 COMBINED AT	CP210	308.	13.08	124.	31.	30.	11.78
+	ROUTED TO	R210	279.	14.00	123.	31.	30.	11.78
+	HYDROGRAPH AT	D209	564.	14.08	170.	43.	41.	11.32
+	ROUTED TO	R209	494.	15.33	158.	42.	40.	11.32
+	HYDROGRAPH AT	221	303.	13.08	69.	17.	17.	.48
+	2 COMBINED AT	1I221	500.	15.33	203.	59.	57.	11.80
+	2 COMBINED AT	2I221	725.	15.25	325.	89.	86.	12.26
+	HYDROGRAPH AT	D220	412.	14.58	129.	33.	31.	13.81
+	ROUTED TO	R220	400.	14.83	128.	33.	31.	13.81
+	2 COMBINED AT	CP221	1031.	15.17	448.	121.	117.	14.75
+	ROUTED TO	R221	928.	16.33	447.	121.	116.	14.75
+	HYDROGRAPH AT	D220	737.	14.58	311.	79.	76.	13.81
+	ROUTED TO	R220	704.	15.83	291.	77.	74.	13.81
+	HYDROGRAPH AT	239	313.	13.08	69.	17.	17.	.48
+	2 COMBINED AT	1I239	705.	15.75	315.	94.	91.	14.29
+	2 COMBINED AT	2I239	1549.	16.25	750.	214.	206.	15.23
+	2 COMBINED AT	CP239	2377.	16.08	1395.	398.	384.	20.79
+	DIVERSION TO	2D251	1740.	16.08	876.	224.	215.	20.79
+	HYDROGRAPH AT	D239	637.	16.08	519.	175.	168.	20.79
+	ROUTED TO	R239	635.	16.42	518.	174.	168.	20.79
+	HYDROGRAPH AT	240	282.	13.00	57.	14.	14.	.40
+	2 COMBINED AT	CP240	635.	16.42	552.	188.	181.	21.19
+	ROUTED TO	R240	634.	16.67	550.	187.	180.	21.19
+	HYDROGRAPH AT	213	373.	12.50	46.	12.	11.	.35
+	ROUTED TO	R213	225.	13.42	46.	12.	11.	.35
+	HYDROGRAPH AT	212	279.	13.42	77.	19.	19.	.54
+	ROUTED TO	SR212	200.	13.83	49.	12.	12.	.54
+	2 COMBINED AT	CP212	378.	13.67	95.	24.	23.	.89
+	ROUTED TO	R212	333.	14.50	93.	24.	23.	.89
+	HYDROGRAPH AT	211	309.	13.08	69.	17.	17.	.49
+	ROUTED TO	R211	220.	14.33	68.	17.	17.	.49
+	HYDROGRAPH AT	221A	175.	13.25	43.	11.	10.	.31
+	2 COMBINED AT	1I221A	276.	14.17	109.	28.	27.	.80
	ROUTED TO							

+		SR221A	271.	14.25	95.	24.	23.	.80
+	2 COMBINED AT	CP221A	589.	14.50	185.	48.	46.	1.69
+	ROUTED TO	R221A	549.	14.92	182.	48.	46.	1.69
+	HYDROGRAPH AT	222	541.	13.58	172.	48.	46.	1.10
+	2 COMBINED AT	CP222	701.	14.83	338.	96.	92.	2.79
+	ROUTED TO	R222	643.	15.58	333.	95.	92.	2.79
+	HYDROGRAPH AT	226	1573.	12.33	192.	54.	52.	1.18
+	ROUTED TO	SR226	503.	12.75	185.	54.	52.	1.18
+	ROUTED TO	R226	407.	15.17	183.	53.	51.	1.18
+	HYDROGRAPH AT	201	420.	12.33	44.	11.	11.	.34
+	ROUTED TO	R201	226.	13.75	44.	11.	11.	.34
+	HYDROGRAPH AT	223	1763.	12.42	327.	110.	106.	1.26
+	2 COMBINED AT	1I223	1763.	12.42	367.	121.	117.	1.60
+	2 COMBINED AT	CP223	1775.	12.42	519.	174.	168.	2.78
+	DIVERSION TO	DI225	60.	8.67	60.	50.	48.	2.78
+	HYDROGRAPH AT	D223	1715.	12.42	459.	124.	120.	2.78
+	ROUTED TO	R223	1589.	12.67	457.	124.	120.	2.78
+	HYDROGRAPH AT	224	1054.	12.33	109.	27.	26.	.80
+	2 COMBINED AT	CP224	2138.	12.50	564.	151.	146.	3.58
+	ROUTED TO	R224	1978.	12.92	552.	151.	146.	3.58
+	HYDROGRAPH AT	241	1436.	12.50	176.	44.	42.	1.51
+	2 COMBINED AT	1I241	2565.	12.83	707.	195.	188.	5.09
+	2 COMBINED AT	2I241	2592.	12.83	1015.	290.	279.	7.88
+	2 COMBINED AT	CP241	2764.	12.83	1470.	464.	447.	29.07
+	ROUTED TO	SR241	2759.	12.92	1469.	464.	447.	29.07
+	ROUTED TO	R241	2444.	13.33	1460.	462.	445.	29.07
+	HYDROGRAPH AT	253	641.	13.17	148.	37.	36.	1.00
+	2 COMBINED AT	1I253	2976.	13.25	1579.	497.	478.	30.07
+	HYDROGRAPH AT	253A	291.	12.33	29.	7.	7.	.25
+	ROUTED TO	R253A	190.	13.08	29.	7.	7.	.25
+	2 COMBINED AT	2I253	3136.	13.25	1607.	504.	485.	30.32
+	HYDROGRAPH AT	247	330.	13.08	76.	19.	18.	.50
+	DIVERSION TO	DI261	0.	.08	0.	0.	0.	.50
+	HYDROGRAPH AT	D247	330.	13.08	76.	19.	18.	.50

+	ROUTED TO	R247	303.	13.50	76.	19.	18.	.50
+	HYDROGRAPH AT	248	592.	13.25	152.	38.	37.	1.00
+	HYDROGRAPH AT	D234	957.	12.75	136.	34.	33.	3.09
+	ROUTED TO	R234	705.	13.50	136.	34.	33.	3.09
+	2 COMBINED AT	1I248	1259.	13.42	287.	72.	69.	4.09
+	2 COMBINED AT	2I248	1553.	13.42	363.	91.	87.	4.59
+	HYDROGRAPH AT	D235	740.	13.25	182.	46.	44.	5.05
+	ROUTED TO	R235	661.	13.83	182.	46.	44.	5.05
+	2 COMBINED AT	CP248	2028.	13.50	539.	135.	130.	12.55
+	DIVERSION TO	DI262	1830.	13.50	504.	126.	121.	12.55
+	HYDROGRAPH AT	D248	198.	13.50	35.	9.	8.	12.55
+	ROUTED TO	R248	176.	14.25	35.	9.	8.	12.55
+	HYDROGRAPH AT	249	571.	13.25	143.	36.	35.	1.00
+	2 COMBINED AT	1I249	564.	13.25	176.	44.	43.	13.55
+	HYDROGRAPH AT	D236	327.	13.50	69.	17.	17.	15.37
+	ROUTED TO	R236	322.	13.75	69.	17.	17.	15.37
+	2 COMBINED AT	CP249	709.	13.58	243.	61.	59.	17.87
+	DIVERSION TO	DI264	82.	13.58	23.	6.	5.	17.87
+	HYDROGRAPH AT	D249	627.	13.58	220.	55.	53.	17.87
+	ROUTED TO	R249	618.	14.08	220.	55.	53.	17.87
+	HYDROGRAPH AT	D236	405.	13.50	102.	26.	25.	15.37
+	ROUTED TO	R236	290.	16.08	92.	25.	24.	15.37
+	HYDROGRAPH AT	250	316.	13.08	71.	18.	17.	.49
+	2 COMBINED AT	1I250	310.	13.08	138.	42.	40.	15.86
+	HYDROGRAPH AT	D237	301.	13.83	83.	21.	20.	16.87
+	ROUTED TO	R237	276.	14.50	83.	21.	20.	16.87
+	2 COMBINED AT	2I250	385.	16.08	219.	63.	60.	17.36
+	2 COMBINED AT	CP250	903.	14.42	436.	117.	113.	19.86
+	ROUTED TO	R250	893.	14.58	436.	117.	113.	19.86
+	HYDROGRAPH AT	D237	307.	13.83	123.	31.	30.	16.87
+	ROUTED TO	R237	296.	14.50	123.	31.	30.	16.87
+	HYDROGRAPH AT	250A	308.	13.17	74.	18.	18.	.51
+	2 COMBINED AT	1I250A	347.	14.25	191.	49.	47.	17.38

+	HYDROGRAPH AT	D238	56.	15.17	19.	5.	5.	19.37
+	ROUTED TO	R238	55.	15.58	19.	5.	5.	19.37
+	2 COMBINED AT	2I250A	367.	14.42	209.	53.	51.	19.88
+	2 COMBINED AT	CP250A	1251.	14.58	639.	169.	163.	22.87
+	DIVERSION TO	DI265A	3.	14.58	1.	0.	0.	22.87
+	HYDROGRAPH AT	D250A	1247.	14.58	638.	169.	163.	22.87
+	DIVERSION TO	1D266	274.	14.58	46.	11.	11.	22.87
+	HYDROGRAPH AT	D250A	973.	14.58	593.	158.	152.	22.87
+	ROUTED TO	R250A	970.	14.75	591.	157.	151.	22.87
+	HYDROGRAPH AT	D238	159.	15.17	54.	13.	13.	19.37
+	ROUTED TO	R238	135.	17.50	48.	13.	12.	19.37
+	HYDROGRAPH AT	251	313.	13.17	72.	18.	17.	.50
+	2 COMBINED AT	1I251	305.	13.17	88.	30.	29.	19.87
+	HYDROGRAPH AT	D239	1740.	16.08	876.	224.	215.	20.79
+	ROUTED TO	R239	1721.	16.50	868.	224.	215.	20.79
+	2 COMBINED AT	2I251	1719.	16.50	926.	254.	244.	21.29
+	2 COMBINED AT	CP251	2310.	16.50	1498.	409.	394.	24.79
+	DIVERSION TO	2D266	1881.	16.50	1228.	333.	321.	24.79
+	HYDROGRAPH AT	D251	429.	16.50	271.	75.	72.	24.79
+	ROUTED TO	R251	423.	16.83	270.	75.	72.	24.79
+	HYDROGRAPH AT	252	326.	13.17	76.	19.	18.	.50
+	2 COMBINED AT	CP252	423.	16.83	320.	93.	90.	25.29
+	DIVERSION TO	DI267	400.	16.83	303.	89.	85.	25.29
+	HYDROGRAPH AT	D252	23.	16.83	16.	4.	4.	25.29
+	ROUTED TO	R252	16.	21.25	12.	3.	3.	25.29
+	2 COMBINED AT	CP253	3136.	13.25	1607.	507.	488.	34.82
+	ROUTED TO	SR253	3093.	13.33	1583.	504.	485.	34.82
+	ROUTED TO	R253	3034.	13.67	1579.	503.	484.	34.82
+	HYDROGRAPH AT	268	589.	13.25	147.	37.	35.	.95
+	2 COMBINED AT	1I268	3438.	13.58	1677.	538.	518.	35.77
+	HYDROGRAPH AT	D250A	274.	14.58	46.	11.	11.	22.87
+	ROUTED TO	R250A	242.	15.33	46.	11.	11.	22.87
+	HYDROGRAPH AT	266	181.	13.33	48.	12.	12.	.33
	2 COMBINED AT							

+		1I266	253.	15.33	91.	23.	22.	23.20
+	HYDROGRAPH AT	D251	1881.	16.50	1228.	333.	321.	24.79
+	ROUTED TO	R251	1865.	16.75	1226.	333.	321.	24.79
+	2 COMBINED AT	CP266	1890.	16.75	1303.	356.	343.	25.12
+	DIVERSION TO	DI283	220.	16.75	148.	41.	40.	25.12
+	HYDROGRAPH AT	D266	1670.	16.75	1156.	314.	303.	25.12
+	ROUTED TO	R266	1668.	16.83	1155.	314.	303.	25.12
+	HYDROGRAPH AT	D252	400.	16.83	303.	89.	85.	25.29
+	ROUTED TO	R252	394.	17.33	301.	88.	85.	25.29
+	HYDROGRAPH AT	267	335.	13.17	79.	20.	19.	.50
+	2 COMBINED AT	1I267	492.	13.67	349.	107.	103.	25.79
+	2 COMBINED AT	CP267	2033.	16.92	1498.	421.	405.	26.12
+	DIVERSION TO	DI284	1245.	16.92	953.	276.	265.	26.12
+	HYDROGRAPH AT	D267	788.	16.92	545.	145.	140.	26.12
+	ROUTED TO	R267	782.	17.17	541.	145.	139.	26.12
+	2 COMBINED AT	CP268	3714.	13.67	2192.	679.	654.	36.60
+	ROUTED TO	SR268	3638.	13.83	2164.	662.	637.	36.60
+	ROUTED TO	R268	3466.	14.33	2119.	644.	620.	36.60
+	HYDROGRAPH AT	286	473.	13.08	109.	27.	26.	.70
+	2 COMBINED AT	1I286	3533.	14.33	2129.	669.	644.	37.30
+	HYDROGRAPH AT	288	160.	13.25	44.	11.	10.	.22
+	ROUTED TO	R288	153.	13.42	43.	11.	10.	.22
+	2 COMBINED AT	CP286	3601.	14.33	2141.	679.	654.	37.52
+	ROUTED TO	R286	3497.	14.58	2129.	675.	650.	37.52
+	HYDROGRAPH AT	287	223.	12.67	36.	9.	9.	.23
+	2 COMBINED AT	1I287	3496.	14.58	2128.	683.	658.	37.75
+	HYDROGRAPH AT	D266	220.	16.75	148.	41.	40.	25.12
+	ROUTED TO	R266	216.	17.33	146.	41.	40.	25.12
+	HYDROGRAPH AT	283	102.	13.08	23.	6.	6.	.16
+	2 COMBINED AT	CP283	216.	17.33	149.	47.	45.	25.28
+	ROUTED TO	R283	214.	17.58	149.	46.	45.	25.28
+	HYDROGRAPH AT	285B	83.	12.33	9.	2.	2.	.06
+	2 COMBINED AT	CP285B	214.	17.58	149.	48.	47.	25.34
+	ROUTED TO	SR285B	211.	17.75	149.	48.	46.	25.34

+	DIVERSION TO	DI297	210.	17.83	149.	48.	46.	25.34
+	HYDROGRAPH AT	D285B	1.	17.75	0.	0.	0.	25.34
+	ROUTED TO	R285B	0.	18.25	0.	0.	0.	25.34
+	HYDROGRAPH AT	D267	1245.	16.92	953.	276.	265.	26.12
+	ROUTED TO	R267	1226.	17.50	950.	274.	264.	26.12
+	HYDROGRAPH AT	284	326.	13.17	76.	19.	18.	.52
+	2 COMBINED AT	CP284	1226.	17.50	972.	292.	281.	26.64
+	ROUTED TO	SR284	1219.	17.67	938.	274.	263.	26.64
+	ROUTED TO	R284	1218.	17.75	937.	273.	263.	26.64
+	HYDROGRAPH AT	285A	82.	12.33	9.	2.	2.	.06
+	2 COMBINED AT	1I285A	1218.	17.75	937.	275.	265.	26.70
+	2 COMBINED AT	CP285A	1217.	17.75	937.	275.	265.	26.92
+	ROUTED TO	SR285A	1217.	17.83	937.	275.	265.	26.92
+	DIVERSION TO	1D297A	245.	17.83	237.	93.	90.	26.92
+	HYDROGRAPH AT	D285A	972.	17.83	699.	182.	176.	26.92
+	ROUTED TO	R285A	967.	18.00	698.	182.	176.	26.92
+	HYDROGRAPH AT	285	56.	12.33	6.	1.	1.	.04
+	2 COMBINED AT	CP285	967.	18.00	698.	184.	177.	26.96
+	ROUTED TO	SR285	966.	18.00	698.	184.	177.	26.96
+	DIVERSION TO	2D297A	263.	18.00	190.	50.	48.	26.96
+	HYDROGRAPH AT	D285	703.	18.00	509.	134.	129.	26.96
+	ROUTED TO	R285	697.	18.33	508.	134.	129.	26.96
+	2 COMBINED AT	CP287	3688.	14.58	2615.	813.	783.	38.59
+	ROUTED TO	SR287	2782.	15.58	2578.	808.	778.	38.59
+	ROUTED TO	R287	2778.	15.83	2566.	796.	767.	38.59
+	HYDROGRAPH AT	298	591.	13.00	122.	30.	29.	.84
+	2 COMBINED AT	CP298	2777.	15.83	2566.	825.	795.	39.43
+	ROUTED TO	SR298	2774.	15.92	2561.	819.	789.	39.43
+	ROUTED TO	R298	2768.	16.33	2550.	805.	775.	39.43
+	HYDROGRAPH AT	316	512.	13.17	122.	31.	29.	.82
+	2 COMBINED AT	CP316	2767.	16.33	2550.	834.	803.	40.25
+	ROUTED TO	R316	2764.	16.50	2541.	825.	794.	40.25
+	HYDROGRAPH AT	334	452.	13.00	95.	24.	23.	.64

+	2 COMBINED AT	1I334	2764.	16.50	2541.	847.	816.	40.89
+	HYDROGRAPH AT	D285	263.	18.00	190.	50.	48.	26.96
+	ROUTED TO	R285	262.	18.33	189.	50.	48.	26.96
+	HYDROGRAPH AT	D285A	245.	17.83	237.	93.	90.	26.92
+	ROUTED TO	R285A	245.	18.25	237.	91.	88.	26.92
+	HYDROGRAPH AT	297A	206.	12.92	39.	10.	9.	.27
+	2 COMBINED AT	1I297A	245.	18.25	237.	100.	97.	27.19
+	2 COMBINED AT	CP297A	507.	18.33	426.	150.	145.	27.23
+	ROUTED TO	R297A	499.	19.92	421.	143.	138.	27.23
+	HYDROGRAPH AT	315	278.	13.25	68.	17.	16.	.47
+	2 COMBINED AT	CP315	499.	19.92	421.	160.	154.	27.70
+	ROUTED TO	R315	496.	20.58	418.	146.	141.	27.70
+	2 COMBINED AT	CP334	3173.	19.42	2884.	991.	954.	41.63
+	ROUTED TO	R334	3168.	19.67	2872.	977.	941.	41.63
+	HYDROGRAPH AT	335	277.	12.92	54.	13.	13.	.35
+	2 COMBINED AT	CP335	3168.	19.67	2872.	990.	954.	41.98
+	ROUTED TO	R335	3165.	19.83	2867.	981.	945.	41.98
+	HYDROGRAPH AT	299	289.	13.00	61.	15.	15.	.40
+	ROUTED TO	R299	227.	14.33	61.	15.	15.	.40
+	HYDROGRAPH AT	317	341.	13.25	82.	21.	20.	.57
+	2 COMBINED AT	CP317	341.	13.25	141.	36.	34.	.97
+	ROUTED TO	R317	311.	13.83	138.	36.	34.	.97
+	HYDROGRAPH AT	300	353.	12.83	66.	16.	16.	.39
+	ROUTED TO	R300	264.	14.17	65.	16.	16.	.39
+	HYDROGRAPH AT	318	581.	12.67	97.	27.	26.	.62
+	2 COMBINED AT	CP318	580.	12.67	156.	43.	41.	1.01
+	ROUTED TO	R318	530.	12.92	154.	43.	41.	1.01
+	HYDROGRAPH AT	301	535.	12.17	46.	12.	12.	.30
+	ROUTED TO	R301	175.	14.00	46.	12.	12.	.30
+	HYDROGRAPH AT	319	577.	12.50	84.	23.	23.	.54
+	2 COMBINED AT	CP319	578.	12.50	127.	36.	34.	.84
+	ROUTED TO	R319	520.	12.83	126.	36.	34.	.84
+	HYDROGRAPH AT	337	744.	12.25	84.	25.	24.	.49
	3 COMBINED AT							

+		CP337	1120.	12.83	357.	103.	99.	2.34
+	ROUTED TO	SR337	373.	13.50	335.	103.	99.	2.34
+	DIVERSION TO	DI367	373.	13.50	335.	103.	99.	2.34
+	HYDROGRAPH AT	D337	0.	.08	0.	0.	0.	2.34
+	ROUTED TO	R337	0.	.08	0.	0.	0.	2.34
+	2 COMBINED AT	1I336	311.	13.83	138.	36.	34.	3.31
+	2 COMBINED AT	2I336	3172.	19.75	2892.	1012.	975.	45.29
+	HYDROGRAPH AT	336	552.	13.92	206.	57.	55.	1.28
+	2 COMBINED AT	CP336	3177.	19.75	2909.	1065.	1026.	46.57
+	ROUTED TO	SR336	3177.	19.83	2907.	1065.	1026.	46.57
+	HYDROGRAPH AT	336A	149.	14.00	54.	14.	13.	.37
+	2 COMBINED AT	CP336A	3176.	19.83	2910.	1078.	1038.	46.94
+	ROUTED TO	R336A	3175.	19.92	2908.	1072.	1033.	46.94
+	HYDROGRAPH AT	364A	99.	12.25	9.	2.	2.	.07
+	2 COMBINED AT	1I364A	3175.	19.92	2908.	1074.	1035.	47.01
+	HYDROGRAPH AT	336B	168.	12.00	9.	2.	2.	.08
+	ROUTED TO	SR336B	101.	12.17	9.	2.	2.	.08
+	ROUTED TO	R336B	90.	12.33	9.	2.	2.	.08
+	2 COMBINED AT	CP364A	3175.	19.92	2908.	1076.	1037.	47.09
+	DIVERSION TO	DI363	1151.	19.92	1053.	386.	372.	47.09
+	HYDROGRAPH AT	D364A	2024.	19.92	1855.	690.	665.	47.09
+	ROUTED TO	R364A	2022.	20.25	1850.	675.	650.	47.09
+	HYDROGRAPH AT	365	272.	12.83	47.	12.	11.	.38
+	ROUTED TO	R365	179.	14.50	45.	12.	11.	.38
+	HYDROGRAPH AT	364	559.	13.00	115.	29.	28.	.78
+	2 COMBINED AT	1I364	558.	13.00	157.	41.	39.	1.16
+	2 COMBINED AT	CP364	2027.	20.17	1858.	712.	686.	48.25
+	ROUTED TO	SR364	2027.	20.25	1858.	705.	679.	48.25
+	DIVERSION TO	DIGILA	342.	20.25	322.	137.	132.	48.25
+	HYDROGRAPH AT	D364	1685.	20.25	1535.	569.	548.	48.25
+	ROUTED TO	R364	1681.	21.17	1528.	549.	529.	48.25
+	HYDROGRAPH AT	D364A	1151.	19.92	1053.	386.	372.	47.09
+	ROUTED TO	R364A	1149.	20.75	1046.	355.	342.	47.09
+	HYDROGRAPH AT	363	360.	13.25	91.	23.	22.	.63

+	2 COMBINED AT	1I363	1149.	20.75	1046.	377.	363.	47.72
+	2 COMBINED AT	2I363	2820.	21.00	2569.	925.	891.	48.88
+	HYDROGRAPH AT	314	293.	13.00	61.	15.	15.	.42
+	ROUTED TO	R314	212.	14.75	60.	15.	15.	.42
+	HYDROGRAPH AT	333	388.	13.08	84.	21.	20.	.58
+	2 COMBINED AT	CP333	388.	13.08	137.	36.	35.	1.00
+	ROUTED TO	R333	361.	13.42	136.	36.	35.	1.00
+	HYDROGRAPH AT	348A	229.	12.58	32.	8.	8.	.22
+	2 COMBINED AT	CP348A	379.	13.42	165.	44.	42.	1.22
+	ROUTED TO	R348A	363.	13.67	164.	44.	42.	1.22
+	HYDROGRAPH AT	348B	355.	13.33	92.	23.	22.	.66
+	2 COMBINED AT	CP348B	667.	13.42	253.	67.	65.	1.88
+	ROUTED TO	SR348B	645.	13.58	253.	67.	65.	1.88
+	ROUTED TO	R348B	617.	14.25	246.	67.	64.	1.88
+	2 COMBINED AT	3I363	2842.	21.00	2618.	987.	950.	50.76
+	HYDROGRAPH AT	348	283.	12.75	50.	12.	12.	.34
+	ROUTED TO	SR348	280.	12.83	49.	12.	12.	.34
+	DIVERSION TO	DI347	0.	.08	0.	0.	0.	.34
+	HYDROGRAPH AT	D348	280.	12.83	49.	12.	12.	.34
+	ROUTED TO	R348	248.	13.33	48.	12.	12.	.34
+	2 COMBINED AT	CP363	2843.	21.00	2620.	998.	961.	51.10

*** NORMAL END OF HEC-1 ***

APPENDIX C

ORIGINAL AND REVISED WHITE TANKS/AGUA FRIA ADMS EXISTING HEC-2 RUNS FOR BULLARD WASH

```
1*********************************************
 *  HEC-2 WATER SURFACE PROFILES             *
 *                                           *
 *  Version   4.6.2;  May 1991               *
 *                                           *
 *  RUN DATE    29OCT94    TIME   10:58:49   *
 *********************************************
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*****************************************
*  U.S. ARMY CORPS OF ENGINEERS
*  HYDROLOGIC ENGINEERING CENTER
*  609 SECOND STREET, SUITE D
*  DAVIS, CALIFORNIA 95616-4687
*          (916) 756-1104
*****************************************
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X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X            X     X
X     X  X        X                        X
XXXXXXX  XXXX     X          XXXXX    XXXXX
X     X  X        X                  X
X     X  X        X     X            X
X     X  XXXXXXX   XXXXX             XXXXXXX
```

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THIS RUN EXECUTED 29OCT94 10:58:49

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****************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
****************************************
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T1      BULLARD WASH OUTFALL FEASIBILITY STUDY        STANLEY CONSULTANTS, INC.
T2      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCD #94-06)       SCI #12278
T3      BULLARD WASH (WASH 10)                                  INPUT FILE: ADMS_H2A
T4
T4    ****************************************************************************
T4    THIS MODEL IS THE SAME AS WLB'S WHITE TANKS/AGUA FRIA WASH 10.H21 EXCEPT
T4    THAT ALL CROSS SECTIONS UPSTREAM OF 3.602 (YUMA ROAD) HAVE BEEN REMOVED
T4    IN ORDER TO REDUCE THE SIZE OF THE MODEL.
T4    ****************************************************************************
T4
T4    T1      WHITE TANKS / AGUA FRIA AREA DRAINAGE MASTER STUDY
T4    T2      100 - YEAR STORM EVENT   FLOODPLAIN RUN  FILE: 10.H2I
T4    T3      BULLARD WASH  (WASH 10) - FROM BUCKEYE CANAL TO DYSART DRAIN.
T4
T4
```

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	.0025	0	0	0	912	0
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1	0	-1	0	0	0	0	0	0	0

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

38	43	1	53	21	22	54	51	4	8
42	5	26	0	110	0	200			

```
NC      .07       .07       .04       .1        .3
QT        3       850       850      3110
          ***  DUE TO THE COMPLEXITY OF THE DOWNSTREAM REACH (CROSS-SECTIONS
               0.000 TO 2.297),AN APPROXIMATE FLOODPLAIN DELINEATION HAS BEEN
               SHOWN IN THIS REACH.HOWEVER,A HEC-2 MODEL WAS SET UP INCLUDING
               THESE X-SECTIONS TO AID IN PRODUCING A REASONABLE APPROXIMATE
               DELINEATION.THIS APPROXIMATE DELINEATION IS AS SHOWN ON THE MAPS
               AND IS BASED ON ENGINEERING JUDGEMENT REFLCTING THE EXISTING
               TOPOGRAPHY,AND USING INFORMATION FROM THE HEC-2 MODEL TO
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               ESTIMATE WHERE BREAKOUT FLOWS WILL OCCUR.
               ALSO, AN APPROXIMATE FLOODPLAIN DELINEATION HAS BEEN SHOWN FOR
               THE UPPERMOST REACH OF BULLARD WASH (CROSS-SECTIONS 10.269 TO
               14.023). THE HEC-2 MODEL WAS ALSO UTILIZED TO ESTIMATE THE
               APPROXIMATE DELINEATION IN THIS REACH.
               A DETAILED ANALYSIS WAS PERFORMED ON BULLARD WASH FROM CROSS-
               SECTION 2.371 TO 6.320 AND FROM 9.189 TO 10.197.

               ****************************************************************
               ****************************************************************

               THE AREA BETWEEN X-SECTION 6.320 AND X-SECTION
               9.189 IS CURRENTLY UNDER CONSTRUCTION.  NO FLOODPLAIN HAS BEEN
               PREPARED FOR THIS AREA OF BULLARD WASH, HOWEVER, THE HEC-2
               ANALYSIS WAS CONTINUED BASED ON EXISTING CONDITIONS AT THE TIME
               OF THE AERIAL MAPPING TO COMPUTE WATER SURFACE ELEVATIONS
               UPSTREAM AND DOWNSTREAM OF THIS REACH.

               ****************************************************************
               ****************************************************************
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***  THE DISCHARGE IN FIELD 4 OF THE QT CARDS IS THE ACTUAL DISCHRAGE
     DERIVED FROM THE 100-YEAR 24-HOUR HEC1 MODEL. THIS DISCHRGE IS
     FOR COMPARISON PURPOSES ONLY AND NO PROFILE IS BEING COMPUTED
     FOR IT. DISCHARGES FOR PROFILES 1 & 2 ARE USED TO DELINEATE THE
     FLOODPLAIN AND FLOODWAY RESPECTIVELY. THESE DISCHARGES ARE BASED
     UPON THE CAPACITY OF THE CHANNEL PLUS A MAXIMUM OF 1 FOOT OVER
     THE TOP WHERE CAPACITY IS EXCEEDED. THESE SITUATIONS ARE
     DOCUMENTED THROUGHOUT THE HEC-2 MODEL.

**   BEGIN APPROXIMATE FLOODPLAIN DELINEATION

     CROSS-SECTION AT BUKEYE CANAL

     Q = Q AT CP364       (= 3110 CFS).
     THIS Q HAS BEEN REDUCED TO THE CAPACITY OF THE CHANNEL PLUS A
     MAXIMUM OF 1 FOOT OVER THE LIMITING ELEVATION AT THE RIGHT
     OVERBANK.
     EXCEEDED FLOW WILL CONTINUE AS SHEET FLOW TO THE WEST.

X1    0.000      12    9980   10120       0       0       0
GR      914    8620     912    9460   910.5    9950     912    9980   910.5   10000
GR      912   10030   912.3   10050     912   10080   910.5   10100     912   10120
GR      912   10510     914   10900
```



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     ANY WSEL EXTENSION AT X1= 0.047 TO X1= 0.616 IS DUE TO THE
     LIMITING ELEVATION AT THE RIGHT OVERBANK.

X1    0.047      14    9960   10100     265     240     250
GR      914    8440   913.8    8900     912    9235   911.8    9550   910.6    9875
GR      912    9950   912.3    9960     912    9975     910   10000   911.3   10035
GR      910   10070   910.3   10100     912   10370   912.5   10820

X1    0.121      14    9980   10100     390     390     390
GR      914    8845     912    9800   911.6    9920     912    9970   912.7    9980
GR      912    9985     910   10000     912   10030   912.1   10040     912   10055
GR      910   10080   910.4   10100     912   10545   912.5   10820

X1    0.201      12    9970   10100     420     420     420
GR      914    9245   912.6    9935     913    9970     912    9985     910   10000
GR      912   10025   912.1   10040     912   10055     910   10075   910.5   10100
GR      912   10240   912.5   10820

X1    0.292      12    9960   10070     480     480     480
GR      914    9525   913.5    9850   912.8    9915   913.3    9960     912    9980
GR    910.5   10000   911.9   10025   910.5   10050   912.1   10070   911.8   10150
GR      912   10220   912.5   10800

     DIVIDED FLOW OCCURS FOR THE NEXT FOUR UPSTREAM CROSS-SECTIONS,
     HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
     X1= 0.668
X1    0.384      17    9970   10095     490     490     490
GR      916    9060     914    9620   913.2    9795     914    9965   914.3    9970
GR      914    9975     912    9985     911   10000     912   10015   912.4   10025
GR      912   10040   911.5   10050     912   10065   912.7   10095   912.3   10210
GR    912.7   10700   913.2   11370

X1    0.488      13    9970   10090     545     545     545
GR      916    9235   914.8    9580     914    9880   913.8    9925     914    9960
GR    915.2    9970     914    9980     912   10000   913.3   10035   912.3   10070
GR    913.5   10090   912.7   10500   913.2   11365

X1    0.531      12    9965   10090     230     230     230
GR      916    9360   914.1    9920   915.4    9965     914    9990   913.5   10000
GR      914   10015   914.1   10030   912.8   10065   914.2   10090     914   10105
GR    912.8   10470   913.2   11350

QT        3    4895    4895    4895

     Q = Q AT CP364A      (= 4895 CFS).

X1    0.616      13    9960   10090     405     480     450
GR    917.3    9665  916.04    9670   917.1    9830   916.5    9960     916    9990
GR      915   10000   915.4   10030   913.8   10070   915.2   10090     914   10100
GR    913.8   10350     914   10790     916   10830
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NC     .045    .045     .03      .1      .3

     ANY WSEL EXTENSION AT X1= 0.668 TO X1= 1.378 IS DUE TO THE
     LIMITING ELEVATION AT THE LEFT BANK.

X1    0.668      10    9950   10035     200     290     270
GR    917.3    9620   916.8    9750   917.3    9950   916.4   10000   916.8   10035
GR      916   10080   915.5   10115     916   10160     918   10250   918.3   10290

X1    0.776      13    9975   10025     535     570     570
GR    920.6    9975     920    9985     918    9990   917.3   10000   917.9   10025
GR    916.4   10185     918   10315     920   10325   920.8   10350   919.3   10400
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GR      920      10435      919.8      10470       924      10525

X1    0.868         11       9970      10020       495        485        490
GR    921.7       9970        920       9980     918.3      10000      919.8      10020        918      10220
GR      920      10295        922      10315     922.1      10335      919.9      10380        922      10485
GR    924.5      10495

X1    0.964         15       9970      10045       505        505        505
GR    923.2       9970        922       9980       920       9985      919.2      10000        920      10015
GR      922      10020      922.5      10045       922      10060      921.5      10140        922      10235
GR    922.8      10265        922      10320     921.7      10345        922      10390        925      10420

QT        3       2596       2596       4895
                Q = Q AT CP364A       (= 4895 CFS).
                THIS Q  HAS BEEN REDUCED BY THE SAME AMOUNT THAT EXCEEDED THE
                CAPACITY OF THE CHANNEL AT THE UPSTREAM REACH  X1= 1.474 TO
                X1= 1.823,    THAT EXCEEDED FLOW WILL RETURN AT X1= 0.964

X1    1.081         13       9955      10090       595        610        620
GR    925.7       9955        924       9965       924      10000        924      10055        925      10090
GR      923      10140        923      10250       924      10260        926      10270        924      10295
GR    923.4      10355        924      10395       930      10425


                DIVIDED FLOW OCCURS FOR THE NEXT FOUR UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 1.435

X1    1.153         16       9945      10060       410        355        380
GR    928.4       9945        928       9955       924       9970        924      10000        924      10025
GR    925.8      10060        924      10100       923      10140        923      10240        924      10265
GR      926      10285        927      10300       924      10340      923.7      10380        924      10410
GR    930.5      10440

X1    1.236         15       9960      10060       435        435        435
GR    930.2       9960        930       9970       924       9980        924      10000        924      10025
GR      926      10040        928      10050     928.3      10060        928      10070      924.5      10130
GR      926      10160        928      10210     928.4      10250      925.9      10310      932.3      10375
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X1    1.317         15       9960      10050       430        430        430
GR    930.4       9960        930       9970       924       9985        924      10000        924      10010
GR      928      10035      928.5      10050       928      10060        927      10140        928      10210
GR      930      10240      930.4      10260     928.9      10300        930      10320        933      10365

X1    1.378         15       9960      10035       345        295        320
GR    930.8       9960        930       9970       924       9985        924      10000        924      10010
GR      928      10020      928.8      10035       928      10050      927.5      10120        928      10180
GR      930      10250      930.9      10280     929.4      10320        930      10365      934.1      10385


                CROSS-SECTION AT STATE ROUTE 85

X1    1.435         12       9965      10070       330        180        300
GR      934       9300        932       9780     931.4       9965      926.3       9995      926.3      10000
GR    926.3      10005        928      10030       931      10070      930.5      10120        932      10140
GR      934      10175      934.5      10185

QT        3       2600       2600       4899

                Q = Q AT CP336       (= 4899 CFS).
                THIS Q HAS BEEN REDUCED TO THE CAPACITY OF THE CHANNEL PLUS A
                MAXIMUM OF 1 FOOT OVER THE LIMITING ELEVATION AT THE RIGHT
                OVERBANK.      EXCEEDED FLOW WILL RETURN AT X1= 0.964

                ANY WSEL EXTENSION AT X1= 1.474 TO X1= 1.823 IS DUE TO THE
                LIMITING ELEVATION AT THE RIGHT OVERBANK.

X1    1.474          7       9985      10015       210        210        210
GR      934       8825        932       9985       930       9990        928      10000        930      10010
GR      932      10015        933      10080

NC     .045       .045        .03         .3        .5
X1    1.517          8       9905      10080       500        160        225
GR      936       9200        934       9320     932.7       9600      932.8       9800      933.2       9905
GR    932.2      10000        934      10055     934.7      10080

X1    1.566          7       9955      10045       320        210        260
GR      938       9870        936       9920       934       9955      932.5      10000        934      10045
GR      936      10060      936.1      10065

NC     .045       .045        .03         .1        .3
X1    1.634          8       9970      10025       360        360        360
GR      940       9690        938       9855       936       9910        934       9970        933      10000
GR      934      10025        936      10050     937.3      10065

X1    1.680          9       9970      10025       200        285        240
GR      940       9700        938       9800       936       9930        934       9970      933.4      10000
GR      934      10025        936      10055       938      10080      938.2      10100
1
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X1    1.745         12       9960      10040       280        400        345
GR    940.3       9660        940       9760       938       9825        936       9900      934.5       9960
GR      934       9975      933.8      10000       934      10025      934.5      10040        936      10090
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GR      938      10195      938.2      10210

X1    1.823         12       9970      10050        370        425        410
GR    940.3       9385        940       9425        938       9450      937.5       9500        938       9600
GR    938.2       9740        938       9785        936       9970      934.9      10000        936      10050
GR      938      10230      938.6      10255

QT        3       4899       4899       4899

                Q = Q AT CP336       (=4899 CFS).

                DIVIDED FLOW OCCURS FOR THE NEXT FIVE UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 2.371

X1    1.893         17       9960      10040        280        370        370
GR    940.3       9055        940       9090        938       9115      937.5       9170        938       9235
GR    938.3       9390        938       9545      936.3       9650        938       9715        940       9770
GR      938       9895        937       9960      936.1      10000        937      10040        938      10110
GR      940      10215        941      10370

X1    1.941         20       9975      10025         40        290        255
GR    940.3       8925        940       8960        938       8985      937.5       9040        938       9100
GR    938.4       9255        938       9430      936.3       9510        938       9580        944       9685
GR    944.6       9820        944       9890        942       9960        940       9975        938       9990
GR    937.9      10000        938      10010        940      10025        942      10040        943      10055

NC     .045        .07        .03         .1         .3
X1    1.988         20       9950      10030         35        280        245
GR    940.3       8890        940       8930        938       8955      937.5       9000        938       9065
GR    938.4       9220        938       9420      936.3       9485        938       9540        940       9575
GR      942       9595        944       9630      944.8       9750      944.7       9810        944       9950
GR      940       9980      938.2      10000        940      10015        944      10030      944.9      10125

                ANY WSEL EXTENSION AT X1= 2.058 TO X1= 2.185 IS DUE TO THE
                LIMITING ELEVATIONS AT THE LEFT OVERBANK.

X1    2.058         18       9970      10035        350        370        370
GR      941       8850        940       8950        939       9020      939.5       9190        938       9500
GR    936.6       9520        938       9540        940       9565        942       9585        944       9650
GR      944       9755      945.6       9835        944       9970        940       9985      938.4      10000
GR      940      10020        944      10035        946      10085

X1    2.185         21       9965      10045        430        670        670
GR    942.5       9310        942       9360        940       9445        938       9545      937.2       9565
GR      938       9580        940       9595        942       9630        943       9765      944.1       9860
GR    944.5       9925        944       9965        942       9975        940       9985        939      10000
GR      940      10015        942      10030        944      10045        945      10185        946      10680
GR    946.2      10690
1
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            **  END OF APPROXIMATE FLOODPLAIN DELINEATION .

X1    2.297         22       9975      10040        610        450        595
GR    946.3       9310        946       9335        944       9425        942       9480        940       9530
GR    937.9       9570      938.3       9605      937.8       9655      938.1       9700      937.9       9775
GR      938       9840        940       9930      941.3       9975        940       9990      939.4      10000
GR      940      10015      940.2      10040      940.8      10040        942      10480        944      10700
GR      946      11415        947      11430

ET                            9.1                                                                     9650      10070

            **  BEGIN DETAILED FLOODPLAIN\FLOODWAY ANALYSIS.

X1    2.371         25       9975      10030        400        500        390
GR    949.7       8815        948       8940        946       9060        944       9145      944.5       9185
GR      944       9270        942       9315        940       9435      939.8       9520        940       9585
GR    940.6       9655        940       9710      939.4       9775        940       9815        942       9890
GR    942.3       9930        942       9975        940       9995      939.7      10000        940      10005
GR    940.7      10030        942      10385        944      10860        946      11400      949.7      11450

ET                            9.1                                                                     9835      10210
X1    2.435         20       9985      10085        335        335        335
GR      950       8650        948       8790        946       8890      945.2       9000        946       9090
GR      944       9250        942       9485      941.1       9720        942       9835      942.4       9950
GR      942       9985        940       9995      939.9      10000        940      10005      941.7      10085
GR      942      10360        944      10760        946      11320        948      11395      949.8      11420

QT        3       4906       4906       4906
ET                            9.1                                                                     9850      10250

                CROSS-SECTION 30 FEET SOUTH OF LOWER BUKEYE RD. "EXTENDED"

                Q = Q AT CP335       (= 4906 CFS).

X1    2.536         15       9965      10060        535        535        535
GR      951       9185        950       9300        948       9555        946       9710      945.5       9865
GR      944       9920      943.5       9935      943.8       9965      943.5      10000      943.7      10060
GR      944      10155      944.8      10500        946      10800        948      11280      950.2      11340

ET                            9.1                                                                     9800      10205

                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 2.883
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X1     2.680        17      9925     10050       735       725       760
GR       954      9265       952      9400       950      9505       948      9645     947.2      9735
GR       948      9790     949.9      9805     948.8      9900       948      9905     947.3      9925
GR       946      9940     945.2     10000     945.6     10050       946     10165       948     10565
GR       950     10935       952     11160
1
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ET                          9.1                                                                 9880     10225
X1     2.771        16      9985     10020       480       480       480
GR       954      9440       952      9545       950      9660     948.1      9810       950      9880
GR     951.4      9890       950      9900     949.4      9985     947.4     10000     948.2     10020
GR     947.3     10075       948     10210       950     10505     950.9     10795       952     11105
GR     953.5     11255

ET                          9.1                                                                 9830     10180
X1     2.883        15      9985     10015       580       580       590
GR       958      9190       956      9360       954      9535       952      9640       950      9840
GR     949.6      9920     950.2      9985     948.5     10000     950.1     10015     949.2     10035
GR       950     10165       952     10385       954     10600       956     11230     956.5     11270

QT         3      4915      4915      4915
ET                          9.1                                                                 9820     10055

                Q = Q AT CP334        (= 4915 CFS).

X1     2.977        15      9980     10050       500       500       500
GR       960      9170       958      9345       956      9530       954      9660       952      9830
GR       951      9960     951.5      9980       950      9990     949.9     10000       950     10010
GR     952.1     10050       954     10480       956     10740       958     11200     958.5     11305

ET                          9.1                                                                 9790     10180
X1     3.070        13      9945     10025       485       495       490
GR     958.5      9510     953.8      9545     954.5      9600     954.5      9945       954      9960
GR     952.5      9975     954.2      9985     952.3     10000     953.2     10025     952.7     10060
GR       954     10290       956     10635       958     10875

QT         3      4432      4432      4432
ET                          9.1                                                                 9730     10190

                Q = Q AT 1I334        (= 4432 CFS).

X1     3.167        18      9970     10020       475       515       510
GR     960.7      9530       956      9585       955      9625     955.4      9730     954.9      9865
GR     955.8      9935     955.1      9970       954      9990     953.9     10000       954     10005
GR     954.9     10020     954.5     10080     955.1     10120     954.8     10220       956     10425
GR       958     10770       960     10990       962     11230

ET                          9.1                                                                 9987     10330

                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 3.602

X1     3.291        23      9970     10020       660       650       655
GR       964      9530       962      9670     961.3      9690     961.8      9725     960.4      9770
GR     961.8      9785     960.1      9940     960.5      9970       960      9985       958      9995
GR     957.2     10000       958     10005       960     10015     960.1     10020       960     10025
GR       958     10040     957.2     10110     957.8     10360     957.6     10460       958     10700
GR       960     10910       962     10970       964     11600
1
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ET                          9.1                                                                 9840     10365
X1     3.376        17      9985     10015       460       440       450
GR     967.9      9300       966      9370       964      9520       962      9630     960.5      9900
GR     961.9      9985       960      9995     958.3     10000       960     10005       961     10015
GR       960     10030     958.4     10055     958.6     10170     958.8     10365       960     10590
GR       962     10930       964     11490

ET                          9.1                                                                 9870     10260
X1     3.491        17      9980     10020       605       605       605
GR       968      9255       966      9435       964      9555       962      9660     960.5      9930
GR     961.9      9980       960      9995     959.5     10000       960     10005     961.9     10020
GR       960     10040     959.6     10130       960     10240       962     10540       964     10735
GR       966     11000       968     11780

QT         3      4438      4438      4438
NC       .07       .07       .04        .1        .3
ET                          9.1                                                                 9840     10170

                CROSS-SECTION AT YUMA RD.

                Q = Q AT CP316        (= 4438 CFS).

X1     3.602        13      9880     10100       590       590       590
GR       970      9225       968      9450       966      9600       964      9750       962      9880
GR     961.9     10000       962     10100     963.2     10330       964     10445       966     10625
GR       968     10770     968.9     10945       970     11005
1
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   SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
   Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
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    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*PROF 1

CCHV=     .100 CEHV=     .300
*SECNO  .000
          ***  DUE TO THE COMPLEXITY OF THE DOWNSTREAM REACH (CROSS-SECTIONS
               0.000 TO 2.297),AN APPROXIMATE FLOODPLAIN DELINEATION HAS BEEN
               SHOWN IN THIS REACH.HOWEVER,A HEC-2 MODEL WAS SET UP INCLUDING
               THESE X-SECTIONS TO AID IN PRODUCING A REASONABLE APPROXIMATE
               DELINEATION.THIS APPROXIMATE DELINEATION IS AS SHOWN ON THE MAPS
               AND IS BASED ON ENGINEERING JUDGEMENT REFLCTING THE EXISTING
               TOPOGRAPHY,AND USING INFORMATION FROM THE HEC-2 MODEL TO
               ESTIMATE WHERE BREAKOUT FLOWS WILL OCCUR.
               ALSO, AN APPROXIMATE FLOODPLAIN DELINEATION HAS BEEN SHOWN FOR
               THE UPPERMOST REACH OF BULLARD WASH (CROSS-SECTIONS 10.269 TO
               14.023). THE HEC-2 MODEL WAS ALSO UTILIZED TO ESTIMATE THE
               APPROXIMATE DELINEATION IN THIS REACH.
               A DETAILED ANALYSIS WAS PERFORMED ON BULLARD WASH FROM CROSS-
               SECTION 2.371 TO 6.320 AND FROM 9.189 TO 10.197.

               ******************************************************************
               ******************************************************************

               THE AREA BETWEEN X-SECTION 6.320 AND X-SECTION
               9.189 IS CURRENTLY UNDER CONSTRUCTION.  NO FLOODPLAIN HAS BEEN
               PREPARED FOR THIS AREA OF BULLARD WASH, HOWEVER, THE HEC-2
               ANALYSIS WAS CONTINUED BASED ON EXISTING CONDITIONS AT THE TIME
               OF THE AERIAL MAPPING TO COMPUTE WATER SURFACE ELEVATIONS
               UPSTREAM AND DOWNSTREAM OF THIS REACH.

               ******************************************************************
               ******************************************************************


          ***  THE DISCHARGE IN FIELD 4 OF THE QT CARDS IS THE ACTUAL DISCHRAGE
               DERIVED FROM THE 100-YEAR 24-HOUR HEC1 MODEL. THIS DISCHRGE IS
               FOR COMPARISON PURPOSES ONLY AND NO PROFILE IS BEING COMPUTED
               FOR IT. DISCHARGES FOR PROFILES 1 & 2 ARE USED TO DELINEATE THE
               FLOODPLAIN AND FLOODWAY RESPECTIVELY. THESE DISCHARGES ARE BASED
               UPON THE CAPACITY OF THE CHANNEL PLUS A MAXIMUM OF 1 FOOT OVER
               THE TOP WHERE CAPACITY IS EXCEEDED. THESE SITUATIONS ARE
               DOCUMENTED THROUGHOUT THE HEC-2 MODEL.
1
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          **   BEGIN APPROXIMATE FLOODPLAIN DELINEATION

               CROSS-SECTION AT BUKEYE CANAL

               Q = Q AT CP364        (= 3110 CFS).
               THIS Q HAS BEEN REDUCED TO THE CAPACITY OF THE CHANNEL PLUS A
               MAXIMUM OF 1 FOOT OVER THE LIMITING ELEVATION AT THE RIGHT
               OVERBANK.
               EXCEEDED FLOW WILL CONTINUE AS SHEET FLOW TO THE WEST.

     .000      1.82    912.32      .00    912.00    912.34      .02       .00       .00    912.00
    850.0     625.2     160.3     64.6     576.3     104.5    133.7        .0        .0    912.00
      .00      1.08      1.53      .48      .070      .040     .070      .000    910.50   9326.62
  .002525        0.        0.       0.         0         0        6       .00   1245.30  10571.93

*SECNO  .047
3280 CROSS SECTION       .05 EXTENDED       .05 FEET

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.48

               ANY WSEL EXTENSION AT X1= 0.047 TO X1= 0.616 IS DUE TO THE
               LIMITING ELEVATION AT THE RIGHT OVERBANK.

     .047      2.55    912.55      .00       .00    912.55      .01       .21       .00    912.30
    850.0     347.1     275.1    227.8     766.2     249.2    510.2       6.9       8.5    910.30
      .11       .45      1.10      .45      .070      .040     .070      .000    910.00   9133.37
  .000410      265.      250.     240.         3         0        0       .00   1686.63  10820.00

*SECNO  .121
3280 CROSS SECTION       .12 EXTENDED       .23 FEET

     .121      2.73    912.73      .00       .00    912.74      .01       .19       .00    912.70
    850.0     111.4     232.9    505.7     287.5     190.2    810.6      19.5      22.2    910.40
      .25       .39      1.22      .62      .070      .040     .070      .000    910.00   9452.89
  .000590      390.      390.     390.         2         0        0       .00   1367.11  10820.00

*SECNO  .201
3280 CROSS SECTION       .20 EXTENDED       .53 FEET

     .201      3.03    913.03      .00       .00    913.05      .02       .30       .00    913.00
    850.0      12.0     366.8    471.2      52.8     228.2    699.3      30.4      34.1    910.50
      .36       .23      1.61      .67      .070      .040     .070      .000    910.00   9724.61
  .000887      420.      420.     420.         2         0        0       .00   1095.39  10820.00
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    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

*SECNO  .292
3280 CROSS SECTION        .29 EXTENDED        .89 FEET

      .292       2.89     913.39        .00        .00     913.41        .02        .36        .00     913.30
     850.0        7.9      301.6      540.6       31.4      208.8      880.3       42.0       45.3     912.10
       .51        .25       1.44        .61       .070       .040       .070       .000     910.50    9860.27
   .000645       480.       480.       480.          1          0          0        .00     939.73   10800.00

*SECNO  .384

3265 DIVIDED FLOW

3280 CROSS SECTION        .38 EXTENDED        .49 FEET

                DIVIDED FLOW OCCURS FOR THE NEXT FOUR UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 0.668
      .384       2.69     913.69        .00        .00     913.70        .01        .29        .00     914.30
     850.0        9.9      241.9      598.1       51.5      198.6     1214.2       56.5       59.6     912.70
       .70        .19       1.22        .49       .070       .040       .070       .000     911.00    9688.08
   .000541       490.       490.       490.          2          0          0        .00    1604.23   11370.00

*SECNO  .488

3265 DIVIDED FLOW

3280 CROSS SECTION        .49 EXTENDED        .81 FEET

      .488       2.01     914.01        .00        .00     914.02        .01        .32        .00     915.20
     850.0        1.1      141.8      707.0        9.0      132.6     1293.2       74.7       78.8     913.50
       .94        .13       1.07        .55       .070       .040       .070       .000     912.00    9875.31
   .000648       545.       545.       545.          0          0          0        .00    1469.90   11365.00

*SECNO  .531

3265 DIVIDED FLOW

3280 CROSS SECTION        .53 EXTENDED        .98 FEET
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    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

      .531       1.38     914.18        .00        .00     914.18        .01        .16        .00     915.40
     850.0         .1       37.2      812.8         .9       55.1     1319.2       82.1       86.4     914.20
      1.05        .06        .67        .62       .070       .040       .070       .000     912.80    9897.62
   .000757       230.       230.       230.          2          0          0        .00    1385.91   11350.00

*SECNO  .616

3265 DIVIDED FLOW

3280 CROSS SECTION        .62 EXTENDED        .05 FEET

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.90

                Q = Q AT CP364A      (= 4895 CFS).

      .616       2.25     916.05        .00        .00     916.19        .14       1.97        .04     916.50
    4895.0         .0      411.6     4483.4         .0      120.0     1539.8       98.7       98.6     915.20
      1.09        .02       3.43       2.91       .070       .040       .070       .000     913.80    9669.96
   .006955       405.       450.       480.          6          0          0        .00     844.48   10830.00

CCHV=     .100 CEHV=     .300
*SECNO  .668
3280 CROSS SECTION        .67 EXTENDED        .97 FEET

                ANY WSEL EXTENSION AT X1= 0.668 TO X1= 1.378 IS DUE TO THE
                LIMITING ELEVATION AT THE LEFT BANK.

      .668       2.76     918.26     918.09        .00     918.74        .48       2.45        .10     917.30
    4895.0     1659.0      930.4     2305.7      401.3      129.1      403.9      106.9      103.2     916.80
      1.10       4.13       7.21       5.71       .045       .030       .045       .000     915.50    9620.00
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   .012123      200.      270.      290.        11        11         0       .00    665.47  10285.47

*SECNO  .776
3280 CROSS SECTION        .78 EXTENDED        .35 FEET

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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.39

     .776      4.55    920.95       .00       .00    921.14       .19      2.37       .03    920.60
   4895.0        .0     577.2    4317.8        .0     133.2    1266.6     122.0     110.8    917.90
     1.15       .00      4.33      3.41      .000      .030      .045      .000    916.40   9975.00
  .002116      535.      570.      570.         4         0         0       .00    510.12  10485.12

*SECNO  .868
3280 CROSS SECTION        .87 EXTENDED        .47 FEET

     .868      4.17    922.17       .00       .00    922.43       .26      1.27       .02    921.70
   4895.0        .0     747.2    4147.8        .0     136.1    1099.3     136.7     116.5    919.80
     1.18       .00      5.49      3.77      .000      .030      .045      .000    918.00   9970.00
  .003296      495.      490.      485.         4         0         0       .00    515.69  10485.69

*SECNO  .964
3280 CROSS SECTION        .96 EXTENDED        .92 FEET

     .964      4.92    924.12       .00       .00    924.61       .49      2.11       .07    923.20
   4895.0        .0    1739.3    3155.7        .0     229.1     771.9     149.7     122.0    922.50
     1.21       .00      7.59      4.09      .000      .030      .045      .000    919.20   9970.00
  .005474      505.      505.      505.         2         0         0       .00    441.24  10411.24

*SECNO 1.081
3280 CROSS SECTION       1.08 EXTENDED        .58 FEET

                Q = Q AT CP364A       (= 4895 CFS).
                THIS Q  HAS BEEN REDUCED BY THE SAME AMOUNT THAT EXCEEDED THE
                CAPACITY OF THE CHANNEL AT THE UPSTREAM REACH  X1= 1.474 TO
                X1= 1.823,     THAT EXCEEDED FLOW WILL RETURN AT X1= 0.964

    1.081      3.28    926.28       .00       .00    926.37       .09      1.72       .04    925.70
   2596.0        .0     779.9    1816.1        .0     281.2     817.0     164.4     128.3    925.00
     1.28       .00      2.77      2.22      .000      .030      .045      .000    923.00   9955.00
  .001187      595.      620.      610.         2         0         0       .00    451.38  10406.38

*SECNO 1.153
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


3265 DIVIDED FLOW

                DIVIDED FLOW OCCURS FOR THE NEXT FOUR UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 1.435

    1.153      3.68    926.68       .00       .00    926.76       .08       .39       .00    928.40
   2596.0        .0     586.6    2009.4        .0     223.0     945.0     173.8     132.1    925.80
     1.32       .00      2.63      2.13      .000      .030      .045      .000    923.00   9959.96
  .000973      410.      380.      355.         3         0         0       .00    453.30  10422.36

*SECNO 1.236

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
    1.236      3.45    927.45    927.45       .00    928.35       .90       .93       .25    930.20
   2596.0        .0    1818.0     778.0        .0     207.0     207.6     181.7     135.5    928.30
     1.34       .00      8.78      3.75      .000      .030      .045      .000    924.00   9974.25
  .008002      435.      435.      435.        20        12         0       .00    242.61  10325.72

*SECNO 1.317
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3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.90

1.317	5.70	929.70	.00	.00	930.04	.34	1.63	.06	930.40
2596.0	.0	1655.1	940.9	.0	297.7	381.5	187.1	138.2	928.50
1.37	.00	5.56	2.47	.000	.030	.045	.000	924.00	9970.74
.002209	430.	430.	430.	3	0	0	.00	300.91	10314.63

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 1.378

3265 DIVIDED FLOW

1.378	6.38	930.38	.00	.00	930.64	.26	.59	.01	930.80
2596.0	.0	1444.6	1151.4	.0	285.0	516.1	192.3	140.5	928.80
1.39	.00	5.07	2.23	.000	.030	.045	.000	924.00	9965.18
.001666	345.	320.	295.	3	0	0	.00	370.84	10366.88

*SECNO 1.435

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

CROSS-SECTION AT STATE ROUTE 85

1.435	4.87	931.17	931.17	.00	932.39	1.22	.87	.29	931.40
2596.0	.0	2555.5	40.5	.0	285.9	24.1	195.4	141.9	931.00
1.40	.00	8.94	1.68	.000	.030	.045	.000	926.30	9966.34
.008479	330.	300.	180.	20	15	0	.00	162.61	10128.96

*SECNO 1.474
3280 CROSS SECTION 1.47 EXTENDED .62 FEET

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

Q = Q AT CP336 (= 4899 CFS).
THIS Q HAS BEEN REDUCED TO THE CAPACITY OF THE CHANNEL PLUS A
MAXIMUM OF 1 FOOT OVER THE LIMITING ELEVATION AT THE RIGHT
OVERBANK. EXCEEDED FLOW WILL RETURN AT X1= 0.964

ANY WSEL EXTENSION AT X1= 1.474 TO X1= 1.823 IS DUE TO THE
LIMITING ELEVATION AT THE RIGHT OVERBANK.

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

1.474	5.62	933.62	933.62	.00	934.04	.42	1.27	.08	932.00
2600.0	1465.5	961.6	172.9	760.5	118.6	72.8	198.4	144.8	932.00
1.41	1.93	8.11	2.38	.045	.030	.045	.000	928.00	9045.76
.004512	210.	210.	210.	4	12	0	.00	1034.24	10080.00

CCHV= .300 CEHV= .500
*SECNO 1.517
3280 CROSS SECTION 1.52 EXTENDED .19 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.98

1.517	2.68	934.88	.00	.00	934.94	.06	.80	.11	933.20
2600.0	1796.4	803.6	.0	1083.0	320.4	.0	210.2	154.5	934.70
1.47	1.66	2.51	.00	.045	.030	.000	.000	932.20	9266.45
.001146	500.	225.	160.	1	0	0	.00	813.55	10080.00

*SECNO 1.566
3280 CROSS SECTION 1.57 EXTENDED .11 FEET

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1.566	3.71	936.21	936.21	.00	937.38	1.17	.67	.56	934.00
2600.0	140.4	2399.1	60.4	42.9	266.5	19.0	216.2	157.8	934.00
1.48	3.27	9.00	3.19	.045	.030	.045	.000	932.50	9914.72
.007773	320.	260.	210.	20	11	0	.00	150.28	10065.00

CCHV= .100 CEHV= .300
*SECNO 1.634
3280 CROSS SECTION 1.63 EXTENDED .97 FEET

3301 HV CHANGED MORE THAN HVINS

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.06

1.634	5.27	938.27	.00	.00	938.66	.38	1.19	.08	934.00
2600.0	727.3	1573.5	299.2	269.4	262.5	106.2	220.2	159.4	934.00
1.50	2.70	5.99	2.82	.045	.030	.045	.000	933.00	9832.50
.001824	360.	360.	360.	3	0	0	.00	232.50	10065.00

*SECNO 1.680
3280 CROSS SECTION 1.68 EXTENDED .57 FEET

1.680	5.37	938.77	.00	.00	939.01	.24	.34	.01	934.00
2600.0	805.5	1399.3	395.2	396.5	279.1	171.0	224.1	160.8	934.00
1.52	2.03	5.01	2.31	.045	.030	.045	.000	933.40	9761.32
.001176	200.	240.	285.	2	0	0	.00	338.68	10100.00

*SECNO 1.745
3280 CROSS SECTION 1.75 EXTENDED .97 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.56

1.745	5.37	939.17	.00	.00	939.27	.10	.24	.01	934.50
2600.0	631.1	1329.0	639.9	419.4	410.7	439.1	232.3	163.7	934.50
1.56	1.50	3.24	1.46	.045	.030	.045	.000	933.80	9787.12
.000482	280.	345.	400.	2	0	0	.00	422.88	10210.00

*SECNO 1.823
3280 CROSS SECTION 1.82 EXTENDED .81 FEET

1.823	4.51	939.41	.00	.00	939.47	.06	.20	.00	936.00
2600.0	1094.0	896.1	609.9	950.7	317.0	461.9	245.9	169.3	936.00
1.62	1.15	2.83	1.32	.045	.030	.045	.000	934.90	9432.35
.000520	370.	410.	425.	2	0	0	.00	822.65	10255.00

*SECNO 1.893

3265 DIVIDED FLOW

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Q = Q AT CP336 (=4899 CFS).

DIVIDED FLOW OCCURS FOR THE NEXT FIVE UPSTREAM CROSS-SECTIONS,
HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
X1= 2.371

1.893	3.61	939.71	.00	.00	939.85	.14	.36	.02	937.00
4899.0	3225.2	1190.3	483.5	1448.1	252.9	231.6	259.0	176.0	937.00
1.65	2.23	4.71	2.09	.045	.030	.045	.000	936.10	9093.62
.001947	280.	370.	370.	2	0	0	.00	1080.16	10199.81

*SECNO 1.941

3265 DIVIDED FLOW

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .66

1.941	3.60	939.90	.00	.00	940.11	.21	.24	.02	940.00
4899.0	4627.7	271.3	.0	1277.9	66.3	.0	261.9	177.6	940.00
1.66	3.62	4.09	.00	.045	.030	.000	.000	936.30	8961.19
.004537	40.	255.	290.	2	0	0	.00	700.71	10024.29

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CCHV=     .100 CEHV=     .300
*SECNO 1.988

3265 DIVIDED FLOW

     1.988      3.80    940.10       .00       .00    940.30       .19       .18       .00    944.00
    4899.0    4790.9     108.1        .0    1359.5      35.4        .0     263.3     178.3    944.00
      1.66      3.52      3.06       .00      .045      .030      .000      .000    936.30   8915.50
   .003961       35.      245.      280.         2         0         0       .00    696.81  10015.41

*SECNO 2.058

3265 DIVIDED FLOW

3280 CROSS SECTION      2.06 EXTENDED       .27 FEET

                ANY WSEL EXTENSION AT X1= 2.058 TO X1= 2.185 IS DUE TO THE
                LIMITING ELEVATIONS AT THE LEFT OVERBANK.

     2.058      4.67    941.27       .00       .00    941.42       .14      1.12       .00    944.00
    4899.0    4612.2     286.8        .0    1546.4      78.3        .0     275.4     184.3    944.00
      1.69      2.98      3.66       .00      .045      .030      .000      .000    936.60   8850.00
   .002608      350.      370.      370.         2         0         0       .00    772.16  10024.75

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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO 2.185

3265 DIVIDED FLOW

3280 CROSS SECTION      2.18 EXTENDED       .16 FEET

     2.185      5.46    942.66       .00       .00    943.05       .39      1.56       .07    944.00
    4899.0    4109.4     789.6        .0     846.6     139.0        .0     288.9     190.7    944.00
      1.72      4.85      5.68       .00      .045      .030      .000      .000    937.20   9310.00
   .004656      430.      670.      670.         2         0         0       .00    472.18  10034.94

*SECNO 2.297

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.93

          **  END OF APPROXIMATE FLOODPLAIN DELINEATION .

     2.297      5.70    943.50       .00       .00    943.54       .04       .46       .03    941.30
    4899.0    3868.5     433.0     597.5    2357.1     222.9    1049.4     319.2     201.3    940.80
      1.83      1.64      1.94       .57      .045      .030      .070      .000    937.80   9438.68
   .000301      610.      595.      450.         3         0         0       .00   1206.62  10645.29

*SECNO 2.371

          **  BEGIN DETAILED FLOODPLAIN\FLOODWAY ANALYSIS.

     2.371      4.26    943.66       .00       .00    943.71       .04       .17       .00    942.00
    4899.0    3581.6     443.4     874.0    2078.7     174.1    1148.2     354.0     215.3    940.70
      1.90      1.72      2.55       .76      .045      .030      .070      .000    939.40   9277.62
   .000570      400.      390.      500.         2         0         0       .00   1501.93  10779.55

*SECNO 2.435

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .62

     2.435      4.01    943.91       .00       .00    944.02       .10       .29       .02    942.00
    4899.0    2586.9    1274.9    1037.2    1299.5     313.9     933.7     376.9     226.8    941.70
      1.94      1.99      4.06      1.11      .045      .030      .070      .000    939.90   9260.15
   .001467      335.      335.      335.         2         0         0       .00   1482.58  10742.73

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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO 2.536
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

                CROSS-SECTION 30 FEET SOUTH OF LOWER BUKEYE RD. "EXTENDED"
```

Q = Q AT CP335 (= 4906 CFS).

2.536	2.30	945.80	945.80	.00	946.40	.60	1.71	.15	943.80
4906.0	791.1	1873.1	2241.8	167.5	207.5	795.1	399.7	241.9	943.70
1.97	4.72	9.03	2.82	.045	.030	.070	.000	943.50	9771.15
.011717	535.	535.	535.	20	11	0	.00	979.53	10750.68

*SECNO 2.680

3265 DIVIDED FLOW

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.47

DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
X1= 2.883

2.680	3.93	949.13	.00	.00	949.33	.20	2.89	.04	947.30
4906.0	539.6	2177.7	2188.7	310.1	435.8	1354.6	427.2	259.7	945.60
2.03	1.74	5.00	1.62	.045	.030	.070	.000	945.20	9565.75
.001927	735.	760.	725.	5	0	0	.00	1136.32	10774.45

*SECNO 2.771

3265 DIVIDED FLOW

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .58

2.771	3.31	950.61	.00	.00	950.81	.20	1.48	.00	949.40
4906.0	1353.9	624.2	2927.8	435.3	89.5	1094.5	447.7	271.8	948.20
2.07	3.11	6.98	2.68	.045	.030	.070	.000	947.30	9624.70
.005705	480.	480.	480.	3	0	0	.00	1066.90	10702.82

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 2.883

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.47

2.883	4.33	952.83	.00	.00	952.99	.16	2.18	.00	950.20
4906.0	2464.6	614.4	1827.0	815.6	105.0	921.6	470.8	284.7	950.10
2.12	3.02	5.85	1.98	.045	.030	.070	.000	948.50	9596.60
.002643	580.	590.	580.	1	0	0	.00	877.27	10473.87

*SECNO 2.977

Q = Q AT CP334 (= 4915 CFS).

2.977	4.37	954.27	.00	.00	954.68	.41	1.62	.08	951.50
4915.0	2276.9	1835.6	802.5	636.5	249.9	526.2	489.5	294.8	952.10
2.15	3.58	7.34	1.53	.045	.030	.070	.000	949.90	9642.89
.004041	500.	500.	500.	2	0	0	.00	871.33	10514.22

*SECNO 3.070

3.070	3.83	956.13	.00	.00	956.28	.15	1.57	.03	954.50
4915.0	1655.7	1153.4	2105.9	694.8	227.5	1146.6	509.1	306.0	953.20
2.20	2.38	5.07	1.84	.045	.030	.070	.000	952.30	9527.59
.002614	485.	490.	495.	2	0	0	.00	1123.98	10651.57

*SECNO 3.167

Q = Q AT 1I334 (= 4432 CFS).

3.167	3.46	957.36	.00	.00	957.48	.12	1.19	.00	955.10
4432.0	2044.8	727.1	1660.1	814.1	150.5	1058.3	532.5	318.7	954.90
2.26	2.51	4.83	1.57	.045	.030	.070	.000	953.90	9569.20
.002191	475.	510.	515.	2	0	0	.00	1088.78	10657.98

*SECNO 3.291

3265 DIVIDED FLOW

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

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3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .55

               DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
               HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
               X1= 3.602

     3.291      2.52    959.72       .00       .00    959.85       .13      2.37       .00    960.50
    4432.0        .0     179.2    4252.8        .0      36.0    1531.6     559.4     333.5    960.10
      2.32       .00      4.98      2.78      .000      .030      .070      .000    957.20   9986.41
   .007133      660.      655.      650.         3         0         0       .00    880.55  10880.48

*SECNO 3.376

3265 DIVIDED FLOW

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.52

     3.376      3.46    961.76       .00       .00    961.83       .08      1.98       .01    961.90
    4432.0     255.6     172.7    4003.7     190.2      46.8    1846.2     577.9     344.1    961.00
      2.38      1.34      3.69      2.17      .045      .030      .070      .000    958.30   9673.73
   .003077      460.      450.      440.         2         0         0       .00   1205.55  10888.70

*SECNO 3.491
     3.491      3.70    963.20       .00       .00    963.27       .08      1.44       .00    961.90
    4432.0    1449.7     409.1    2573.2     664.1     102.0    1454.9     607.8     359.8    961.90
      2.46      2.18      4.01      1.77      .045      .030      .070      .000    959.50   9597.03
   .001901      605.      605.      605.         4         0         0       .00   1059.92  10656.95

CCHV=     .100 CEHV=     .300
*SECNO 3.602

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .68

               CROSS-SECTION AT YUMA RD.

               Q = Q AT CP316       (= 4438 CFS).
1
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     3.602      2.78    964.68       .00       .00    964.90       .23      1.58       .05    962.00
    4438.0     426.8    2771.4    1239.8     234.6     599.2     620.9     632.7     372.4    962.00
      2.50      1.82      4.63      2.00      .070      .040      .070      .000    961.90   9699.47
   .004075      590.      590.      590.         1         0         0       .00    806.16  10505.63


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T1      WHITE TANKS / AGUA FRIA AREA DRAINAGE MASTER STUDY
T2      100 - YEAR STORM EVENT   FLOODWAY RUN  FILE: 10.H2I
T3      BULLARD WASH  (WASH 10) - FROM BUCKEYE CANAL TO DYSART DRAIN.

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

                3                                                                   912.32

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     14                  -1

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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*PROF 2
0

CCHV=     .100 CEHV=     .300
*SECNO  .000
          ***  DUE TO THE COMPLEXITY OF THE DOWNSTREAM REACH (CROSS-SECTIONS
               0.000 TO 2.297),AN APPROXIMATE FLOODPLAIN DELINEATION HAS BEEN
               SHOWN IN THIS REACH.HOWEVER,A HEC-2 MODEL WAS SET UP INCLUDING
               THESE X-SECTIONS TO AID IN PRODUCING A REASONABLE APPROXIMATE
               DELINEATION.THIS APPROXIMATE DELINEATION IS AS SHOWN ON THE MAPS
               AND IS BASED ON ENGINEERING JUDGEMENT REFLCTING THE EXISTING
               TOPOGRAPHY,AND USING INFORMATION FROM THE HEC-2 MODEL TO
               ESTIMATE WHERE BREAKOUT FLOWS WILL OCCUR.
               ALSO, AN APPROXIMATE FLOODPLAIN DELINEATION HAS BEEN SHOWN FOR
               THE UPPERMOST REACH OF BULLARD WASH (CROSS-SECTIONS 10.269 TO
               14.023). THE HEC-2 MODEL WAS ALSO UTILIZED TO ESTIMATE THE
               APPROXIMATE DELINEATION IN THIS REACH.
               A DETAILED ANALYSIS WAS PERFORMED ON BULLARD WASH FROM CROSS-
               SECTION 2.371 TO 6.320 AND FROM 9.189 TO 10.197.
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                    ******************************************************************
                    ******************************************************************

                    THE AREA BETWEEN X-SECTION 6.320 AND X-SECTION
                    9.189 IS CURRENTLY UNDER CONSTRUCTION.  NO FLOODPLAIN HAS BEEN
                    PREPARED FOR THIS AREA OF BULLARD WASH, HOWEVER, THE HEC-2
                    ANALYSIS WAS CONTINUED BASED ON EXISTING CONDITIONS AT THE TIME
                    OF THE AERIAL MAPPING TO COMPUTE WATER SURFACE ELEVATIONS
                    UPSTREAM AND DOWNSTREAM OF THIS REACH.

                    ******************************************************************
                    ******************************************************************


                 *** THE DISCHARGE IN FIELD 4 OF THE QT CARDS IS THE ACTUAL DISCHRAGE
                     DERIVED FROM THE 100-YEAR 24-HOUR HEC1 MODEL. THIS DISCHRGE IS
                     FOR COMPARISON PURPOSES ONLY AND NO PROFILE IS BEING COMPUTED
                     FOR IT. DISCHARGES FOR PROFILES 1 & 2 ARE USED TO DELINEATE THE
                     FLOODPLAIN AND FLOODWAY RESPECTIVELY. THESE DISCHARGES ARE BASED
                     UPON THE CAPACITY OF THE CHANNEL PLUS A MAXIMUM OF 1 FOOT OVER
                     THE TOP WHERE CAPACITY IS EXCEEDED. THESE SITUATIONS ARE
1
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                     DOCUMENTED THROUGHOUT THE HEC-2 MODEL.

                 **  BEGIN APPROXIMATE FLOODPLAIN DELINEATION

                     CROSS-SECTION AT BUKEYE CANAL

                     Q = Q AT CP364        (= 3110 CFS).
                     THIS Q HAS BEEN REDUCED TO THE CAPACITY OF THE CHANNEL PLUS A
                     MAXIMUM OF 1 FOOT OVER THE LIMITING ELEVATION AT THE RIGHT
                     OVERBANK.
                     EXCEEDED FLOW WILL CONTINUE AS SHEET FLOW TO THE WEST.

      .000      1.82    912.32      .00    912.32    912.34      .02      .00      .00    912.00
     850.0     624.6     160.3     65.1     577.9     104.8    134.8       .0       .0    912.00
       .00      1.08      1.53      .48      .070      .040     .070     .000   910.50   9325.60
   .002500        0.        0.       0.         0         0        0      .00  1246.80  10572.40

*SECNO  .047
3280 CROSS SECTION        .05 EXTENDED        .05 FEET

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.47

                     ANY WSEL EXTENSION AT X1= 0.047 TO X1= 0.616 IS DUE TO THE
                     LIMITING ELEVATION AT THE RIGHT OVERBANK.

      .047      2.55    912.55      .00       .00    912.55      .01      .21      .00    912.30
     850.0     347.1     275.0    227.9     767.1     249.4    511.0       6.9      8.5    910.30
       .11       .45      1.10      .45      .070      .040     .070     .000   910.00   9133.16
   .000409      265.      250.     240.         3         0        0      .00  1686.84  10820.00

*SECNO  .121
3280 CROSS SECTION        .12 EXTENDED        .23 FEET

      .121      2.73    912.73      .00       .00    912.74      .01      .19      .00    912.70
     850.0     111.5     232.8    505.7     288.0     190.3    811.2      19.5     22.2    910.40
       .25       .39      1.22      .62      .070      .040     .070     .000   910.00   9452.48
   .000588      390.      390.     390.         2         0        0      .00  1367.52  10820.00

*SECNO  .201
3280 CROSS SECTION        .20 EXTENDED        .53 FEET

      .201      3.03    913.03      .00       .00    913.05      .02      .30      .00    913.00
     850.0      12.0     366.8    471.2      52.9     228.3    699.4      30.4     34.1    910.50
       .36       .23      1.61      .67      .070      .040     .070     .000   910.00   9724.55
   .000886      420.      420.     420.         2         0        0      .00  1095.45  10820.00

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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO  .292
3280 CROSS SECTION        .29 EXTENDED        .89 FEET

      .292      2.89    913.39      .00       .00    913.41      .02      .36      .00    913.30
     850.0       7.9     301.6    540.6      31.4     208.8    880.3      42.0     45.3    912.10
       .51       .25      1.44      .61      .070      .040     .070     .000   910.50   9860.27
   .000645      480.      480.     480.         1         0        0      .00   939.73  10800.00

*SECNO  .384
```

3280 CROSS SECTION .38 EXTENDED .49 FEET

DIVIDED FLOW OCCURS FOR THE NEXT FOUR UPSTREAM CROSS-SECTIONS,
HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
X1= 0.668

.384	2.69	913.69	.00	.00	913.70	.01	.29	.00	914.30
850.0	9.9	241.9	598.1	51.5	198.7	1214.3	56.6	59.6	912.70
.70	.19	1.22	.49	.070	.040	.070	.000	911.00	9688.05
.000541	490.	490.	490.	2	0	0	.00	1604.28	11370.00

*SECNO .488

3265 DIVIDED FLOW

3280 CROSS SECTION .49 EXTENDED .81 FEET

.488	2.01	914.01	.00	.00	914.02	.01	.32	.00	915.20
850.0	1.1	141.8	707.0	9.0	132.6	1293.2	74.7	78.8	913.50
.94	.13	1.07	.55	.070	.040	.070	.000	912.00	9875.31
.000648	545.	545.	545.	0	0	0	.00	1469.90	11365.00

*SECNO .531

3265 DIVIDED FLOW

3280 CROSS SECTION .53 EXTENDED .98 FEET

1

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
.531	1.38	914.18	.00	.00	914.18	.01	.16	.00	915.40
850.0	.1	37.2	812.8	.9	55.1	1319.2	82.1	86.4	914.20
1.05	.06	.67	.62	.070	.040	.070	.000	912.80	9897.62
.000757	230.	230.	230.	2	0	0	.00	1385.91	11350.00

*SECNO .616

3265 DIVIDED FLOW

3280 CROSS SECTION .62 EXTENDED .05 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.90

Q = Q AT CP364A (= 4895 CFS).

.616	2.25	916.05	.00	.00	916.19	.14	1.97	.04	916.50
4895.0	.0	411.6	4483.4	.0	120.0	1539.8	98.8	98.6	915.20
1.09	.02	3.43	2.91	.070	.040	.070	.000	913.80	9669.96
.006955	405.	450.	480.	6	0	0	.00	844.48	10830.00

CCHV= .100 CEHV= .300
*SECNO .668
3280 CROSS SECTION .67 EXTENDED .97 FEET

ANY WSEL EXTENSION AT X1= 0.668 TO X1= 1.378 IS DUE TO THE
LIMITING ELEVATION AT THE LEFT BANK.

.668	2.76	918.26	918.09	.00	918.74	.48	2.45	.10	917.30
4895.0	1659.0	930.4	2305.7	401.3	129.1	403.9	106.9	103.2	916.80
1.10	4.13	7.21	5.71	.045	.030	.045	.000	915.50	9620.00
.012123	200.	270.	290.	11	11	0	.00	665.47	10285.47

*SECNO .776
3280 CROSS SECTION .78 EXTENDED .35 FEET

1

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.39

.776	4.55	920.95	.00	.00	921.14	.19	2.37	.03	920.60
4895.0	.0	577.2	4317.8	.0	133.2	1266.6	122.0	110.8	917.90
1.15	.00	4.33	3.41	.000	.030	.045	.000	916.40	9975.00
.002116	535.	570.	570.	4	0	0	.00	510.12	10485.12

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*SECNO  .868
3280 CROSS SECTION        .87 EXTENDED        .47 FEET

      .868      4.17    922.17       .00       .00    922.43       .26      1.27       .02    921.70
    4895.0        .0     747.2    4147.8        .0     136.1    1099.3     136.7     116.5    919.80
      1.18       .00      5.49      3.77      .000      .030      .045      .000    918.00   9970.00
   .003296      495.      490.      485.         4         0         0       .00    515.69  10485.69

*SECNO  .964
3280 CROSS SECTION        .96 EXTENDED        .92 FEET

      .964      4.92    924.12       .00       .00    924.61       .49      2.11       .07    923.20
    4895.0        .0    1739.3    3155.7        .0     229.1     771.9     149.7     122.0    922.50
      1.21       .00      7.59      4.09      .000      .030      .045      .000    919.20   9970.00
   .005474      505.      505.      505.         2         0         0       .00    441.24  10411.24

*SECNO 1.081
3280 CROSS SECTION       1.08 EXTENDED        .58 FEET

                Q = Q AT CP364A       (= 4895 CFS).
                THIS Q  HAS BEEN REDUCED BY THE SAME AMOUNT THAT EXCEEDED THE
                CAPACITY OF THE CHANNEL AT THE UPSTREAM REACH  X1= 1.474 TO
                X1= 1.823,    THAT EXCEEDED FLOW WILL RETURN AT X1= 0.964

     1.081      3.28    926.28       .00       .00    926.37       .09      1.72       .04    925.70
    2596.0        .0     779.9    1816.1        .0     281.2     817.0     164.5     128.3    925.00
      1.28       .00      2.77      2.22      .000      .030      .045      .000    923.00   9955.00
   .001187      595.      620.      610.         2         0         0       .00    451.38  10406.38

*SECNO 1.153
1
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    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

3265 DIVIDED FLOW

                DIVIDED FLOW OCCURS FOR THE NEXT FOUR UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 1.435

     1.153      3.68    926.68       .00       .00    926.76       .08       .39       .00    928.40
    2596.0        .0     586.6    2009.4        .0     223.0     945.0     173.8     132.1    925.80
      1.32       .00      2.63      2.13      .000      .030      .045      .000    923.00   9959.96
   .000973      410.      380.      355.         3         0         0       .00    453.30  10422.36

*SECNO 1.236

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     1.236      3.45    927.45    927.45       .00    928.35       .90       .93       .25    930.20
    2596.0        .0    1818.0     778.0        .0     207.0     207.6     181.7     135.5    928.30
      1.34       .00      8.78      3.75      .000      .030      .045      .000    924.00   9974.25
   .008002      435.      435.      435.        20        12         0       .00    242.61  10325.72

*SECNO 1.317

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.90

     1.317      5.70    929.70       .00       .00    930.04       .34      1.63       .06    930.40
    2596.0        .0    1655.1    940.9        .0     297.7     381.5     187.1     138.2    928.50
      1.37       .00      5.56      2.47      .000      .030      .045      .000    924.00   9970.74
   .002209      430.      430.      430.         3         0         0       .00    300.91  10314.63

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    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST
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*SECNO 1.378

3265 DIVIDED FLOW

     1.378      6.38    930.38       .00       .00    930.64       .26       .59       .01    930.80
    2596.0        .0    1444.6    1151.4        .0     285.0     516.1     192.3     140.5    928.80
      1.39       .00      5.07      2.23      .000      .030      .045      .000    924.00   9965.18
   .001666      345.      320.      295.         3         0         0       .00    370.84  10366.88

*SECNO 1.435

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

                CROSS-SECTION AT STATE ROUTE 85

     1.435      4.87    931.17    931.17       .00    932.39      1.22       .87       .29    931.40
    2596.0        .0    2555.5      40.5        .0     285.9      24.1     195.4     141.9    931.00
      1.40       .00      8.94      1.68      .000      .030      .045      .000    926.30   9966.34
   .008479      330.      300.      180.        20        15         0       .00    162.61  10128.96

*SECNO 1.474
3280 CROSS SECTION      1.47 EXTENDED       .62 FEET

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

                Q = Q AT CP336       (= 4899 CFS).
                THIS Q HAS BEEN REDUCED TO THE CAPACITY OF THE CHANNEL PLUS A
                MAXIMUM OF 1 FOOT OVER THE LIMITING ELEVATION AT THE RIGHT
                OVERBANK.      EXCEEDED FLOW WILL RETURN AT X1= 0.964

                ANY WSEL EXTENSION AT X1= 1.474 TO X1= 1.823 IS DUE TO THE
                LIMITING ELEVATION AT THE RIGHT OVERBANK.
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    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

     1.474      5.62    933.62    933.62       .00    934.04       .42      1.27       .08    932.00
    2600.0    1465.5     961.6     172.9     760.5     118.6      72.8     198.4     144.8    932.00
      1.41      1.93      8.11      2.38      .045      .030      .045      .000    928.00   9045.76
   .004512      210.      210.      210.         4        12         0       .00   1034.24  10080.00

CCHV=     .300 CEHV=     .500
*SECNO 1.517
3280 CROSS SECTION      1.52 EXTENDED       .19 FEET

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.98

     1.517      2.68    934.88       .00       .00    934.94       .06       .80       .11    933.20
    2600.0    1796.4     803.6        .0    1083.0     320.4        .0     210.3     154.5    934.70
      1.47      1.66      2.51       .00      .045      .030      .000      .000    932.20   9266.45
   .001146      500.      225.      160.         1         0         0       .00    813.55  10080.00

*SECNO 1.566
3280 CROSS SECTION      1.57 EXTENDED       .11 FEET

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     1.566      3.71    936.21    936.21       .00    937.38      1.17       .67       .56    934.00
    2600.0     140.4    2399.1      60.4      42.9     266.5      19.0     216.2     157.8    934.00
      1.48      3.27      9.00      3.19      .045      .030      .045      .000    932.50   9914.72
   .007773      320.      260.      210.        20        11         0       .00    150.28  10065.00

CCHV=     .100 CEHV=     .300
*SECNO 1.634
3280 CROSS SECTION      1.63 EXTENDED       .97 FEET

3301 HV CHANGED MORE THAN HVINS
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    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
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     Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
     TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.06

      1.634      5.27     938.27       .00        .00     938.66       .38       1.19        .08     934.00
     2600.0     727.3     1573.5     299.2      269.4      262.5     106.2      220.2      159.4     934.00
       1.50      2.70       5.99      2.82       .045       .030      .045       .000     933.00    9832.50
    .001824      360.       360.      360.          3          0         0        .00     232.50   10065.00

 *SECNO 1.680
 3280 CROSS SECTION       1.68 EXTENDED        .57 FEET

      1.680      5.37     938.77       .00        .00     939.01       .24        .34        .01     934.00
     2600.0     805.5     1399.3     395.2      396.5      279.1     171.0      224.1      160.9     934.00
       1.52      2.03       5.01      2.31       .045       .030      .045       .000     933.40    9761.32
    .001176      200.       240.      285.          2          0         0        .00     338.68   10100.00

 *SECNO 1.745
 3280 CROSS SECTION       1.75 EXTENDED        .97 FEET

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.56

      1.745      5.37     939.17       .00        .00     939.27       .10        .24        .01     934.50
     2600.0     631.1     1329.0     639.9      419.4      410.7     439.1      232.3      163.7     934.50
       1.56      1.50       3.24      1.46       .045       .030      .045       .000     933.80    9787.12
    .000482      280.       345.      400.          2          0         0        .00     422.88   10210.00

 *SECNO 1.823
 3280 CROSS SECTION       1.82 EXTENDED        .81 FEET

      1.823      4.51     939.41       .00        .00     939.47       .06        .20        .00     936.00
     2600.0    1094.0     896.1     609.9      950.7      317.0     461.9      245.9      169.3     936.00
       1.62      1.15       2.83      1.32       .045       .030      .045       .000     934.90    9432.35
    .000520      370.       410.      425.          2          0         0        .00     822.65   10255.00

 *SECNO 1.893

 3265 DIVIDED FLOW

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                 Q = Q AT CP336        (=4899 CFS).

                 DIVIDED FLOW OCCURS FOR THE NEXT FIVE UPSTREAM CROSS-SECTIONS,
                 HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                 X1= 2.371

      1.893      3.61     939.71       .00        .00     939.85       .14        .36        .02     937.00
     4899.0    3225.2     1190.3     483.5     1448.1      252.9     231.6      259.0      176.0     937.00
       1.65      2.23       4.71      2.09       .045       .030      .045       .000     936.10    9093.62
    .001947      280.       370.      370.          2          0         0        .00    1080.16   10199.81

 *SECNO 1.941

 3265 DIVIDED FLOW

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .66

      1.941      3.60     939.90       .00        .00     940.11       .21        .24        .02     940.00
     4899.0    4627.7     271.3        .0     1277.9       66.3        .0      262.0      177.6     940.00
       1.66      3.62       4.09       .00       .045       .030      .000       .000     936.30    8961.19
    .004537       40.       255.      290.          2          0         0        .00     700.71   10024.29

 CCHV=      .100 CEHV=      .300
 *SECNO 1.988

 3265 DIVIDED FLOW

      1.988      3.80     940.10       .00        .00     940.30       .19        .18        .00     944.00
     4899.0    4790.9     108.1        .0     1359.5       35.4        .0      263.3      178.4     944.00
       1.66      3.52       3.06       .00       .045       .030      .000       .000     936.30    8915.50
    .003961       35.       245.      280.          2          0         0        .00     696.81   10015.41

 *SECNO 2.058

 3265 DIVIDED FLOW

 3280 CROSS SECTION       2.06 EXTENDED        .27 FEET

                 ANY WSEL EXTENSION AT X1= 2.058 TO X1= 2.185 IS DUE TO THE
                 LIMITING ELEVATIONS AT THE LEFT OVERBANK.

      2.058      4.67     941.27       .00        .00     941.42       .14       1.12        .00     944.00
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    4899.0    4612.2     286.8       .0    1546.4      78.3       .0     275.5     184.3    944.00
      1.69      2.98      3.66      .00      .045      .030      .000      .000    936.60   8850.00
   .002608      350.      370.     370.         2         0         0       .00    772.16  10024.75
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO 2.185

3265 DIVIDED FLOW

3280 CROSS SECTION      2.18 EXTENDED       .16 FEET

     2.185      5.46    942.66       .00       .00    943.05       .39      1.56       .07    944.00
    4899.0    4109.4     789.6        .0     846.6     139.0        .0     289.0     190.7    944.00
      1.72      4.85      5.68       .00      .045      .030      .000      .000    937.20   9310.00
   .004656      430.      670.      670.         2         0         0       .00    472.18  10034.94

*SECNO 2.297

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.93

            **  END OF APPROXIMATE FLOODPLAIN DELINEATION .

     2.297      5.70    943.50       .00       .00    943.54       .04       .46       .03    941.30
    4899.0    3868.5     433.0     597.5    2357.1     222.9    1049.4     319.3     201.3    940.80
      1.83      1.64      1.94       .57      .045      .030      .070      .000    937.80   9438.68
   .000301      610.      595.      450.         3         0         0       .00   1206.62  10645.29

*SECNO 2.371

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .31

3470 ENCROACHMENT STATIONS=     9650.0   10070.0  TYPE=      1  TARGET=      420.000

            **  BEGIN DETAILED FLOODPLAIN\FLOODWAY ANALYSIS.

     2.371      4.21    943.61       .00    943.66    943.90       .29       .29       .08    942.00
    4899.0    3635.7    1006.2     257.1     927.7     171.3     113.5     342.8     209.5    940.70
      1.85      3.92      5.87      2.27      .045      .030      .070      .000    939.40   9650.00
   .003100      400.      390.      500.         3         0         0       .00    420.00  10070.00

*SECNO 2.435

3470 ENCROACHMENT STATIONS=     9835.0   10210.0  TYPE=      1  TARGET=      375.000
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1


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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

     2.435      4.67    944.57       .00    943.91    945.10       .53      1.13       .07    942.00
    4899.0    1250.1    2766.5     882.4     355.6     379.6     350.3     351.6     212.6    941.70
      1.87      3.52      7.29      2.52      .045      .030      .070      .000    939.90   9835.00
   .003667      335.      335.      335.         2         0         0       .00    375.00  10210.00

*SECNO 2.536

3470 ENCROACHMENT STATIONS=     9850.0   10250.0  TYPE=      1  TARGET=      400.000

                CROSS-SECTION 30 FEET SOUTH OF LOWER BUKEYE RD. "EXTENDED"

                Q = Q AT CP335       (= 4906 CFS).

     2.536      3.32    946.82       .00    945.80    947.30       .48      2.19       .01    943.80
    4906.0    1140.2    2219.2    1546.6     274.4     304.1     539.5     365.2     217.4    943.70
      1.90      4.16      7.30      2.87      .045      .030      .070      .000    943.50   9850.00
   .004601      535.      535.      535.         2         0         0       .00    400.00  10250.00

*SECNO 2.680

3265 DIVIDED FLOW

3470 ENCROACHMENT STATIONS=     9800.0   10205.0  TYPE=      1  TARGET=      405.000

                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 2.883

     2.680      4.33    949.53       .00    949.13    950.02       .49      2.72       .00    947.30
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    4906.0     135.2    3235.7    1535.1      66.5     485.5     566.2     384.1     223.9    945.60
      1.94      2.03      6.66      2.71      .045      .030      .070      .000    945.20   9800.00
   .002967      735.      760.      725.         1         0         0       .00    370.13  10205.00

 *SECNO 2.771

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .70

 3470 ENCROACHMENT STATIONS=     9880.0   10225.0  TYPE=      1  TARGET=      345.000
1
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    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

     2.771       4.24     951.54        .00     950.61     952.01       .46       1.98        .00     949.40
    4906.0      644.7     1083.9     3177.4      173.3      121.9     786.2      396.2      227.8     948.20
      1.97       3.72       8.89       4.04       .045       .030      .070       .000     947.30    9880.00
   .006131       480.       480.       480.          2          0         0        .00     345.00   10225.00

 *SECNO 2.883

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.67

 3470 ENCROACHMENT STATIONS=     9830.0   10180.0  TYPE=      1  TARGET=      350.000
     2.883       5.29     953.79        .00     952.83     954.04       .25       2.01        .02     950.20
    4906.0     2326.6      841.0     1738.4      608.8      133.8     682.6      413.0      232.4     950.10
      2.01       3.82       6.28       2.55       .045       .030      .070       .000     948.50    9830.00
   .002210       580.       590.       580.          2          0         0        .00     350.00   10180.00

 *SECNO 2.977

 3470 ENCROACHMENT STATIONS=     9820.0   10055.0  TYPE=      1  TARGET=      235.000

                Q = Q AT CP334       (= 4915 CFS).

     2.977       5.04     954.94        .00     954.27     955.58       .65       1.42        .12     951.50
    4915.0     2520.5     2367.1       27.3      547.9      296.5      14.1      426.1      235.8     952.10
      2.03       4.60       7.98       1.94       .045       .030      .070       .000     949.90    9820.00
   .003803       500.       500.       500.          2          0         0        .00     235.00   10055.00

 *SECNO 3.070

 3470 ENCROACHMENT STATIONS=     9790.0   10180.0  TYPE=      1  TARGET=      390.000
     3.070       4.64     956.94        .00     956.13     957.29       .35       1.68        .03     954.50
    4915.0     1248.9     1903.3     1762.8      378.0      291.6     607.5      438.1      239.3     953.20
      2.06       3.30       6.53       2.90       .045       .030      .070       .000     952.30    9790.00
   .003115       485.       490.       495.          2          0         0        .00     390.00   10180.00

 *SECNO 3.167

 3470 ENCROACHMENT STATIONS=     9730.0   10190.0  TYPE=      1  TARGET=      460.000

1
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                Q = Q AT 1I334       (= 4432 CFS).

     3.167       4.41     958.31        .00     957.36     958.50       .19       1.19        .02     955.10
    4432.0     2166.6     1054.3     1211.2      732.0      198.1     587.7      454.0      244.1     954.90
      2.10       2.96       5.32       2.06       .045       .030      .070       .000     953.90    9730.00
   .001844       475.       510.       515.          2          0         0        .00     460.00   10190.00

 *SECNO 3.291

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .43

 3470 ENCROACHMENT STATIONS=     9987.0   10330.0  TYPE=      1  TARGET=      343.000

                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 3.602

     3.291       3.35     960.55        .00     959.72     960.89       .35       2.35        .05  100000.00
    4432.0         .0      447.1     3984.9         .0       61.6     912.0      472.7      250.2     960.10
      2.14        .00       7.26       4.37       .000       .030      .070       .000     957.20    9987.00
   .009894       660.       655.       650.          2          0         0        .00     343.00   10330.00

 *SECNO 3.376

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.05

 3470 ENCROACHMENT STATIONS=     9840.0   10365.0  TYPE=      1  TARGET=      525.000
     3.376       4.39     962.69        .00     961.76     962.80       .11       1.88        .02     961.90
```

4432.0	568.4	323.7	3539.9	247.7	74.6	1379.2	486.3	254.6	961.00
2.19	2.29	4.34	2.57	.045	.030	.070	.000	958.30	9840.00
.002354	460.	450.	440.	1	0	0	.00	525.00	10365.00

*SECNO 3.491

3470 ENCROACHMENT STATIONS= 9870.0 10260.0 TYPE= 1 TARGET= 390.000

3.491	4.54	964.04	.00	963.20	964.22	.18	1.40	.02	961.90
4432.0	1144.0	721.3	2566.6	344.8	135.7	990.1	508.3	260.9	961.90
2.24	3.32	5.31	2.59	.045	.030	.070	.000	959.50	9870.00
.002279	605.	605.	605.	4	0	0	.00	390.00	10260.00

CCHV= .100 CEHV= .300
*SECNO 3.602

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3470 ENCROACHMENT STATIONS= 9840.0 10170.0 TYPE= 1 TARGET= 330.000

CROSS-SECTION AT YUMA RD.

Q = Q AT CP316 (= 4438 CFS).

3.602	3.57	965.47	.00	964.68	965.76	.28	1.51	.03	962.00
4438.0	296.9	3577.2	563.8	126.6	775.1	230.4	526.0	265.8	962.00
2.28	2.34	4.61	2.45	.070	.040	.070	.000	961.90	9840.00
.002878	590.	590.	590.	2	0	0	.00	330.00	10170.00

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THIS RUN EXECUTED 29OCT94 10:58:59

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

BULLARD WASH (WASH 10)

SUMMARY PRINTOUT

	SECNO	Q	CWSEL	SSTA	STCHL	STCHR	ENDST	DIFWSX	TOPWID	DEPTH	ELMIN	10*KS	VCH
	.000	850.00	912.32	9326.62	9980.00	10120.00	10571.93	.00	1245.30	1.82	910.50	25.25	1.5
	.000	850.00	912.32	9325.60	9980.00	10120.00	10572.40	.00	1246.80	1.82	910.50	25.00	1.5
*	.047	850.00	912.55	9133.37	9960.00	10100.00	10820.00	.23	1686.63	2.55	910.00	4.10	1.1
*	.047	850.00	912.55	9133.16	9960.00	10100.00	10820.00	.23	1686.84	2.55	910.00	4.09	1.1
	.121	850.00	912.73	9452.89	9980.00	10100.00	10820.00	.19	1367.11	2.73	910.00	5.90	1.2
	.121	850.00	912.73	9452.48	9980.00	10100.00	10820.00	.19	1367.52	2.73	910.00	5.88	1.2
	.201	850.00	913.03	9724.61	9970.00	10100.00	10820.00	.29	1095.39	3.03	910.00	8.87	1.6
	.201	850.00	913.03	9724.55	9970.00	10100.00	10820.00	.29	1095.45	3.03	910.00	8.86	1.6
	.292	850.00	913.39	9860.27	9960.00	10070.00	10800.00	.37	939.73	2.89	910.50	6.45	1.4
	.292	850.00	913.39	9860.27	9960.00	10070.00	10800.00	.37	939.73	2.89	910.50	6.45	1.4
	.384	850.00	913.69	9688.08	9970.00	10095.00	11370.00	.30	1604.23	2.69	911.00	5.41	1.2
	.384	850.00	913.69	9688.05	9970.00	10095.00	11370.00	.30	1604.28	2.69	911.00	5.41	1.2
	.488	850.00	914.01	9875.31	9970.00	10090.00	11365.00	.32	1469.90	2.01	912.00	6.48	1.0
	.488	850.00	914.01	9875.31	9970.00	10090.00	11365.00	.32	1469.90	2.01	912.00	6.48	1.0
	.531	850.00	914.18	9897.62	9965.00	10090.00	11350.00	.16	1385.91	1.38	912.80	7.57	.6
	.531	850.00	914.18	9897.62	9965.00	10090.00	11350.00	.16	1385.91	1.38	912.80	7.57	.6
*	.616	4895.00	916.05	9669.96	9960.00	10090.00	10830.00	1.88	844.48	2.25	913.80	69.55	3.4
*	.616	4895.00	916.05	9669.96	9960.00	10090.00	10830.00	1.88	844.48	2.25	913.80	69.55	3.4
	.668	4895.00	918.26	9620.00	9950.00	10035.00	10285.47	2.21	665.47	2.76	915.50	121.23	2
	.668	4895.00	918.26	9620.00	9950.00	10035.00	10285.47	2.21	665.47	2.76	915.50	121.23	2
*	.776	4895.00	920.95	9975.00	9975.00	10025.00	10485.12	2.69	510.12	4.55	916.40	21.16	4.3
*	.776	4895.00	920.95	9975.00	9975.00	10025.00	10485.12	2.69	510.12	4.55	916.40	21.16	4.3

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	SECNO	Q	CWSEL	SSTA	STCHL	STCHR	ENDST	DIFWSX	TOPWID	DEPTH	ELMIN	10*KS	VCH
	.868	4895.00	922.17	9970.00	9970.00	10020.00	10485.69	1.22	515.69	4.17	918.00	32.96	5.4
	.868	4895.00	922.17	9970.00	9970.00	10020.00	10485.69	1.22	515.69	4.17	918.00	32.96	5.4
	.964	4895.00	924.12	9970.00	9970.00	10045.00	10411.24	1.95	441.24	4.92	919.20	54.74	7.5
	.964	4895.00	924.12	9970.00	9970.00	10045.00	10411.24	1.95	441.24	4.92	919.20	54.74	7.5
	1.081	2596.00	926.28	9955.00	9955.00	10090.00	10406.38	2.15	451.38	3.28	923.00	11.87	2.7
	1.081	2596.00	926.28	9955.00	9955.00	10090.00	10406.38	2.15	451.38	3.28	923.00	11.87	2.7
	1.153	2596.00	926.68	9959.96	9945.00	10060.00	10422.36	.40	453.30	3.68	923.00	9.73	2.6
	1.153	2596.00	926.68	9959.96	9945.00	10060.00	10422.36	.40	453.30	3.68	923.00	9.73	2.6
*	1.236	2596.00	927.45	9974.25	9960.00	10060.00	10325.72	.77	242.61	3.45	924.00	80.02	8.7
*	1.236	2596.00	927.45	9974.25	9960.00	10060.00	10325.72	.77	242.61	3.45	924.00	80.02	8.7
*	1.317	2596.00	929.70	9970.74	9960.00	10050.00	10314.63	2.25	300.91	5.70	924.00	22.09	5.5
*	1.317	2596.00	929.70	9970.74	9960.00	10050.00	10314.63	2.25	300.91	5.70	924.00	22.09	5.5
	1.378	2596.00	930.38	9965.18	9960.00	10035.00	10366.88	.68	370.84	6.38	924.00	16.66	5.0
	1.378	2596.00	930.38	9965.18	9960.00	10035.00	10366.88	.68	370.84	6.38	924.00	16.66	5.0
*	1.435	2596.00	931.17	9966.34	9965.00	10070.00	10128.96	.79	162.61	4.87	926.30	84.79	8.9
*	1.435	2596.00	931.17	9966.34	9965.00	10070.00	10128.96	.79	162.61	4.87	926.30	84.79	8.9
*	1.474	2600.00	933.62	9045.76	9985.00	10015.00	10080.00	2.45	1034.24	5.62	928.00	45.12	8.1
*	1.474	2600.00	933.62	9045.76	9985.00	10015.00	10080.00	2.45	1034.24	5.62	928.00	45.12	8.1
*	1.517	2600.00	934.88	9266.45	9905.00	10080.00	10080.00	1.26	813.55	2.68	932.20	11.46	2.5
*	1.517	2600.00	934.88	9266.45	9905.00	10080.00	10080.00	1.26	813.55	2.68	932.20	11.46	2.5
*	1.566	2600.00	936.21	9914.72	9955.00	10045.00	10065.00	1.33	150.28	3.71	932.50	77.73	9.0
*	1.566	2600.00	936.21	9914.72	9955.00	10045.00	10065.00	1.33	150.28	3.71	932.50	77.73	9.0
*	1.634	2600.00	938.27	9832.50	9970.00	10025.00	10065.00	2.06	232.50	5.27	933.00	18.24	5.9
*	1.634	2600.00	938.27	9832.50	9970.00	10025.00	10065.00	2.06	232.50	5.27	933.00	18.24	5.9
	1.680	2600.00	938.77	9761.32	9970.00	10025.00	10100.00	.49	338.68	5.37	933.40	11.76	5.0
	1.680	2600.00	938.77	9761.32	9970.00	10025.00	10100.00	.49	338.68	5.37	933.40	11.76	5.0
*	1.745	2600.00	939.17	9787.12	9960.00	10040.00	10210.00	.40	422.88	5.37	933.80	4.82	3.2
*	1.745	2600.00	939.17	9787.12	9960.00	10040.00	10210.00	.40	422.88	5.37	933.80	4.82	3.2
	1.823	2600.00	939.41	9432.35	9970.00	10050.00	10255.00	.25	822.65	4.51	934.90	5.20	2.8
	1.823	2600.00	939.41	9432.35	9970.00	10050.00	10255.00	.25	822.65	4.51	934.90	5.20	2.8
	1.893	4899.00	939.71	9093.62	9960.00	10040.00	10199.81	.30	1080.16	3.61	936.10	19.47	4.7
	1.893	4899.00	939.71	9093.62	9960.00	10040.00	10199.81	.30	1080.16	3.61	936.10	19.47	4.7
*	1.941	4899.00	939.90	8961.19	9975.00	10025.00	10024.29	.19	700.71	3.60	936.30	45.37	4.0
*	1.941	4899.00	939.90	8961.19	9975.00	10025.00	10024.29	.19	700.71	3.60	936.30	45.37	4.0

	SECNO	Q	CWSEL	SSTA	STCHL	STCHR	ENDST	DIFWSX	TOPWID	DEPTH	ELMIN	10*KS	VCH
	1.988	4899.00	940.10	8915.50	9950.00	10030.00	10015.41	.20	696.81	3.80	936.30	39.61	3.0
	1.988	4899.00	940.10	8915.50	9950.00	10030.00	10015.41	.20	696.81	3.80	936.30	39.61	3.0
	2.058	4899.00	941.27	8850.00	9970.00	10035.00	10024.75	1.17	772.16	4.67	936.60	26.08	3.6
	2.058	4899.00	941.27	8850.00	9970.00	10035.00	10024.75	1.17	772.16	4.67	936.60	26.08	3.6
	2.185	4899.00	942.66	9310.00	9965.00	10045.00	10034.94	1.39	472.18	5.46	937.20	46.56	5.6
	2.185	4899.00	942.66	9310.00	9965.00	10045.00	10034.94	1.39	472.18	5.46	937.20	46.56	5.6
*	2.297	4899.00	943.50	9438.68	9975.00	10040.00	10645.29	.84	1206.62	5.70	937.80	3.01	1.9
*	2.297	4899.00	943.50	9438.68	9975.00	10040.00	10645.29	.84	1206.62	5.70	937.80	3.01	1.9
	2.371	4899.00	943.66	9277.62	9975.00	10030.00	10779.55	.16	1501.93	4.26	939.40	5.70	2.5
*	2.371	4899.00	943.61	9650.00	9975.00	10030.00	10070.00	.11	420.00	4.21	939.40	31.00	5.8
*	2.435	4899.00	943.91	9260.15	9985.00	10085.00	10742.73	.25	1482.58	4.01	939.90	14.67	4.0
	2.435	4899.00	944.57	9835.00	9985.00	10085.00	10210.00	.96	375.00	4.67	939.90	36.67	7.2
*	2.536	4906.00	945.80	9771.15	9965.00	10060.00	10750.68	1.89	979.53	2.30	943.50	117.17	9.0
	2.536	4906.00	946.82	9850.00	9965.00	10060.00	10250.00	2.25	400.00	3.32	943.50	46.01	7.3
*	2.680	4906.00	949.13	9565.75	9925.00	10050.00	10774.45	3.33	1136.32	3.93	945.20	19.27	5.0
	2.680	4906.00	949.53	9800.00	9925.00	10050.00	10205.00	2.71	370.13	4.33	945.20	29.67	6.6
*	2.771	4906.00	950.61	9624.70	9985.00	10020.00	10702.82	1.47	1066.90	3.31	947.30	57.05	6.9
*	2.771	4906.00	951.54	9880.00	9985.00	10020.00	10225.00	2.01	345.00	4.24	947.30	61.31	8.8
*	2.883	4906.00	952.83	9596.60	9985.00	10015.00	10473.87	2.22	877.27	4.33	948.50	26.43	5.8
*	2.883	4906.00	953.79	9830.00	9985.00	10015.00	10180.00	2.25	350.00	5.29	948.50	22.10	6.2
	2.977	4915.00	954.27	9642.89	9980.00	10050.00	10514.22	1.44	871.33	4.37	949.90	40.41	7.3
	2.977	4915.00	954.94	9820.00	9980.00	10050.00	10055.00	1.15	235.00	5.04	949.90	38.03	7.9
	3.070	4915.00	956.13	9527.59	9945.00	10025.00	10651.57	1.86	1123.98	3.83	952.30	26.14	5.0
	3.070	4915.00	956.94	9790.00	9945.00	10025.00	10180.00	2.01	390.00	4.64	952.30	31.15	6.5
	3.167	4432.00	957.36	9569.20	9970.00	10020.00	10657.98	1.22	1088.78	3.46	953.90	21.91	4.8
	3.167	4432.00	958.31	9730.00	9970.00	10020.00	10190.00	1.36	460.00	4.41	953.90	18.44	5.3
*	3.291	4432.00	959.72	9986.41	9970.00	10020.00	10880.48	2.36	880.55	2.52	957.20	71.33	4.9
*	3.291	4432.00	960.55	9987.00	9970.00	10020.00	10330.00	2.24	343.00	3.35	957.20	98.94	7.2

*	3.376	4432.00	961.76	9673.73	9985.00	10015.00	10888.70	2.04	1205.55	3.46	958.30	30.77	3.6
*	3.376	4432.00	962.69	9840.00	9985.00	10015.00	10365.00	2.14	525.00	4.39	958.30	23.54	4.3
	3.491	4432.00	963.20	9597.03	9980.00	10020.00	10656.95	1.44	1059.92	3.70	959.50	19.01	4.0
	3.491	4432.00	964.04	9870.00	9980.00	10020.00	10260.00	1.36	390.00	4.54	959.50	22.79	5.3
*	3.602	4438.00	964.68	9699.47	9880.00	10100.00	10505.63	1.48	806.16	2.78	961.90	40.75	.6
	3.602	4438.00	965.47	9840.00	9880.00	10100.00	10170.00	1.43	330.00	3.57	961.90	28.78	6

BULLARD WASH (WASH 10)

SUMMARY PRINTOUT TABLE 110

	SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENC
	.000	912.32	.32	912.34	1245.30	625.17	160.26	64.57	.00	.00	9980.00	10120.00	.0
	.000	912.32	.00	912.34	1246.80	624.56	160.34	65.10	.00	.00	9980.00	10120.00	.0
*	.047	912.55	.00	912.55	1686.63	347.06	275.13	227.81	.00	.00	9960.00	10100.00	.0
*	.047	912.55	.00	912.55	1686.84	347.12	275.00	227.88	.00	.00	9960.00	10100.00	.0
	.121	912.73	.00	912.74	1367.11	111.36	232.90	505.73	.00	.00	9980.00	10100.00	.0
	.121	912.73	.00	912.74	1367.52	111.46	232.84	505.70	.00	.00	9980.00	10100.00	.0
	.201	913.03	.00	913.05	1095.39	12.00	366.79	471.21	.00	.00	9970.00	10100.00	.0
	.201	913.03	.00	913.05	1095.45	12.01	366.77	471.22	.00	.00	9970.00	10100.00	.0
	.292	913.39	.00	913.41	939.73	7.85	301.57	540.57	.00	.00	9960.00	10070.00	.0
	.292	913.39	.00	913.41	939.73	7.85	301.57	540.57	.00	.00	9960.00	10070.00	.0
	.384	913.69	.00	913.70	1604.23	9.94	241.92	598.14	.00	.00	9970.00	10095.00	.0
	.384	913.69	.00	913.70	1604.28	9.95	241.90	598.15	.00	.00	9970.00	10095.00	.0
	.488	914.01	.00	914.02	1469.90	1.13	141.84	707.02	.00	.00	9970.00	10090.00	.0
	.488	914.01	.00	914.02	1469.90	1.13	141.84	707.02	.00	.00	9970.00	10090.00	.0
	.531	914.18	.00	914.18	1385.91	.06	37.19	812.75	.00	.00	9965.00	10090.00	.0
	.531	914.18	.00	914.18	1385.91	.06	37.19	812.75	.00	.00	9965.00	10090.00	.0
*	.616	916.05	.00	916.19	844.48	.00	411.57	4483.43	.00	.00	9960.00	10090.00	.0
*	.616	916.05	.00	916.19	844.48	.00	411.57	4483.43	.00	.00	9960.00	10090.00	.0
	.668	918.26	.00	918.74	665.47	1658.98	930.36	2305.66	.00	.00	9950.00	10035.00	.0
	.668	918.26	.00	918.74	665.47	1658.98	930.36	2305.66	.00	.00	9950.00	10035.00	.0
*	.776	920.95	.00	921.14	510.12	.00	577.24	4317.76	.00	.00	9975.00	10025.00	.0
*	.776	920.95	.00	921.14	510.12	.00	577.24	4317.76	.00	.00	9975.00	10025.00	.0
	.868	922.17	.00	922.43	515.69	.00	747.24	4147.75	.00	.00	9970.00	10020.00	.0
	.868	922.17	.00	922.43	515.69	.00	747.24	4147.75	.00	.00	9970.00	10020.00	.0
	.964	924.12	.00	924.61	441.24	.00	1739.32	3155.68	.00	.00	9970.00	10045.00	.0
	.964	924.12	.00	924.61	441.24	.00	1739.32	3155.68	.00	.00	9970.00	10045.00	.0
	1.081	926.28	.00	926.37	451.38	.00	779.91	1816.08	.00	.00	9955.00	10090.00	.0
	1.081	926.28	.00	926.37	451.38	.00	779.91	1816.08	.00	.00	9955.00	10090.00	.0
	1.153	926.68	.00	926.76	453.30	.00	586.65	2009.35	.00	.00	9945.00	10060.00	.0
	1.153	926.68	.00	926.76	453.30	.00	586.65	2009.35	.00	.00	9945.00	10060.00	.0
*	1.236	927.45	.00	928.35	242.61	.00	1818.01	777.99	.00	.00	9960.00	10060.00	.0
*	1.236	927.45	.00	928.35	242.61	.00	1818.01	777.99	.00	.00	9960.00	10060.00	.0

	SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENC
*	1.317	929.70	.00	930.04	300.91	.00	1655.12	940.88	.00	.00	9960.00	10050.00	.0
*	1.317	929.70	.00	930.04	300.91	.00	1655.12	940.88	.00	.00	9960.00	10050.00	.0
	1.378	930.38	.00	930.64	370.84	.00	1444.64	1151.36	.00	.00	9960.00	10035.00	.0
	1.378	930.38	.00	930.64	370.84	.00	1444.64	1151.36	.00	.00	9960.00	10035.00	.0
*	1.435	931.17	.00	932.39	162.61	.00	2555.55	40.45	.00	.00	9965.00	10070.00	.0
*	1.435	931.17	.00	932.39	162.61	.00	2555.55	40.45	.00	.00	9965.00	10070.00	.0
*	1.474	933.62	.00	934.04	1034.24	1465.46	961.65	172.89	.00	.00	9985.00	10015.00	.0
*	1.474	933.62	.00	934.04	1034.24	1465.46	961.65	172.89	.00	.00	9985.00	10015.00	.0
*	1.517	934.88	.00	934.94	813.55	1796.39	803.61	.00	.00	.00	9905.00	10080.00	.0
*	1.517	934.88	.00	934.94	813.55	1796.39	803.61	.00	.00	.00	9905.00	10080.00	.0
*	1.566	936.21	.00	937.38	150.28	140.43	2399.14	60.43	.00	.00	9955.00	10045.00	.0
*	1.566	936.21	.00	937.38	150.28	140.43	2399.14	60.43	.00	.00	9955.00	10045.00	.0
*	1.634	938.27	.00	938.66	232.50	727.29	1573.53	299.18	.00	.00	9970.00	10025.00	.0
*	1.634	938.27	.00	938.66	232.50	727.29	1573.53	299.18	.00	.00	9970.00	10025.00	.0
	1.680	938.77	.00	939.01	338.68	805.50	1399.31	395.19	.00	.00	9970.00	10025.00	.0
	1.680	938.77	.00	939.01	338.68	805.50	1399.31	395.19	.00	.00	9970.00	10025.00	.0
*	1.745	939.17	.00	939.27	422.88	631.15	1328.97	639.89	.00	.00	9960.00	10040.00	.0

*	1.745	939.17	.00	939.27	422.88	631.15	1328.97	639.89	.00	.00	9960.00	10040.00	.0
	1.823	939.41	.00	939.47	822.65	1094.01	896.10	609.89	.00	.00	9970.00	10050.00	.0
	1.823	939.41	.00	939.47	822.65	1094.01	896.10	609.89	.00	.00	9970.00	10050.00	.0
	1.893	939.71	.00	939.85	1080.16	3225.21	1190.25	483.54	.00	.00	9960.00	10040.00	.0
	1.893	939.71	.00	939.85	1080.16	3225.21	1190.25	483.54	.00	.00	9960.00	10040.00	.0
*	1.941	939.90	.00	940.11	700.71	4627.73	271.27	.00	.00	.00	9975.00	10025.00	.0
*	1.941	939.90	.00	940.11	700.71	4627.73	271.27	.00	.00	.00	9975.00	10025.00	.0
	1.988	940.10	.00	940.30	696.81	4790.88	108.12	.00	.00	.00	9950.00	10030.00	.0
	1.988	940.10	.00	940.30	696.81	4790.88	108.12	.00	.00	.00	9950.00	10030.00	.0
	2.058	941.27	.00	941.42	772.16	4612.20	286.80	.00	.00	.00	9970.00	10035.00	.0
	2.058	941.27	.00	941.42	772.16	4612.20	286.80	.00	.00	.00	9970.00	10035.00	.0
	2.185	942.66	.00	943.05	472.18	4109.41	789.59	.00	.00	.00	9965.00	10045.00	.0
	2.185	942.66	.00	943.05	472.18	4109.41	789.59	.00	.00	.00	9965.00	10045.00	.0
*	2.297	943.50	.00	943.54	1206.62	3868.54	432.96	597.50	.00	.00	9975.00	10040.00	.0
*	2.297	943.50	.00	943.54	1206.62	3868.54	432.96	597.50	.00	.00	9975.00	10040.00	.0
	2.371	943.66	.00	943.71	1501.93	3581.64	443.40	873.96	.00	.00	9975.00	10030.00	.0
*	2.371	943.61	-.05	943.90	420.00	3635.70	1006.20	257.10	420.00	9650.00	9975.00	10030.00	10070.0

	SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENC
*	2.435	943.91	.00	944.02	1482.58	2586.88	1274.89	1037.23	.00	.00	9985.00	10085.00	.0
	2.435	944.57	.66	945.10	375.00	1250.14	2766.49	882.37	375.00	9835.00	9985.00	10085.00	10210.0
*	2.536	945.80	.00	946.40	979.53	791.13	1873.09	2241.78	.00	.00	9965.00	10060.00	.0
	2.536	946.82	1.02	947.30	400.00	1140.16	2219.21	1546.63	400.00	9850.00	9965.00	10060.00	10250.0
*	2.680	949.13	.00	949.33	1136.32	539.63	2177.67	2188.70	.00	.00	9925.00	10050.00	.0
	2.680	949.53	.40	950.02	370.13	135.17	3235.72	1535.10	405.00	9800.00	9925.00	10050.00	10205.0
*	2.771	950.61	.00	950.81	1066.90	1353.94	624.25	2927.81	.00	.00	9985.00	10020.00	.0
*	2.771	951.54	.94	952.01	345.00	644.68	1083.90	3177.42	345.00	9880.00	9985.00	10020.00	10225.0
*	2.883	952.83	.00	952.99	877.27	2464.59	614.42	1826.99	.00	.00	9985.00	10015.00	.0
*	2.883	953.79	.96	954.04	350.00	2326.61	841.02	1738.37	350.00	9830.00	9985.00	10015.00	10180.0
	2.977	954.27	.00	954.68	871.33	2276.91	1835.62	802.47	.00	.00	9980.00	10050.00	.0
	2.977	954.94	.66	955.58	235.00	2520.55	2367.13	27.33	235.00	9820.00	9980.00	10050.00	10055.0
	3.070	956.13	.00	956.28	1123.98	1655.72	1153.43	2105.86	.00	.00	9945.00	10025.00	.0
	3.070	956.94	.81	957.29	390.00	1248.90	1903.29	1762.81	390.00	9790.00	9945.00	10025.00	10180.0
	3.167	957.36	.00	957.48	1088.78	2044.80	727.08	1660.11	.00	.00	9970.00	10020.00	.0
	3.167	958.31	.95	958.50	460.00	2166.55	1054.25	1211.20	460.00	9730.00	9970.00	10020.00	10190.0
*	3.291	959.72	.00	959.85	880.55	.00	179.21	4252.79	.00	.00	9970.00	10020.00	.0
*	3.291	960.55	.83	960.89	343.00	.00	447.15	3984.85	343.00	9987.00	9970.00	10020.00	10330.0
*	3.376	961.76	.00	961.83	1205.55	255.61	172.66	4003.73	.00	.00	9985.00	10015.00	.0
*	3.376	962.69	.93	962.80	525.00	568.39	323.67	3539.94	525.00	9840.00	9985.00	10015.00	10365.
	3.491	963.20	.00	963.27	1059.92	1449.73	409.07	2573.20	.00	.00	9980.00	10020.00	.0
	3.491	964.04	.84	964.22	390.00	1144.03	721.32	2566.65	390.00	9870.00	9980.00	10020.00	10260.0
*	3.602	964.68	.00	964.90	806.16	426.76	2771.40	1239.84	.00	.00	9880.00	10100.00	.0
	3.602	965.47	.80	965.76	330.00	296.93	3577.23	563.84	330.00	9840.00	9880.00	10100.00	10170.0

SUMMARY OF ERRORS AND SPECIAL NOTES

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WARNING SECNO=      .047  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      .047  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      .616  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      .616  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      .776  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      .776  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     1.236  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     1.236  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     1.236  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=     1.236  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     1.236  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     1.236  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=     1.317  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=     1.317  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     1.435  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     1.435  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     1.435  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=     1.435  PROFILE=  2  CRITICAL DEPTH ASSUMED
```

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CAUTION SECNO=      1.435  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      1.435  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=      1.474  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.474  PROFILE=  1  MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      1.474  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.474  PROFILE=  2  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      1.517  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      1.517  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      1.566  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.566  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      1.566  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO=      1.566  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.566  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      1.566  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=      1.634  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      1.634  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      1.745  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      1.745  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      1.941  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      1.941  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      2.297  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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WARNING SECNO=      2.297  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      2.371  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      2.435  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      2.536  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      2.536  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      2.536  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=      2.680  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      2.771  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      2.771  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      2.883  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      2.883  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      3.291  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      3.291  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      3.376  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      3.376  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      3.602  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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FLOODWAY DATA, BULLARD WASH (WASH 10)
PROFILE NO. 2

STATION	WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WITHOUT FLOODWAY	DIFFERENCE
.000	1247.	817.	1.0	912.3	912.3	.0
.047	1687.	1527.	.6	912.5	912.5	.0
.121	1368.	1290.	.7	912.7	912.7	.0
.201	1095.	981.	.9	913.0	913.0	.0
.292	940.	1121.	.8	913.4	913.4	.0
.384	1682.	1465.	.6	913.7	913.7	.0
.488	1490.	1435.	.6	914.0	914.0	.0
.531	1452.	1375.	.6	914.2	914.2	.0
.616	1160.	1660.	2.9	916.1	916.1	.0
.668	665.	934.	5.2	918.3	918.3	.0
.776	510.	1400.	3.5	921.0	921.0	.0
.868	516.	1235.	4.0	922.2	922.2	.0
.964	441.	1001.	4.9	924.1	924.1	.0
1.081	451.	1098.	2.4	926.3	926.3	.0
1.153	462.	1168.	2.2	926.7	926.7	.0
1.236	351.	415.	6.3	927.4	927.4	.0
1.317	344.	679.	3.8	929.7	929.7	.0
1.378	402.	801.	3.2	930.4	930.4	.0
1.435	163.	310.	8.4	931.2	931.2	.0
1.474	1034.	952.	2.7	933.6	933.6	.0
1.517	814.	1403.	1.9	934.9	934.9	.0
1.566	150.	328.	7.9	936.2	936.2	.0
1.634	233.	638.	4.1	938.3	938.3	.0
1.680	339.	847.	3.1	938.8	938.8	.0
1.745	423.	1269.	2.0	939.2	939.2	.0
1.823	823.	1730.	1.5	939.4	939.4	.0
1.893	1106.	1933.	2.5	939.7	939.7	.0
1.941	1063.	1344.	3.6	939.9	939.9	.0

1.988	1100.	1395.	3.5	940.1	940.1	.0
2.058	1175.	1625.	3.0	941.3	941.3	.0
2.185	725.	986.	5.0	942.7	942.7	.0
2.297	1207.	3629.	1.3	943.5	943.5	.0
2.371	420.	1212.	4.0	943.6	943.7	-.1
2.435	375.	1085.	4.5	944.6	943.9	.7
2.536	400.	1118.	4.4	946.8	945.8	1.0
2.680	405.	1118.	4.4	949.5	949.1	.4
2.771	345.	1081.	4.5	951.5	950.6	.9
2.883	350.	1425.	3.4	953.8	952.8	1.0
2.977	235.	859.	5.7	955.0	954.3	.7
3.070	390.	1277.	3.8	956.9	956.1	.8
3.167	460.	1518.	2.9	958.3	957.4	.9
3.291	343.	974.	4.6	960.5	959.7	.8

1

FLOODWAY DATA, BULLARD WASH (WASH 10)
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WATER SURFACE ELEVATION WITHOUT FLOODWAY	DIFFERENCE
3.376	525.	1702.	2.6	962.7	961.8	.9
3.491	390.	1471.	3.0	964.0	963.2	.8
3.602	330.	1132.	3.9	965.5	964.7	.8

```
1*********************************************
 *  HEC-2 WATER SURFACE PROFILES             *
 *                                           *
 *  Version   4.6.2;  May 1991               *
 *                                           *
 *  RUN DATE    29OCT94    TIME   10:57:59   *
 *********************************************
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*************************************
*  U.S. ARMY CORPS OF ENGINEERS
*  HYDROLOGIC ENGINEERING CENTER
*  609 SECOND STREET, SUITE D
*  DAVIS, CALIFORNIA 95616-4687
*        (916) 756-1104
*************************************
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X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X            X     X
X     X  X        X                        X
XXXXXXX  XXXX     X          XXXXX    XXXXX
X     X  X        X                  X
X     X  X        X     X            X
X     X  XXXXXXX   XXXXX             XXXXXXX
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THIS RUN EXECUTED 29OCT94 10:57:59

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*************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
*************************************
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T1      BULLARD WASH OUTFALL FEASIBILITY STUDY        STANLEY CONSULTANTS, INC.
T2      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCD #94-06)       SCI #12278
T3      BULLARD WASH REVISED                                  INPUT FILE: 12278H2A
T4
T4   ***************************************************************************
T4   THIS MODEL IS THE SAME MODEL AS WLB'S WHITE TANKS/AGUA FRIA WASH 10.H21
T4   EXCEPT ALL CROSS SECTIONS UPSTREAM OF 3.602 (YUMA ROAD) HAVE BEEN REMOVED
T4   IN ORDER TO REDUCE THE SIZE OF THE MODEL.
T4
T4   FLOW RATES HAVE BEEN REDUCED ACCORDING TO REVISED HYDROLOGY FROM THE SCI
T4   HEC-1 MODEL 12278H1A REFLECTING FUTURE UPSTREAM FLOOD CONTROL PROJECTS.
T4   ***************************************************************************
T4
T4   T1      WHITE TANKS / AGUA FRIA AREA DRAINAGE MASTER STUDY
T4   T2      100 - YEAR STORM EVENT   FLOODPLAIN RUN  FILE: 10.H2I
T4   T3      BULLARD WASH  (WASH 10) - FROM BUCKEYE CANAL TO DYSART DRAIN.
T4

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

      0        2         0         0      .0025        0         0         0        912        0

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

      1        0        -1         0         0         0         0         0         0         0

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    38        43         1        53        21        22        54        51         4         8
    42         5        26         0       110         0       200

NC      .07       .07       .04       .1        .3
QT        3       850       850      2100
          ***  DUE TO THE COMPLEXITY OF THE DOWNSTREAM REACH (CROSS-SECTIONS
               0.000 TO 2.297),AN APPROXIMATE FLOODPLAIN DELINEATION HAS BEEN
               SHOWN IN THIS REACH.HOWEVER,A HEC-2 MODEL WAS SET UP INCLUDING
               THESE X-SECTIONS TO AID IN PRODUCING A REASONABLE APPROXIMATE
               DELINEATION.THIS APPROXIMATE DELINEATION IS AS SHOWN ON THE MAPS
               AND IS BASED ON ENGINEERING JUDGEMENT REFLCTING THE EXISTING
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               TOPOGRAPHY,AND USING INFORMATION FROM THE HEC-2 MODEL TO
               ESTIMATE WHERE BREAKOUT FLOWS WILL OCCUR.
               ALSO, AN APPROXIMATE FLOODPLAIN DELINEATION HAS BEEN SHOWN FOR
               THE UPPERMOST REACH OF BULLARD WASH (CROSS-SECTIONS 10.269 TO
               14.023). THE HEC-2 MODEL WAS ALSO UTILIZED TO ESTIMATE THE
               APPROXIMATE DELINEATION IN THIS REACH.
               A DETAILED ANALYSIS WAS PERFORMED ON BULLARD WASH FROM CROSS-
               SECTION 2.371 TO 6.320 AND FROM 9.189 TO 10.197.

               ****************************************************************
               ****************************************************************

               THE AREA BETWEEN X-SECTION 6.320 AND X-SECTION
               9.189 IS CURRENTLY UNDER CONSTRUCTION.  NO FLOODPLAIN HAS BEEN
               PREPARED FOR THIS AREA OF BULLARD WASH, HOWEVER, THE HEC-2
               ANALYSIS WAS CONTINUED BASED ON EXISTING CONDITIONS AT THE TIME
               OF THE AERIAL MAPPING TO COMPUTE WATER SURFACE ELEVATIONS
               UPSTREAM AND DOWNSTREAM OF THIS REACH.

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                 *** THE DISCHARGE IN FIELD 4 OF THE QT CARDS IS THE ACTUAL DISCHRAGE
                     DERIVED FROM THE 100-YEAR 24-HOUR HEC1 MODEL. THIS DISCHRGE IS
                     FOR COMPARISON PURPOSES ONLY AND NO PROFILE IS BEING COMPUTED
                     FOR IT. DISCHARGES FOR PROFILES 1 & 2 ARE USED TO DELINEATE THE
                     FLOODPLAIN AND FLOODWAY RESPECTIVELY. THESE DISCHARGES ARE BASED
                     UPON THE CAPACITY OF THE CHANNEL PLUS A MAXIMUM OF 1 FOOT OVER
                     THE TOP WHERE CAPACITY IS EXCEEDED. THESE SITUATIONS ARE
                     DOCUMENTED THROUGHOUT THE HEC-2 MODEL.

                  ** BEGIN APPROXIMATE FLOODPLAIN DELINEATION

                     CROSS-SECTION AT BUKEYE CANAL

                     Q = Q AT CP364       (= 1969 CFS).
                     THIS Q HAS BEEN REDUCED TO THE CAPACITY OF THE CHANNEL PLUS A
                     MAXIMUM OF 1 FOOT OVER THE LIMITING ELEVATION AT THE RIGHT
                     OVERBANK.
                     EXCEEDED FLOW WILL CONTINUE AS SHEET FLOW TO THE WEST.

 X1     0.000        12      9980     10120         0         0         0
 GR       914      8620       912      9460     910.5      9950       912      9980     910.5     10000
 GR       912     10030     912.3     10050       912     10080     910.5     10100       912     10120
 GR       912     10510       914     10900
1
    29OCT94      10:57:59                                                                          PAGE    3


                     ANY WSEL EXTENSION AT X1= 0.047 TO X1= 0.616 IS DUE TO THE
                     LIMITING ELEVATION AT THE RIGHT OVERBANK.

 X1     0.047        14      9960     10100       265       240       250
 GR       914      8440     913.8      8900       912      9235     911.8      9550     910.6      9875
 GR       912      9950     912.3      9960       912      9975       910     10000     911.3     10035
 GR       910     10070     910.3     10100       912     10370     912.5     10820

 X1     0.121        14      9980     10100       390       390       390
 GR       914      8845       912      9800     911.6      9920       912      9970     912.7      9980
 GR       912      9985       910     10000       912     10030     912.1     10040       912     10055
 GR       910     10080     910.4     10100       912     10545     912.5     10820

 X1     0.201        12      9970     10100       420       420       420
 GR       914      9245     912.6      9935       913      9970       912      9985       910     10000
 GR       912     10025     912.1     10040       912     10055       910     10075     910.5     10100
 GR       912     10240     912.5     10820

 X1     0.292        12      9960     10070       480       480       480
 GR       914      9525     913.5      9850     912.8      9915     913.3      9960       912      9980
 GR     910.5     10000     911.9     10025     910.5     10050     912.1     10070     911.8     10150
 GR       912     10220     912.5     10800

                     DIVIDED FLOW OCCURS FOR THE NEXT FOUR UPSTREAM CROSS-SECTIONS,
                     HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                     X1= 0.668
 X1     0.384        17      9970     10095       490       490       490
 GR       916      9060       914      9620     913.2      9795       914      9965     914.3      9970
 GR       914      9975       912      9985       911     10000       912     10015     912.4     10025
 GR       912     10040     911.5     10050       912     10065     912.7     10095     912.3     10210
 GR     912.7     10700     913.2     11370

 X1     0.488        13      9970     10090       545       545       545
 GR       916      9235     914.8      9580       914      9880     913.8      9925       914      9960
 GR     915.2      9970       914      9980       912     10000     913.3     10035     912.3     10070
 GR     913.5     10090     912.7     10500     913.2     11365

 X1     0.531        12      9965     10090       230       230       230
 GR       916      9360     914.1      9920     915.4      9965       914      9990     913.5     10000
 GR       914     10015     914.1     10030     912.8     10065     914.2     10090       914     10105
 GR     912.8     10470     913.2     11350

 QT         3      3200      3200      3200

                     Q = Q AT CP364A      (= 3081 CFS).

 X1     0.616        13      9960     10090       405       480       450
 GR     917.3      9665    916.04      9670     917.1      9830     916.5      9960       916      9990
 GR       915     10000     915.4     10030     913.8     10070     915.2     10090       914     10100
 GR     913.8     10350       914     10790       916     10830
1
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 NC      .045      .045       .03        .1        .3

                     ANY WSEL EXTENSION AT X1= 0.668 TO X1= 1.378 IS DUE TO THE
                     LIMITING ELEVATION AT THE LEFT BANK.

 X1     0.668        10      9950     10035       200       290       270
 GR     917.3      9620     916.8      9750     917.3      9950     916.4     10000     916.8     10035
 GR       916     10080     915.5     10115       916     10160       918     10250     918.3     10290

 X1     0.776        13      9975     10025       535       570       570
 GR     920.6      9975       920      9985       918      9990     917.3     10000     917.9     10025
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GR     916.4      10185       918      10315       920      10325     920.8      10350     919.3      10400
GR       920      10435     919.8      10470       924      10525

X1     0.868         11      9970      10020       495        485       490
GR     921.7       9970       920       9980     918.3      10000     919.8      10020       918      10220
GR       920      10295       922      10315     922.1      10335     919.9      10380       922      10485
GR     924.5      10495

X1     0.964         15      9970      10045       505        505       505
GR     923.2       9970       922       9980       920       9985     919.2      10000       920      10015
GR       922      10020     922.5      10045       922      10060     921.5      10140       922      10235
GR     922.8      10265       922      10320     921.7      10345       922      10390       925      10420

QT         3       2596      2596       3200
                 Q = Q AT CP364A       (= 3081 CFS).
                 THIS Q  HAS BEEN REDUCED BY THE SAME AMOUNT THAT EXCEEDED THE
                 CAPACITY OF THE CHANNEL AT THE UPSTREAM REACH  X1= 1.474 TO
                 X1= 1.823,    THAT EXCEEDED FLOW WILL RETURN AT X1= 0.964

X1     1.081         13      9955      10090       595        610       620
GR     925.7       9955       924       9965       924      10000       924      10055       925      10090
GR       923      10140       923      10250       924      10260       926      10270       924      10295
GR     923.4      10355       924      10395       930      10425


                 DIVIDED FLOW OCCURS FOR THE NEXT FOUR UPSTREAM CROSS-SECTIONS,
                 HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                 X1= 1.435

X1     1.153         16      9945      10060       410        355       380
GR     928.4       9945       928       9955       924       9970       924      10000       924      10025
GR     925.8      10060       924      10100       923      10140       923      10240       924      10265
GR       926      10285       927      10300       924      10340     923.7      10380       924      10410
GR     930.5      10440

X1     1.236         15      9960      10060       435        435       435
GR     930.2       9960       930       9970       924       9980       924      10000       924      10025
GR       926      10040       928      10050     928.3      10060       928      10070     924.5      10130
GR       926      10160       928      10210     928.4      10250     925.9      10310     932.3      10375
1
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X1     1.317         15      9960      10050       430        430       430
GR     930.4       9960       930       9970       924       9985       924      10000       924      10010
GR       928      10035     928.5      10050       928      10060       927      10140       928      10210
GR       930      10240     930.4      10260     928.9      10300       930      10320       933      10365

X1     1.378         15      9960      10035       345        295       320
GR     930.8       9960       930       9970       924       9985       924      10000       924      10010
GR       928      10020     928.8      10035       928      10050     927.5      10120       928      10180
GR       930      10250     930.9      10280     929.4      10320       930      10365     934.1      10385


                 CROSS-SECTION AT STATE ROUTE 85

X1     1.435         12      9965      10070       330        180       300
GR       934       9300       932       9780     931.4       9965     926.3       9995     926.3      10000
GR     926.3      10005       928      10030       931      10070     930.5      10120       932      10140
GR       934      10175     934.5      10185

QT         3       2600      2600       3200

                 Q = Q AT CP336       (= 3082 CFS).
                 THIS Q HAS BEEN REDUCED TO THE CAPACITY OF THE CHANNEL PLUS A
                 MAXIMUM OF 1 FOOT OVER THE LIMITING ELEVATION AT THE RIGHT
                 OVERBANK.      EXCEEDED FLOW WILL RETURN AT X1= 0.964

                 ANY WSEL EXTENSION AT X1= 1.474 TO X1= 1.823 IS DUE TO THE
                 LIMITING ELEVATION AT THE RIGHT OVERBANK.

X1     1.474          7      9985      10015       210        210       210
GR       934       8825       932       9985       930       9990       928      10000       930      10010
GR       932      10015       933      10080

NC      .045       .045       .03         .3        .5
X1     1.517          8      9905      10080       500        160       225
GR       936       9200       934       9320     932.7       9600     932.8       9800     933.2       9905
GR     932.2      10000       934      10055     934.7      10080

X1     1.566          7      9955      10045       320        210       260
GR       938       9870       936       9920       934       9955     932.5      10000       934      10045
GR       936      10060     936.1      10065

NC      .045       .045       .03         .1        .3
X1     1.634          8      9970      10025       360        360       360
GR       940       9690       938       9855       936       9910       934       9970       933      10000
GR       934      10025       936      10050     937.3      10065

X1     1.680          9      9970      10025       200        285       240
GR       940       9700       938       9800       936       9930       934       9970     933.4      10000
GR       934      10025       936      10055       938      10080     938.2      10100
1
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X1     1.745         12      9960      10040       280        400       345
GR     940.3       9660       940       9760       938       9825       936       9900     934.5       9960
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GR      934      9975     933.8    10000      934    10025    934.5    10040      936    10090
GR      938     10195     938.2    10210

X1    1.823        12      9970    10050      370      425      410
GR    940.3      9385       940     9425      938     9450    937.5     9500      938     9600
GR    938.2      9740       938     9785      936     9970    934.9    10000      936    10050
GR      938     10230     938.6    10255

QT        3      3200      3200     3200

                Q = Q AT CP336       (=3082 CFS).

                DIVIDED FLOW OCCURS FOR THE NEXT FIVE UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 2.371

X1    1.893        17      9960    10040      280      370      370
GR    940.3      9055       940     9090      938     9115    937.5     9170      938     9235
GR    938.3      9390       938     9545    936.3     9650      938     9715      940     9770
GR      938      9895       937     9960    936.1    10000      937    10040      938    10110
GR      940     10215       941    10370

X1    1.941        20      9975    10025       40      290      255
GR    940.3      8925       940     8960      938     8985    937.5     9040      938     9100
GR    938.4      9255       938     9430    936.3     9510      938     9580      944     9685
GR    944.6      9820       944     9890      942     9960      940     9975      938     9990
GR    937.9     10000       938    10010      940    10025      942    10040      943    10055

NC     .045       .07       .03       .1       .3
X1    1.988        20      9950    10030       35      280      245
GR    940.3      8890       940     8930      938     8955    937.5     9000      938     9065
GR    938.4      9220       938     9420    936.3     9485      938     9540      940     9575
GR      942      9595       944     9630    944.8     9750    944.7     9810      944     9950
GR      940      9980     938.2    10000      940    10015      944    10030    944.9    10125

                ANY WSEL EXTENSION AT X1= 2.058 TO X1= 2.185 IS DUE TO THE
                LIMITING ELEVATIONS AT THE LEFT OVERBANK.

X1    2.058        18      9970    10035      350      370      370
GR      941      8850       940     8950      939     9020    939.5     9190      938     9500
GR    936.6      9520       938     9540      940     9565      942     9585      944     9650
GR      944      9755     945.6     9835      944     9970      940     9985    938.4    10000
GR      940     10020       944    10035      946    10085

X1    2.185        21      9965    10045      430      670      670
GR    942.5      9310       942     9360      940     9445      938     9545    937.2     9565
GR      938      9580       940     9595      942     9630      943     9765    944.1     9860
GR    944.5      9925       944     9965      942     9975      940     9985      939    10000
GR      940     10015       942    10030      944    10045      945    10185      946    10680
GR    946.2     10690
1
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            **  END OF APPROXIMATE FLOODPLAIN DELINEATION .

X1    2.297        22      9975    10040      610      450      595
GR    946.3      9310       946     9335      944     9425      942     9480      940     9530
GR    937.9      9570     938.3     9605    937.8     9655    938.1     9700    937.9     9775
GR      938      9840       940     9930    941.3     9975      940     9990    939.4    10000
GR      940     10015     940.2    10040    940.8    10040      942    10480      944    10700
GR      946     11415       947    11430

            **  BEGIN DETAILED FLOODPLAIN\FLOODWAY ANALYSIS.

X1    2.371        25      9975    10030      400      500      390
GR    949.7      8815       948     8940      946     9060      944     9145    944.5     9185
GR      944      9270       942     9315      940     9435    939.8     9520      940     9585
GR    940.6      9655       940     9710    939.4     9775      940     9815      942     9890
GR    942.3      9930       942     9975      940     9995    939.7    10000      940    10005
GR    940.7     10030       942    10385      944    10860      946    11400    949.7    11450

X1    2.435        20      9985    10085      335      335      335
GR      950      8650       948     8790      946     8890    945.2     9000      946     9090
GR      944      9250       942     9485    941.1     9720      942     9835    942.4     9950
GR      942      9985       940     9995    939.9    10000      940    10005    941.7    10085
GR      942     10360       944    10760      946    11320      948    11395    949.8    11420

QT        3      3200      3200     3200

                CROSS-SECTION 30 FEET SOUTH OF LOWER BUKEYE RD. "EXTENDED"

                Q = Q AT CP335       (= 3066 CFS).

X1    2.536        15      9965    10060      535      535      535
GR      951      9185       950     9300      948     9555      946     9710    945.5     9865
GR      944      9920     943.5     9935    943.8     9965    943.5    10000    943.7    10060
GR      944     10155     944.8    10500      946    10800      948    11280    950.2    11340

                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 2.883

X1    2.680        17      9925    10050      735      725      760
GR      954      9265       952     9400      950     9505      948     9645    947.2     9735
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GR      948      9790     949.9     9805     948.8     9900      948     9905     947.3     9925
GR      946      9940     945.2    10000     945.6    10050      946    10165       948    10565
GR      950     10935       952    11160
1
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X1    2.771        16      9985    10020       480      480      480
GR      954      9440       952     9545       950     9660    948.1     9810       950     9880
GR    951.4      9890       950     9900     949.4     9985    947.4    10000     948.2    10020
GR    947.3     10075       948    10210       950    10505    950.9    10795       952    11105
GR    953.5     11255

X1    2.883        15      9985    10015       580      580      590
GR      958      9190       956     9360       954     9535      952     9640       950     9840
GR    949.6      9920     950.2     9985     948.5    10000    950.1    10015     949.2    10035
GR      950     10165       952    10385       954    10600      956    11230     956.5    11270

QT        3      3200      3200     3200

                Q = Q AT CP334       (= 3070 CFS).

X1    2.977        15      9980    10050       500      500      500
GR      960      9170       958     9345       956     9530      954     9660       952     9830
GR      951      9960     951.5     9980       950     9990    949.9    10000       950    10010
GR    952.1     10050       954    10480       956    10740      958    11200     958.5    11305

X1    3.070        13      9945    10025       485      495      490
GR    958.5      9510     953.8     9545     954.5     9600    954.5     9945       954     9960
GR    952.5      9975     954.2     9985     952.3    10000    953.2    10025     952.7    10060
GR      954     10290       956    10635       958    10875

QT        3      2800      2800     2800

                Q = Q AT 1I334       (= 2701 CFS).

X1    3.167        18      9970    10020       475      515      510
GR    960.7      9530       956     9585       955     9625    955.4     9730     954.9     9865
GR    955.8      9935     955.1     9970       954     9990    953.9    10000       954    10005
GR    954.9     10020     954.5    10080     955.1    10120    954.8    10220       956    10425
GR      958     10770       960    10990       962    11230


                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 3.602

X1    3.291        23      9970    10020       660      650      655
GR      964      9530       962     9670     961.3     9690    961.8     9725     960.4     9770
GR    961.8      9785     960.1     9940     960.5     9970      960     9985       958     9995
GR    957.2     10000       958    10005       960    10015    960.1    10020       960    10025
GR      958     10040     957.2    10110     957.8    10360    957.6    10460       958    10700
GR      960     10910       962    10970       964    11600

X1    3.376        17      9985    10015       460      440      450
GR    967.9      9300       966     9370       964     9520      962     9630     960.5     9900
GR    961.9      9985       960     9995     958.3    10000      960    10005       961    10015
GR      960     10030     958.4    10055     958.6    10170    958.8    10365       960    10590
GR      962     10930       964    11490
1
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X1    3.491        17      9980    10020       605      605      605
GR      968      9255       966     9435       964     9555      962     9660     960.5     9930
GR    961.9      9980       960     9995     959.5    10000      960    10005     961.9    10020
GR      960     10040     959.6    10130       960    10240      962    10540       964    10735
GR      966     11000       968    11780

QT        3      2800      2800     2800
NC      .07       .07       .04       .1        .3

                CROSS-SECTION AT YUMA RD.

                Q = Q AT CP316       (= 2704 CFS).

X1    3.602        13      9880    10100       590      590      590
GR      970      9225       968     9450       966     9600      964     9750       962     9880
GR    961.9     10000       962    10100     963.2    10330      964    10445       966    10625
GR      968     10770     968.9    10945       970    11005
1
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


*PROF 1

CCHV=     .100 CEHV=     .300
*SECNO  .000
          ***  DUE TO THE COMPLEXITY OF THE DOWNSTREAM REACH (CROSS-SECTIONS
               0.000 TO 2.297),AN APPROXIMATE FLOODPLAIN DELINEATION HAS BEEN
               SHOWN IN THIS REACH.HOWEVER,A HEC-2 MODEL WAS SET UP INCLUDING
               THESE X-SECTIONS TO AID IN PRODUCING A REASONABLE APPROXIMATE
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DELINEATION.THIS APPROXIMATE DELINEATION IS AS SHOWN ON THE MAPS AND IS BASED ON ENGINEERING JUDGEMENT REFLCTING THE EXISTING TOPOGRAPHY,AND USING INFORMATION FROM THE HEC-2 MODEL TO ESTIMATE WHERE BREAKOUT FLOWS WILL OCCUR.
ALSO, AN APPROXIMATE FLOODPLAIN DELINEATION HAS BEEN SHOWN FOR THE UPPERMOST REACH OF BULLARD WASH (CROSS-SECTIONS 10.269 TO 14.023). THE HEC-2 MODEL WAS ALSO UTILIZED TO ESTIMATE THE APPROXIMATE DELINEATION IN THIS REACH.
A DETAILED ANALYSIS WAS PERFORMED ON BULLARD WASH FROM CROSS-SECTION 2.371 TO 6.320 AND FROM 9.189 TO 10.197.

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THE AREA BETWEEN X-SECTION 6.320 AND X-SECTION 9.189 IS CURRENTLY UNDER CONSTRUCTION. NO FLOODPLAIN HAS BEEN PREPARED FOR THIS AREA OF BULLARD WASH, HOWEVER, THE HEC-2 ANALYSIS WAS CONTINUED BASED ON EXISTING CONDITIONS AT THE TIME OF THE AERIAL MAPPING TO COMPUTE WATER SURFACE ELEVATIONS UPSTREAM AND DOWNSTREAM OF THIS REACH.

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*** THE DISCHARGE IN FIELD 4 OF THE QT CARDS IS THE ACTUAL DISCHRAGE DERIVED FROM THE 100-YEAR 24-HOUR HEC1 MODEL. THIS DISCHRGE IS FOR COMPARISON PURPOSES ONLY AND NO PROFILE IS BEING COMPUTED FOR IT. DISCHARGES FOR PROFILES 1 & 2 ARE USED TO DELINEATE THE FLOODPLAIN AND FLOODWAY RESPECTIVELY. THESE DISCHARGES ARE BASED UPON THE CAPACITY OF THE CHANNEL PLUS A MAXIMUM OF 1 FOOT OVER THE TOP WHERE CAPACITY IS EXCEEDED. THESE SITUATIONS ARE DOCUMENTED THROUGHOUT THE HEC-2 MODEL.

** BEGIN APPROXIMATE FLOODPLAIN DELINEATION

CROSS-SECTION AT BUKEYE CANAL

Q = Q AT CP364 (= 1969 CFS).
THIS Q HAS BEEN REDUCED TO THE CAPACITY OF THE CHANNEL PLUS A MAXIMUM OF 1 FOOT OVER THE LIMITING ELEVATION AT THE RIGHT OVERBANK.
EXCEEDED FLOW WILL CONTINUE AS SHEET FLOW TO THE WEST.

.000	1.82	912.32	.00	912.00	912.34	.02	.00	.00	912.00
850.0	625.2	160.3	64.6	576.3	104.5	133.7	.0	.0	912.00
.00	1.08	1.53	.48	.070	.040	.070	.000	910.50	9326.62
.002525	0.	0.	0.	0	0	6	.00	1245.30	10571.93

*SECNO .047
3280 CROSS SECTION .05 EXTENDED .05 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.48

ANY WSEL EXTENSION AT X1= 0.047 TO X1= 0.616 IS DUE TO THE LIMITING ELEVATION AT THE RIGHT OVERBANK.

.047	2.55	912.55	.00	.00	912.55	.01	.21	.00	912.30
850.0	347.1	275.1	227.8	766.2	249.2	510.2	6.9	8.5	910.30
.11	.45	1.10	.45	.070	.040	.070	.000	910.00	9133.37
.000410	265.	250.	240.	3	0	0	.00	1686.63	10820.00

*SECNO .121
3280 CROSS SECTION .12 EXTENDED .23 FEET

.121	2.73	912.73	.00	.00	912.74	.01	.19	.00	912.70
850.0	111.4	232.9	505.7	287.5	190.2	810.6	19.5	22.2	910.40
.25	.39	1.22	.62	.070	.040	.070	.000	910.00	9452.89
.000590	390.	390.	390.	2	0	0	.00	1367.11	10820.00

*SECNO .201
3280 CROSS SECTION .20 EXTENDED .53 FEET

.201	3.03	913.03	.00	.00	913.05	.02	.30	.00	913.00
850.0	12.0	366.8	471.2	52.8	228.2	699.3	30.4	34.1	910.50
.36	.23	1.61	.67	.070	.040	.070	.000	910.00	9724.61
.000887	420.	420.	420.	2	0	0	.00	1095.39	10820.00

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

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*SECNO  .292
3280 CROSS SECTION        .29 EXTENDED        .89 FEET

      .292      2.89    913.39       .00       .00    913.41       .02       .36       .00    913.30
     850.0       7.9     301.6     540.6      31.4     208.8     880.3      42.0      45.3    912.10
       .51       .25      1.44       .61      .070      .040      .070      .000    910.50   9860.27
   .000645      480.      480.      480.         1         0         0       .00    939.73  10800.00

*SECNO  .384

3265 DIVIDED FLOW

3280 CROSS SECTION        .38 EXTENDED        .49 FEET

                 DIVIDED FLOW OCCURS FOR THE NEXT FOUR UPSTREAM CROSS-SECTIONS,
                 HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                 X1= 0.668
      .384      2.69    913.69       .00       .00    913.70       .01       .29       .00    914.30
     850.0       9.9     241.9     598.1      51.5     198.6    1214.2      56.5      59.6    912.70
       .70       .19      1.22       .49      .070      .040      .070      .000    911.00   9688.08
   .000541      490.      490.      490.         2         0         0       .00   1604.23  11370.00

*SECNO  .488

3265 DIVIDED FLOW

3280 CROSS SECTION        .49 EXTENDED        .81 FEET

      .488      2.01    914.01       .00       .00    914.02       .01       .32       .00    915.20
     850.0       1.1     141.8     707.0       9.0     132.6    1293.2      74.7      78.8    913.50
       .94       .13      1.07       .55      .070      .040      .070      .000    912.00   9875.31
   .000648      545.      545.      545.         0         0         0       .00   1469.90  11365.00

*SECNO  .531

3265 DIVIDED FLOW

3280 CROSS SECTION        .53 EXTENDED        .98 FEET
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   SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
   Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
   TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
   SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

      .531      1.38    914.18       .00       .00    914.18       .01       .16       .00    915.40
     850.0        .1      37.2     812.8        .9      55.1    1319.2      82.1      86.4    914.20
      1.05       .06       .67       .62      .070      .040      .070      .000    912.80   9897.62
   .000757      230.      230.      230.         2         0         0       .00   1385.91  11350.00

*SECNO  .616

                 Q = Q AT CP364A      (= 3081 CFS).

      .616      1.85    915.65       .00       .00    915.74       .09      1.53       .03    916.50
    3200.0        .0     209.1    2990.9        .0      80.6    1245.3      96.9      98.5    915.20
      1.10       .00      2.59      2.40      .000      .040      .070      .000    913.80   9993.50
   .006205      405.      450.      480.         5         0         0       .00    829.50  10823.00

CCHV=     .100 CEHV=     .300
*SECNO  .668
3280 CROSS SECTION        .67 EXTENDED        .57 FEET

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .67

                 ANY WSEL EXTENSION AT X1= 0.668 TO X1= 1.378 IS DUE TO THE
                 LIMITING ELEVATION AT THE LEFT BANK.

      .668      2.36    917.86    917.77       .00    918.27       .40      2.43       .09    917.30
    3200.0     909.4     594.7    1696.0     269.9      95.3     314.0     103.3     102.9    916.80
      1.12      3.37      6.24      5.40      .045      .030      .045      .000    915.50   9620.00
   .013643      200.      270.      290.        12        11         0       .00    624.05  10244.05

*SECNO  .776

3265 DIVIDED FLOW

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.76

      .776      3.93    920.33       .00       .00    920.47       .14      2.18       .03    920.60
    3200.0        .0     367.6    2832.4        .0     102.8     990.5     114.8     109.9    917.90
      1.17       .00      3.58      2.86      .000      .030      .045      .000    916.40   9979.44
   .001785      535.      570.      570.         5         0         0       .00    467.41  10476.99
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 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO  .868

3265 DIVIDED FLOW

   .868      3.47    921.47       .00       .00    921.68       .21      1.18       .02    921.70
 3200.0        .0     483.1    2716.9        .0     101.1     796.3     125.8     115.1    919.80
   1.21       .00      4.78      3.41      .000      .030      .045      .000    918.00   9971.36
 .003534     495.      490.      485.         4         0         0       .00    448.84  10458.43

*SECNO  .964
3280 CROSS SECTION       .96 EXTENDED       .36 FEET

   .964      4.36    923.56       .00       .00    923.95       .39      2.22       .05    923.20
 3200.0        .0    1260.0    1940.0        .0     186.6     566.1     135.4     120.2    922.50
   1.24       .00      6.75      3.43      .000      .030      .045      .000    919.20   9970.00
 .005635     505.      505.      505.         2         0         0       .00    435.58  10405.58

*SECNO 1.081

3265 DIVIDED FLOW

3280 CROSS SECTION      1.08 EXTENDED       .20 FEET

                Q = Q AT CP364A      (= 3081 CFS).
                THIS Q  HAS BEEN REDUCED BY THE SAME AMOUNT THAT EXCEEDED THE
                CAPACITY OF THE CHANNEL AT THE UPSTREAM REACH  X1= 1.474 TO
                X1= 1.823,    THAT EXCEEDED FLOW WILL RETURN AT X1= 0.964

  1.081      2.90    925.90       .00       .00    926.03       .12      2.05       .03    925.70
 2596.0        .0     735.7    1860.3        .0     231.1     700.0     147.3     126.4    925.00
   1.30       .00      3.18      2.66      .000      .030      .045      .000    923.00   9955.00
 .002024     595.      620.      610.         3         0         0       .00    447.85  10404.52

*SECNO 1.153

3265 DIVIDED FLOW

                DIVIDED FLOW OCCURS FOR THE NEXT FOUR UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
1
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                X1= 1.435

  1.153      3.50    926.50       .00       .00    926.59       .09       .56       .00    928.40
 2596.0        .0     572.4    2023.6        .0     205.0     881.8     155.6     130.1    925.80
   1.34       .00      2.79      2.29      .000      .030      .045      .000    923.00   9960.63
 .001216     410.      380.      355.         3         0         0       .00    446.67  10421.53

*SECNO 1.236

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  1.236      3.42    927.42    927.42       .00    928.35       .93      1.11       .25    930.20
 2596.0        .0    1825.0     771.0        .0     205.2     203.3     163.1     133.5    928.30
   1.35       .00      8.89      3.79      .000      .030      .045      .000    924.00   9974.30
 .008284     435.      435.      435.        20         5         0       .00    240.49  10325.46

*SECNO 1.317

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.95

  1.317      5.71    929.71       .00       .00    930.05       .34      1.64       .06    930.40
 2596.0        .0    1652.1    943.9        .0     298.7     384.3     168.5     136.2    928.50
   1.38       .00      5.53      2.46      .000      .030      .045      .000    924.00   9970.71
 .002178     430.      430.      430.         3         0         0       .00    301.69  10314.86

*SECNO 1.378

3265 DIVIDED FLOW
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1.378	6.39	930.39	.00	.00	930.64	.26	.59	.01	930.80
2596.0	.0	1443.6	1152.4	.0	285.2	517.0	173.6	138.5	928.80
1.40	.00	5.06	2.23	.000	.030	.045	.000	924.00	9965.14
.001660	345.	320.	295.	3	0	0	.00	371.09	10366.90

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 1.435

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

CROSS-SECTION AT STATE ROUTE 85

1.435	4.87	931.17	931.17	.00	932.39	1.22	.87	.29	931.40
2596.0	.0	2555.9	40.1	.0	285.7	23.9	176.7	139.9	931.00
1.41	.00	8.95	1.68	.000	.030	.045	.000	926.30	9966.36
.008504	330.	300.	180.	20	15	0	.00	162.57	10128.92

*SECNO 1.474
3280 CROSS SECTION 1.47 EXTENDED .62 FEET

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

Q = Q AT CP336 (= 3082 CFS).
THIS Q HAS BEEN REDUCED TO THE CAPACITY OF THE CHANNEL PLUS A
MAXIMUM OF 1 FOOT OVER THE LIMITING ELEVATION AT THE RIGHT
OVERBANK. EXCEEDED FLOW WILL RETURN AT X1= 0.964

ANY WSEL EXTENSION AT X1= 1.474 TO X1= 1.823 IS DUE TO THE
LIMITING ELEVATION AT THE RIGHT OVERBANK.

1.474	5.62	933.62	933.62	.00	934.04	.42	1.27	.08	932.00
2600.0	1465.5	961.6	172.9	760.6	118.6	72.8	179.8	142.8	932.00
1.43	1.93	8.11	2.38	.045	.030	.045	.000	928.00	9045.72
.004512	210.	210.	210.	3	12	0	.00	1034.28	10080.00

CCHV= .300 CEHV= .500
*SECNO 1.517
3280 CROSS SECTION 1.52 EXTENDED .19 FEET

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.98

1.517	2.68	934.88	.00	.00	934.94	.06	.80	.11	933.20
2600.0	1796.4	803.6	.0	1083.0	320.4	.0	191.6	152.5	934.70
1.48	1.66	2.51	.00	.045	.030	.000	.000	932.20	9266.45
.001146	500.	225.	160.	1	0	0	.00	813.55	10080.00

*SECNO 1.566
3280 CROSS SECTION 1.57 EXTENDED .11 FEET

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1.566	3.71	936.21	936.21	.00	937.38	1.17	.67	.56	934.00
2600.0	140.4	2399.1	60.4	42.9	266.5	19.0	197.6	155.8	934.00
1.49	3.27	9.00	3.19	.045	.030	.045	.000	932.50	9914.72
.007773	320.	260.	210.	20	11	0	.00	150.28	10065.00

CCHV= .100 CEHV= .300
*SECNO 1.634
3280 CROSS SECTION 1.63 EXTENDED .97 FEET

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.06

1.634	5.27	938.27	.00	.00	938.66	.38	1.19	.08	934.00
2600.0	727.3	1573.5	299.2	269.4	262.5	106.2	201.5	157.4	934.00
1.51	2.70	5.99	2.82	.045	.030	.045	.000	933.00	9832.50
.001824	360.	360.	360.	3	0	0	.00	232.50	10065.00

*SECNO 1.680
3280 CROSS SECTION 1.68 EXTENDED .57 FEET

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
1.680	5.37	938.77	.00	.00	939.01	.24	.34	.01	934.00
2600.0	805.5	1399.3	395.2	396.5	279.1	171.0	205.5	158.8	934.00
1.53	2.03	5.01	2.31	.045	.030	.045	.000	933.40	9761.32
.001176	200.	240.	285.	2	0	0	.00	338.68	10100.00

*SECNO 1.745
3280 CROSS SECTION 1.75 EXTENDED .97 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.56

1.745	5.37	939.17	.00	.00	939.27	.10	.24	.01	934.50
2600.0	631.1	1329.0	639.9	419.4	410.7	439.1	213.6	161.7	934.50
1.57	1.50	3.24	1.46	.045	.030	.045	.000	933.80	9787.12
.000482	280.	345.	400.	2	0	0	.00	422.88	10210.00

*SECNO 1.823
3280 CROSS SECTION 1.82 EXTENDED .81 FEET

1.823	4.51	939.41	.00	.00	939.47	.06	.20	.00	936.00
2600.0	1094.0	896.1	609.9	950.7	317.0	461.9	227.3	167.3	936.00
1.63	1.15	2.83	1.32	.045	.030	.045	.000	934.90	9432.35
.000520	370.	410.	425.	2	0	0	.00	822.65	10255.00

*SECNO 1.893

3265 DIVIDED FLOW

Q = Q AT CP336 (=3082 CFS).

DIVIDED FLOW OCCURS FOR THE NEXT FIVE UPSTREAM CROSS-SECTIONS,
HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
X1= 2.371

1.893	3.53	939.63	.00	.00	939.70	.07	.23	.00	937.00
3200.0	2093.2	794.1	312.7	1383.1	246.6	219.3	240.1	174.0	937.00
1.68	1.51	3.22	1.43	.045	.030	.045	.000	936.10	9094.59
.000942	280.	370.	370.	2	0	0	.00	1068.11	10195.73

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 1.941

3265 DIVIDED FLOW

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .60

1.941	3.43	939.73	.00	.00	939.84	.11	.12	.01	940.00
3200.0	3029.2	170.8	.0	1163.9	58.0	.0	242.8	175.5	940.00
1.69	2.60	2.94	.00	.045	.030	.000	.000	936.30	8963.39
.002607	40.	255.	290.	2	0	0	.00	692.81	10022.97

CCHV= .100 CEHV= .300
*SECNO 1.988

3265 DIVIDED FLOW

1.988	3.54	939.84	.00	.00	939.95	.11	.11	.00	944.00
3200.0	3142.1	57.9	.0	1185.5	26.1	.0	244.0	176.3	944.00
1.69	2.65	2.22	.00	.045	.030	.000	.000	936.30	8932.00
.002625	35.	245.	280.	2	0	0	.00	672.07	10013.66

*SECNO 2.058

3265 DIVIDED FLOW

ANY WSEL EXTENSION AT X1= 2.058 TO X1= 2.185 IS DUE TO THE
LIMITING ELEVATIONS AT THE LEFT OVERBANK.

2.058	4.15	940.75	.00	.00	940.86	.11	.91	.00	944.00
3200.0	3025.6	174.4	.0	1175.1	56.4	.0	253.9	181.9	944.00
1.73	2.57	3.09	.00	.045	.030	.000	.000	936.60	8875.01
.002552	350.	370.	370.	2	0	0	.00	738.12	10022.81

*SECNO 2.185

3265 DIVIDED FLOW

2.185	4.86	942.06	.00	.00	942.35	.29	1.44	.06	944.00
3200.0	2713.0	487.0	.0	634.9	103.2	.0	264.0	187.5	944.00
1.76	4.27	4.72	.00	.045	.030	.000	.000	937.20	9354.24
.004031	430.	670.	670.	2	0	0	.00	339.25	10030.43

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 2.297

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 3.97

** END OF APPROXIMATE FLOODPLAIN DELINEATION .

2.297	4.94	942.74	.00	.00	942.77	.03	.39	.03	941.30
3200.0	2686.1	263.3	250.5	1959.0	173.7	622.7	287.3	196.6	940.80
1.89	1.37	1.52	.40	.045	.030	.070	.000	937.80	9459.49
.000256	610.	595.	450.	3	0	0	.00	1102.53	10562.02

*SECNO 2.371

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .62

** BEGIN DETAILED FLOODPLAIN\FLOODWAY ANALYSIS.

2.371	3.50	942.90	.00	.00	942.93	.04	.16	.00	942.00
3200.0	2467.4	301.7	430.9	1548.2	131.8	641.3	312.0	208.9	940.70
1.96	1.59	2.29	.67	.045	.030	.070	.000	939.40	9294.95
.000669	400.	390.	500.	2	0	0	.00	1301.66	10596.61

*SECNO 2.435

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .55

2.435	3.31	943.21	.00	.00	943.33	.12	.37	.02	942.00
3200.0	1605.2	1028.7	566.1	820.5	243.8	522.0	327.0	218.8	941.70
2.00	1.96	4.22	1.08	.045	.030	.070	.000	939.90	9342.47
.002218	335.	335.	335.	2	0	0	.00	1260.13	10602.60

*SECNO 2.536
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

CROSS-SECTION 30 FEET SOUTH OF LOWER BUKEYE RD. "EXTENDED"

Q = Q AT CP335 (= 3066 CFS).

2.536	1.90	945.40	945.40	.00	945.92	.52	2.33	.12	943.80
3200.0	509.4	1365.3	1325.3	113.5	169.5	538.9	341.8	231.3	943.70
2.03	4.49	8.05	2.46	.045	.030	.070	.000	943.50	9868.57
.012217	535.	535.	535.	13	11	0	.00	782.13	10650.69

*SECNO 2.680

3265 DIVIDED FLOW

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.61

DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
X1= 2.883

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    2.680      3.39    948.59       .00       .00    948.75       .16      2.79       .04    947.30
   3200.0     236.1    1592.3    1371.6     178.0     368.6     992.0     361.7     246.0    945.60
     2.10      1.33      4.32      1.38      .045      .030      .070      .000    945.20   9603.37
  .001800      735.      760.      725.         6         0         0       .00    965.08  10675.04

*SECNO 2.771

3265 DIVIDED FLOW

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .51

    2.771      2.78    950.08       .00       .00    950.27       .19      1.51       .01    949.40
   3200.0     688.6     466.6    2044.8     261.6      71.1     779.8     376.3     256.0    948.20
     2.14      2.63      6.56      2.62      .045      .030      .070      .000    947.30   9654.95
  .006869      480.      480.      480.         3         0         0       .00    859.60  10533.30

*SECNO 2.883

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.71

    2.883      3.83    952.33       .00       .00    952.45       .12      2.17       .01    950.20
   3200.0    1570.1     447.7    1182.1     628.9      90.1     706.6     393.2     267.1    950.10
     2.21      2.50      4.97      1.67      .045      .030      .070      .000    948.50   9622.72
  .002339      580.      590.      580.         3         0         0       .00    797.68  10420.39
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO 2.977

                Q = Q AT CP334       (= 3070 CFS).

    2.977      3.79    953.69       .00       .00    954.07       .38      1.54       .08    951.50
   3200.0    1455.7    1405.9     338.4     453.9     209.6     284.9     406.9     275.8    952.10
     2.24      3.21      6.71      1.19      .045      .030      .070      .000    949.90   9686.64
  .004265      500.      500.      500.         3         0         0       .00    722.43  10409.07

*SECNO 3.070
    3.070      3.33    955.63       .00       .00    955.75       .12      1.65       .03    954.50
   3200.0     926.8     847.3    1425.9     481.5     186.5     844.4     420.7     285.7    953.20
     2.29      1.92      4.54      1.69      .045      .030      .070      .000    952.30   9531.41
  .002739      485.      490.      495.         3         0         0       .00   1038.83  10570.24

*SECNO 3.167

                Q = Q AT 1I334       (= 2701 CFS).

    3.167      2.95    956.85       .00       .00    956.94       .09      1.19       .00    955.10
   2800.0    1257.9     522.1    1020.1     616.2     125.7     762.3     438.0     297.4    954.90
     2.35      2.04      4.15      1.34      .045      .030      .070      .000    953.90   9575.02
  .002062      475.      510.      515.         3         0         0       .00    997.16  10572.18

*SECNO 3.291

3265 DIVIDED FLOW

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .51

                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 3.602

    3.291      2.00    959.20       .00       .00    959.30       .10      2.35       .00    960.50
   2800.0        .0     104.3    2695.7        .0      23.2    1103.4     457.7     310.9    960.10
     2.43       .00      4.50      2.44      .000      .030      .070      .000    957.20   9989.00
  .007862      660.      655.      650.         3         0         0       .00    816.91  10825.92
```



```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO 3.376

3265 DIVIDED FLOW

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.65
```

3.376	2.92	961.22	.00	.00	961.28	.06	1.98	.00	961.90
2800.0	57.0	94.8	2648.2	63.2	31.9	1405.0	471.0	320.1	961.00
2.49	.90	2.97	1.88	.045	.030	.070	.000	958.30	9769.59
.002895	460.	450.	440.	3	0	0	.00	984.00	10798.16

*SECNO 3.491

3.491	3.13	962.63	.00	.00	962.68	.05	1.40	.00	961.90
2800.0	803.5	268.6	1727.9	455.2	79.3	1109.0	492.9	333.7	961.90
2.58	1.77	3.39	1.56	.045	.030	.070	.000	959.50	9626.83
.001897	605.	605.	605.	4	0	0	.00	974.78	10601.60

CCHV= .100 CEHV= .300
*SECNO 3.602

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .68

CROSS-SECTION AT YUMA RD.

Q = Q AT CP316 (= 2704 CFS).

3.602	2.22	964.12	.00	.00	964.30	.18	1.58	.04	962.00
2800.0	214.4	1903.0	682.7	146.9	478.7	412.1	511.0	345.1	962.00
2.64	1.46	3.98	1.66	.070	.040	.070	.000	961.90	9740.57
.004062	590.	590.	590.	1	0	0	.00	715.75	10456.32

THIS RUN EXECUTED 29OCT94 10:58:05

****
HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

BULLARD WASH REVISED

SUMMARY PRINTOUT

	SECNO	Q	CWSEL	SSTA	STCHL	STCHR	ENDST	DIFWSX	TOPWID	DEPTH	ELMIN	10*KS	VCH
	.000	850.00	912.32	9326.62	9980.00	10120.00	10571.93	.00	1245.30	1.82	910.50	25.25	1.5
*	.047	850.00	912.55	9133.37	9960.00	10100.00	10820.00	.23	1686.63	2.55	910.00	4.10	1.1
	.121	850.00	912.73	9452.89	9980.00	10100.00	10820.00	.19	1367.11	2.73	910.00	5.90	1.2
	.201	850.00	913.03	9724.61	9970.00	10100.00	10820.00	.29	1095.39	3.03	910.00	8.87	1.6
	.292	850.00	913.39	9860.27	9960.00	10070.00	10800.00	.37	939.73	2.89	910.50	6.45	1.4
	.384	850.00	913.69	9688.08	9970.00	10095.00	11370.00	.30	1604.23	2.69	911.00	5.41	1.2
	.488	850.00	914.01	9875.31	9970.00	10090.00	11365.00	.32	1469.90	2.01	912.00	6.48	1.0
	.531	850.00	914.18	9897.62	9965.00	10090.00	11350.00	.16	1385.91	1.38	912.80	7.57	.6
	.616	3200.00	915.65	9993.50	9960.00	10090.00	10823.00	1.48	829.50	1.85	913.80	62.05	2.5
*	.668	3200.00	917.86	9620.00	9950.00	10035.00	10244.05	2.21	624.05	2.36	915.50	136.43	6.2
*	.776	3200.00	920.33	9979.44	9975.00	10025.00	10476.99	2.47	467.41	3.93	916.40	17.85	3.5
	.868	3200.00	921.47	9971.36	9970.00	10020.00	10458.43	1.13	448.84	3.47	918.00	35.34	4.7
	.964	3200.00	923.56	9970.00	9970.00	10045.00	10405.58	2.10	435.58	4.36	919.20	56.35	6.7
	1.081	2596.00	925.90	9955.00	9955.00	10090.00	10404.52	2.34	447.85	2.90	923.00	20.24	3.1
	1.153	2596.00	926.50	9960.63	9945.00	10060.00	10421.53	.59	446.67	3.50	923.00	12.16	2.7
*	1.236	2596.00	927.42	9974.30	9960.00	10060.00	10325.46	.93	240.49	3.42	924.00	82.84	8.8
*	1.317	2596.00	929.71	9970.71	9960.00	10050.00	10314.86	2.29	301.69	5.71	924.00	21.78	5.5

	SECNO	Q	CWSEL	SSTA	STCHL	STCHR	ENDST	DIFWSX	TOPWID	DEPTH	ELMIN	10*KS	VCH
	1.378	2596.00	930.39	9965.14	9960.00	10035.00	10366.90	.68	371.09	6.39	924.00	16.60	5.0
*	1.435	2596.00	931.17	9966.36	9965.00	10070.00	10128.92	.78	162.57	4.87	926.30	85.04	8.9
*	1.474	2600.00	933.62	9045.72	9985.00	10015.00	10080.00	2.45	1034.28	5.62	928.00	45.12	8.1

*	1.517	2600.00	934.88	9266.45	9905.00	10080.00	10080.00	1.26	813.55	2.68	932.20	11.46	2.5
*	1.566	2600.00	936.21	9914.72	9955.00	10045.00	10065.00	1.33	150.28	3.71	932.50	77.73	9.0
*	1.634	2600.00	938.27	9832.50	9970.00	10025.00	10065.00	2.06	232.50	5.27	933.00	18.24	5.9
	1.680	2600.00	938.77	9761.32	9970.00	10025.00	10100.00	.49	338.68	5.37	933.40	11.76	5.0
*	1.745	2600.00	939.17	9787.12	9960.00	10040.00	10210.00	.40	422.88	5.37	933.80	4.82	2
	1.823	2600.00	939.41	9432.35	9970.00	10050.00	10255.00	.25	822.65	4.51	934.90	5.20	.8
	1.893	3200.00	939.63	9094.59	9960.00	10040.00	10195.73	.22	1068.11	3.53	936.10	9.42	3.2
*	1.941	3200.00	939.73	8963.39	9975.00	10025.00	10022.97	.10	692.81	3.43	936.30	26.07	2.9
	1.988	3200.00	939.84	8932.00	9950.00	10030.00	10013.66	.11	672.07	3.54	936.30	26.25	2.2
	2.058	3200.00	940.75	8875.01	9970.00	10035.00	10022.81	.91	738.12	4.15	936.60	25.52	3.0
	2.185	3200.00	942.06	9354.24	9965.00	10045.00	10030.43	1.31	339.25	4.86	937.20	40.31	4.7
*	2.297	3200.00	942.74	9459.49	9975.00	10040.00	10562.02	.69	1102.53	4.94	937.80	2.56	1.5
*	2.371	3200.00	942.90	9294.95	9975.00	10030.00	10596.61	.15	1301.66	3.50	939.40	6.69	2.2
*	2.435	3200.00	943.21	9342.47	9985.00	10085.00	10602.60	.32	1260.13	3.31	939.90	22.18	4.2
*	2.536	3200.00	945.40	9868.57	9965.00	10060.00	10650.69	2.19	782.13	1.90	943.50	122.17	8.0
*	2.680	3200.00	948.59	9603.37	9925.00	10050.00	10675.04	3.19	965.08	3.39	945.20	18.00	4.3
*	2.771	3200.00	950.08	9654.95	9985.00	10020.00	10533.30	1.49	859.60	2.78	947.30	68.69	6.5
*	2.883	3200.00	952.33	9622.72	9985.00	10015.00	10420.39	2.25	797.68	3.83	948.50	23.39	4.9
	2.977	3200.00	953.69	9686.64	9980.00	10050.00	10409.07	1.36	722.43	3.79	949.90	42.65	6.7
	3.070	3200.00	955.63	9531.41	9945.00	10025.00	10570.24	1.94	1038.83	3.33	952.30	27.39	4.5
	3.167	2800.00	956.85	9575.02	9970.00	10020.00	10572.18	1.23	997.16	2.95	953.90	20.62	4.1
*	3.291	2800.00	959.20	9989.00	9970.00	10020.00	10825.92	2.35	816.91	2.00	957.20	78.62	4.5
*	3.376	2800.00	961.22	9769.59	9985.00	10015.00	10798.16	2.02	984.00	2.92	958.30	28.95	2.9

	SECNO	Q	CWSEL	SSTA	STCHL	STCHR	ENDST	DIFWSX	TOPWID	DEPTH	ELMIN	10*KS	CH
	3.491	2800.00	962.63	9626.83	9980.00	10020.00	10601.60	1.41	974.78	3.13	959.50	18.97	3.3
*	3.602	2800.00	964.12	9740.57	9880.00	10100.00	10456.32	1.49	715.75	2.22	961.90	40.62	3.9

BULLARD WASH REVISED

SUMMARY PRINTOUT TABLE 110

	SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENC
	.000	912.32	.32	912.34	1245.30	625.17	160.26	64.57	.00	.00	9980.00	10120.00	.0
*	.047	912.55	.00	912.55	1686.63	347.06	275.13	227.81	.00	.00	9960.00	10100.00	.0
	.121	912.73	.00	912.74	1367.11	111.36	232.90	505.73	.00	.00	9980.00	10100.00	.0
	.201	913.03	.00	913.05	1095.39	12.00	366.79	471.21	.00	.00	9970.00	10100.00	.0
	.292	913.39	.00	913.41	939.73	7.85	301.57	540.57	.00	.00	9960.00	10070.00	.0
	.384	913.69	.00	913.70	1604.23	9.94	241.92	598.14	.00	.00	9970.00	10095.00	.0
	.488	914.01	.00	914.02	1469.90	1.13	141.84	707.02	.00	.00	9970.00	10090.00	.
	.531	914.18	.00	914.18	1385.91	.06	37.19	812.75	.00	.00	9965.00	10090.00	.
	.616	915.65	.00	915.74	829.50	.00	209.13	2990.87	.00	.00	9960.00	10090.00	.
*	.668	917.86	.00	918.27	624.05	909.37	594.67	1695.96	.00	.00	9950.00	10035.00	.
*	.776	920.33	.00	920.47	467.41	.00	367.57	2832.43	.00	.00	9975.00	10025.00	.
	.868	921.47	.00	921.68	448.84	.00	483.09	2716.91	.00	.00	9970.00	10020.0	.
	.964	923.56	.00	923.95	435.58	.00	1260.04	1939.96	.00	.00	9970.00	10045.00	.
	1.081	925.90	.00	926.03	447.85	.00	735.65	1860.35	.00	.00	9955.00	10090.00	.
	1.153	926.50	.00	926.59	446.67	.00	572.40	2023.60	.00	.00	9945.00	10060.00	.
*	1.236	927.42	.00	928.35	240.49	.00	1825.00	771.00	.00	.00	9960.00	10060.00	.
*	1.317	929.71	.00	930.05	301.69	.00	1652.08	943.92	.00	.00	9960.00	10050.00	.

	1.378	930.39	.00	930.64	371.09	.00	1443.59	1152.41	.00	.00	9960.00	10035.00	.C
*	1.435	931.17	.00	932.39	162.57	.00	2555.87	40.13	.00	.00	9965.00	10070.00	.C
*	1.474	933.62	.00	934.04	1034.28	1465.51	961.60	172.89	.00	.00	9985.00	10015.00	.C
*	1.517	934.88	.00	934.94	813.55	1796.39	803.61	.00	.00	.00	9905.00	10080.00	.C
*	1.566	936.21	.00	937.38	150.28	140.43	2399.14	60.43	.00	.00	9955.00	10045.00	.C
*	1.634	938.27	.00	938.66	232.50	727.29	1573.53	299.18	.00	.00	9970.00	10025.00	.C
	1.680	938.77	.00	939.01	338.68	805.50	1399.31	395.19	.00	.00	9970.00	10025.00	.C

	SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENC
*	1.745	939.17	.00	939.27	422.88	631.15	1328.97	639.89	.00	.00	9960.00	10040.00	.C
	1.823	939.41	.00	939.47	822.65	1094.01	896.10	609.89	.00	.00	9970.00	10050.00	.C
	1.893	939.63	.00	939.70	1068.11	2093.19	794.12	312.69	.00	.00	9960.00	10040.00	.C
*	1.941	939.73	.00	939.84	692.81	3029.18	170.82	.00	.00	.00	9975.00	10025.00	.C
	1.988	939.84	.00	939.95	672.07	3142.10	57.90	.00	.00	.00	9950.00	10030.00	.C
	2.058	940.75	.00	940.86	738.12	3025.59	174.41	.00	.00	.00	9970.00	10035.00	.C
	2.185	942.06	.00	942.35	339.25	2713.02	486.98	.00	.00	.00	9965.00	10045.00	.C
*	2.297	942.74	.00	942.77	1102.53	2686.13	263.33	250.54	.00	.00	9975.00	10040.00	.C
*	2.371	942.90	.00	942.93	1301.66	2467.40	301.72	430.88	.00	.00	9975.00	10030.00	.C
*	2.435	943.21	.00	943.33	1260.13	1605.23	1028.72	566.05	.00	.00	9985.00	10085.00	.C
*	2.536	945.40	.00	945.92	782.13	509.37	1365.33	1325.29	.00	.00	9965.00	10060.00	.C
*	2.680	948.59	.00	948.75	965.08	236.11	1592.26	1371.63	.00	.00	9925.00	10050.00	.C
*	2.771	950.08	.00	950.27	859.60	688.56	466.59	2044.85	.00	.00	9985.00	10020.00	.C
*	2.883	952.33	.00	952.45	797.68	1570.13	447.72	1182.15	.00	.00	9985.00	10015.00	.C
	2.977	953.69	.00	954.07	722.43	1455.68	1405.91	338.41	.00	.00	9980.00	10050.00	.C
	3.070	955.63	.00	955.75	1038.83	926.78	847.29	1425.92	.00	.00	9945.00	10025.00	.C
	3.167	956.85	.00	956.94	997.16	1257.88	522.07	1020.05	.00	.00	9970.00	10020.00	.C
*	3.291	959.20	.00	959.30	816.91	.00	104.32	2695.68	.00	.00	9970.00	10020.00	.C
*	3.376	961.22	.00	961.28	984.00	57.04	94.79	2648.17	.00	.00	9985.00	10015.00	.C
	3.491	962.63	.00	962.68	974.78	803.54	268.56	1727.90	.00	.00	9980.00	10020.00	.C
*	3.602	964.12	.00	964.30	715.75	214.38	1902.96	682.66	.00	.00	9880.00	10100.00	.0

SUMMARY OF ERRORS AND SPECIAL NOTES

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WARNING SECNO=      .047  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      .668  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      .776  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     1.236  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     1.236  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     1.236  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=     1.317  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     1.435  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     1.435  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     1.435  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     1.474  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     1.474  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=     1.517  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     1.566  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     1.566  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     1.566  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=     1.634  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     1.745  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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WARNING SECNO=      1.941  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      2.297  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      2.371  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      2.435  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      2.536  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      2.536  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      2.680  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      2.771  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      2.883  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      3.291  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      3.376  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      3.602  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
1
   29OCT94       10:57:59                                                          PAGE   30
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APPENDIX D

RECOMMENDED ALTERNATIVE HEC-2 RUNS FOR BULLARD WASH CHANNEL AND EAST LOCAL TRIBUTARY COLLECTOR CHANNEL

PROJECT TITLE : Bullard Wash Outfall Study
PROJECT NUMBER : 94129 6/12/1995

B O S S H E C - 2 (tm)

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Version : 3.10
Serial Number : 0010276.250

Licensed to Wood Patel Associates

NOTE:
STARTING WATER SURFACE ELEVATIONS ARE FROM DAMES AND MOORE GILA RIVER FLOOD INSURANCE STUDY WITH NO ADJUSTMENT FOR ANY POTENTIAL DIFFERENCE IN VERTICAL DATUM.

PROGRAM ORIGIN :

Boss Hec-2 (tm) is an enhanced version of the U.S. Army Corps of Engineers Hydrologic Engineering Center HEC-2 program for water-surface profile computations. Program based upon the September 1990 version, updated on August 1991.

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PROJECT DESCRIPTION :

PROJECT TITLE : Bullard Wash Outfall Study
PROJECT NUMBER : 94129
DESCRIPTION :
NGINEER : Wood, Patel & Associates, Inc.
DATE OF RUN : 6/12/1995
TIME OF RUN : 4:18 pm

```
T1      94129
T2      Bullard Wash Outfall Study
T3
T4      * 10-year flow = 1400 cfs:
T4        Starting water surface elevation equals 100-year Gila River
T4        water surface elevation.
T4      * 100-year flow = 3200 cfs:
T4        Starting water surface elevation equals 10-year Gila River
T4        water surface elevation.
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JOB PARAMETERS :

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	0.0	0	0.0	1400.0	912.5	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1	1	0.0	0.0	0.0	0.0	0.0	-6.0	0.0	

USER-DEFINED SUMMARY TABLES (J3) :

38	42	1	43	26	51	4	8	10	53
54	13	15		38	39	8	10	1	4
67	25		150						

REQUESTED CROSS-SECTION PRINTOUTS (J5) :

	-10	-10			
NC	0.045	0.045	0.045	0.1	0.3

CONFLUENCE WITH GILA RIVER
CONFLUENCE WITH GILA RIVER

X1	1340	4	0.0	200.0	0.0	0.0	0.0	1.0	0.0	
CI	100.0	899.37	0.035	4.0	4.0	-65.0	0.01			
GR	903.8	0.0	904.0	38.0	904.0	100.0	904.0	200.0		
X1	1640	9	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	901.64	300.035	4.0	4.0	-65.0	0.01			
GR	910.0	0.0	904.6	0.1	904.0	15.0	904.0	100.0	904.0	137.0
GR	903.4	160.0	904.0	185.0	904.0	199.9	910.0	200.0		
X1	1940	7	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	902.15	300.035	4.0	4.0	-65.0	0.01			
GR	912.0	0.0	902.0	0.1	902.0	100.0	902.0	175.0	903.6	186.0

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GR    904.0      199.9      912.0      200.0

X1     2240         15        0.0      200.0      300.0      300.0      300.0        1.0        0.0
CI    100.0     902.66    300.035        4.0        4.0       65.0       0.01
GR    911.8        0.0      910.5       16.0      912.0       25.0      912.0       56.0      910.8       61.0
GR    910.6       80.0      912.0       90.0      912.0      100.0      912.0      109.0      910.0      121.0
GR    910.0      142.0      912.0      150.0      912.0      165.0      910.0      175.0      910.0      200.0

NC    0.025      0.025      0.025        0.3        0.5
X1     2419          9        0.0      200.0      179.0      179.0      179.0        1.0        0.0
CI    100.0     902.96    179.035        4.0        4.0       65.0       0.01
GR    911.6        0.0      911.6        7.0      910.2       22.0      910.0       48.0      910.0      100.0
GR    910.0      130.0      910.1      172.0      911.0      192.0      911.1      200.0
  DOWNSTREAM END OF DROP # 1

DOWNSTREAM END OF DROP # 1

X1   2439.0          5        0.0      200.0       20.0       20.0       20.0        1.0        0.0
CI    100.0     903.00     20.019      0.001      0.001       65.0       0.01
GR    910.5        0.0      910.5       19.0      910.0       24.0      910.0      100.0      910.0      200.0
  DOWNSTREAM END OF BID CANAL OVERCHUTE

DOWNSTREAM END OF BID CANAL OVERCHUTE

      2442.0          7        0.0      200.0        3.0        3.0        3.0        1.0        0.0
CI    100.0     906.41      3.019      0.001      0.001      -65.0       0.01
GR    915.0        0.0      910.4        0.1      910.4       20.0      910.0       24.0      910.0      100.0
GR    910.0      199.9      915.0      200.0

NC      0.0        0.0        0.0        0.1        0.3
  UPSTREAM END OF BID CANAL OVERCHUTE
UPSTREAM END OF BID CANAL OVERCHUTE

X1   2528.0          8        0.0      200.0       86.0       86.0       86.0        1.0        0.0
CI    100.0     906.56     86.019      0.001      0.001       65.0       0.01
GR    913.2        0.0      912.5       20.0      912.1       50.0      912.0       70.0      912.1      100.0
GR    912.1      131.0      914.0      157.0      914.0      200.0

X1     2548          5        0.0      200.0       40.0       40.0       40.0        1.0        0.0
CI    100.0     906.59     40.025        2.0        2.0       85.0       0.01
GR    914.0        0.0      912.6      100.0      912.7      152.0      914.0      170.0      914.0      200.0

X1     2730          3        0.0      200.0      202.0      202.0      202.0        1.0        0.0
CI    100.0     906.90    182.025        2.0        2.0       85.0       0.01
GR    914.0        0.0      914.0      100.0      914.0      200.0

X1     3030          3        0.0      200.0      300.0      300.0      300.0        1.0        0.0
CI    100.0     907.41    300.025        2.0        2.0       85.0       0.01
GR    914.0        0.0      914.0      100.0      913.3      200.0

       3330          3        0.0      200.0      300.0      300.0      300.0        1.0        0.0
CI    100.0     907.92    300.025        2.0        2.0       85.0       0.01
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GR	914.4	0.0	914.3	100.0	914.0	200.0				
X1	3630	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	908.43	300.025	2.0	2.0	85.0	0.01			
GR	915.0	0.0	914.8	100.0	914.7	200.0				
X1	3930	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	908.94	300.025	2.0	2.0	85.0	0.01			
GR	915.6	0.0	915.5	100.0	915.3	200.0				
X1	4230	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	909.45	300.025	2.0	2.0	85.0	0.01			
GR	916.2	0.0	916.0	100.0	915.9	200.0				
X1	4530	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	909.96	300.025	2.0	2.0	85.0	0.01			
GR	917.0	0.0	916.8	100.0	916.5	200.0				
X1	4830	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	910.47	300.025	2.0	2.0	85.0	0.01			
GR	917.8	0.0	917.5	100.0	917.2	200.0				
X1	5130	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	910.98	300.025	2.0	2.0	85.0	0.01			
GR	918.3	0.0	918.1	100.0	918.0	200.0				
X1	5430	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	911.49	300.025	2.0	2.0	85.0	0.01			
GR	918.8	0.0	918.7	100.0	918.6	200.0				
X1	5730	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	912.0	300.025	2.0	2.0	85.0	0.01			
GR	919.9	0.0	919.8	100.0	919.8	200.0				
X1	6030	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	912.51	300.025	2.0	2.0	85.0	0.01			
GR	920.0	0.0	920.0	100.0	920.0	200.0				
X1	6330	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	913.02	300.025	2.0	2.0	85.0	0.01			
GR	920.0	0.0	920.0	100.0	920.0	200.0				
X1	6630	7	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	913.53	300.025	2.0	2.0	85.0	0.01			
GR	922.0	0.0	922.0	45.0	921.6	90.0	921.5	100.0	921.3	155.0
GR	920.4	195.0	920.0	200.0						
NC	0.0	0.0	0.0	0.3	0.5					
X1	6718.7	5	0.0	200.0	88.7	88.7	88.7	1.0	0.0	
CI	100.0	913.68	88.025	2.0	2.0	85.0	0.01			
GR	922.0	0.0	922.0	75.0	921.6	100.0	920.3	190.0	920.4	200.0

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NC    0.014      0.014      0.014       0.0        0.0
  DOWNSTREAM FACE OF MC-85 BOX CULVERT
DOWNSTREAM FACE OF MC-85 BOX CULVERT

X1   6768.7         10       67.5     132.5      138.7     138.7     138.7       1.0       0.0
CI      0.0        0.0        0.0       0.0        0.0      0.01      0.01
GR    922.0        0.0      922.0      67.5     913.77      67.6    913.77      80.0    913.77     100.0
GR   913.77      130.0     913.77     132.4      921.2     132.5     921.2     192.0     921.0     200.0

SC    6.014        0.2        3.0     200.0        6.0      10.0      97.2       8.1    913.93    913.77
  UPSTREAM FACE OF MC-85 BOX CULVERT
UPSTREAM FACE OF MC-85 BOX CULVERT

X1   6865.9          7       67.5     132.5      97.2      97.2      97.2       1.0       0.0
X2      0.0        0.0          2       0.0     922.0       0.0         0       0.0       0.0
BT       -7        0.0      922.0       0.0      67.5     922.0       0.0      67.6     922.0       0.0
BT               100.0      922.0       0.0     132.4     922.0       0.0     132.5     922.0       0.0
BT               200.0      922.0       0.0
GR    922.0        0.0      922.0      67.5    913.93      67.6    913.93     100.0    913.93     132.4
GR    922.0      132.5      922.0     200.0
  DOWNSTREAM FACE OF SPRR BOX CULVERT

DOWNSTREAM FACE OF SPRR BOX CULVERT

      6935.7          7       67.5     132.5      69.8      69.8      69.8       1.0       0.0
GR    922.0        0.0      922.0      67.5    914.05      67.6    914.05     100.0    914.05     132.4
GR    922.0      132.5      922.0     200.0

NC    0.019      0.019      0.019       0.1        0.3
SC    6.014        0.2        3.0     200.0        6.0      10.0      97.3       8.1    914.22    914.05
  UPSTREAM FACE OF SPRR BOX CULVERT
UPSTREAM FACE OF SPRR BOX CULVERT

X1   7033.0          7       67.5     132.5      97.3      97.3      97.3       1.0       0.0
X2      0.0        0.0          2       0.0     926.0       0.0         0       0.0       0.0
BT       -7        0.0      926.0       0.0      67.5     926.0       0.0      67.6     926.0       0.0
BT               100.0      926.0       0.0     132.4     926.0       0.0     132.5     926.0       0.0
BT               200.0      926.0       0.0
GR    926.0        0.0      926.0      67.5    914.22      67.6    914.22     100.0    914.22     132.4
GR    926.0      132.5      926.0     200.0

X1     7083          6        0.0     200.0      50.0      50.0      50.0       1.0       0.0
CI    100.0     914.31     50.019       2.0       2.0      65.0      0.01
GR    924.0        0.0      924.0     100.0     924.0     147.0     924.4     153.0     924.7     193.0
GR    924.7      200.0

X1     7160          8        0.0     200.0      77.0      77.0      77.0       1.0       0.0
CI    100.0     914.43     77.019       2.0       2.0      65.0      0.01
GR    931.0        0.0      930.4      25.0     930.0      27.0     929.5      53.0     929.6      60.0
      928.2      100.0      928.0     107.0     928.0     200.0
  ITTOM OF DROP # 2
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BOTTOM OF DROP # 2

X1	7200	8	0.0	200.0	40.0	40.0	40.0	1.0	0.0	
CI	100.0	914.499	40.019	2.0	2.0	55.0	0.01			
GR	931.0	0.0	930.4	25.0	930.0	27.0	929.5	53.0	929.6	60.0
GR	928.2	100.0	928.0	107.0	928.0	200.0				

TOP OF DROP # 2

TOP OF DROP # 2

X1	7206	10	0.0	200.0	6.0	6.0	6.0	1.0	0.0	
CI	100.0	919.5293	6.019	2.0	2.0	-55.0	0.01			
GR	935.0	0.0	931.0	0.1	930.4	25.0	930.0	27.0	929.5	53.0
GR	929.6	60.0	928.2	100.0	928.0	107.0	928.0	199.9	935.0	200.0

BOTTOM OF DROP # 3

BOTTOM OF DROP # 3

X1	7350	5	0.0	200.0	144.0	144.0	144.0	1.0	0.0	
CI	100.0	919.7741	144.019	2.0	2.0	55.0	0.01			
GR	936.1	0.0	936.0	30.0	934.0	45.0	932.0	100.0	931.8	200.0

TOP OF DROP # 3

TOP OF DROP # 3

X1	7356	5	0.0	200.0	6.0	6.0	6.0	1.0	0.0	
CI	100.0	924.8044	6.019	2.0	2.0	55.0	0.01			
GR	936.1	0.0	936.0	30.0	934.0	45.0	932.0	100.0	931.8	200.0

BOTTOM OF DROP # 4

BOTTOM OF DROP # 4

X1	7500	11	0.0	200.0	144.0	144.0	144.0	1.0	0.0	
CI	100.0	925.0492	144.019	2.0	2.0	55.0	0.01			
GR	935.3	0.0	935.7	37.0	936.0	44.0	936.0	70.0	936.2	85.0
GR	936.1	100.0	936.0	110.0	935.4	137.0	936.0	184.0	936.0	191.0
GR	936.4	200.0								

TOP OF DROP # 4

TOP OF DROP # 4

X1	7506	11	0.0	200.0	6.0	6.0	6.0	1.0	0.0	
CI	100.0	930.11	6.019	2.0	2.0	55.0	0.01			
GR	935.3	0.0	935.7	37.0	936.0	44.0	936.0	70.0	936.2	85.0
GR	936.1	100.0	936.0	110.0	935.4	137.0	936.0	184.0	936.0	191.0
GR	936.4	200.0								

X1	7547	9	0.0	200.0	41.0	41.0	41.0	1.0	0.0	
CI	100.0	930.18	41.025	2.0	2.0	55.0	0.01			
GR	936.1	0.0	936.7	25.0	937.0	40.0	937.8	60.0	937.8	80.0
GR	937.4	100.0	936.2	145.0	936.0	158.0	937.4	200.0		

X1	7760	4	0.0	200.0	213.0	213.0	213.0	1.0	0.0	
CI	100.0	930.54	213.025	2.0	2.0	55.0	0.01			
GR	938.0	0.0	938.0	70.0	938.3	100.0	939.3	200.0		
X1	7800	4	0.0	200.0	40.0	40.0	40.0	1.0	0.0	
CI	100.0	930.61	40.025	2.0	2.0	55.0	0.01			
GR	938.0	0.0	938.0	38.0	938.7	100.0	939.8	200.0		
X1	7847	12	0.0	200.0	47.0	47.0	47.0	1.0	0.0	
CI	100.0	930.69	47.025	2.0	2.0	-55.0	0.01			
GR	942.0	0.0	936.1	0.1	936.2	9.0	936.7	23.0	937.0	39.0
GR	937.8	59.0	937.8	80.0	937.4	100.0	936.1	145.0	936.0	160.0
GR	937.5	199.9	942.0	200.0						
X1	8100	9	0.0	200.0	253.0	253.0	253.0	1.0	0.0	
CI	100.0	931.12	253.025	2.0	2.0	-55.0	0.01			
GR	945.0	0.0	937.1	0.1	938.0	76.0	939.4	100.0	940.0	108.0
GR	940.4	118.0	940.5	131.0	941.9	199.9	945.0	200.0		
X1	8400	7	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	931.63	300.025	2.0	2.0	55.0	0.01			
GR	944.0	0.0	944.0	72.0	940.0	86.0	940.0	100.0	940.0	137.0
GR	944.0	143.0	944.0	200.0						
	8670	6	0.0	200.0	270.0	270.0	270.0	1.0	0.0	
CI	100.0	932.09	270.025	2.0	2.0	55.0	0.01			
GR	941.0	0.0	942.0	10.0	944.0	70.0	945.3	110.0	944.5	120.0
GR	944.4	200.0								
X1	8970	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	932.60	300.025	2.0	2.0	55.0	0.01			
GR	945.5	0.0	945.3	100.0	945.0	200.0				
X1	9270	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	933.11	300.025	2.0	2.0	55.0	0.01			
GR	945.4	0.0	945.1	100.0	945.1	200.0				
X1	9570	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	933.62	300.025	2.0	2.0	55.0	0.01			
GR	944.5	0.0	944.0	100.0	943.2	200.0				
X1	9870	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	934.13	300.025	2.0	2.0	85.0	0.01			
GR	942.7	0.0	942.3	100.0	942.0	200.0				
X1	10170	3	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	934.64	300.025	2.0	2.0	85.0	0.01			
GR	941.9	0.0	942.5	100.0	943.1	200.0				
	10410	4	0.0	200.0	240.0	240.0	240.0	1.0	0.0	
	100.0	935.15	300.025	2.0	2.0	85.0	0.01			
GR	942.0	0.0	942.0	68.0	942.2	100.0	942.7	200.0		

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X1    10680        3       0.0     200.0     270.0     270.0     270.0       1.0       0.0
CI    100.0    935.61   270.025       2.0       2.0      85.0      0.01
GR    942.0       0.0     942.0     100.0     942.5     200.0

X1    10980        4       0.0     200.0     300.0     300.0     300.0       1.0       0.0
CI    100.0    936.12   300.025       2.0       2.0      85.0      0.01
GR    942.0       0.0     942.0      33.0     942.4     100.0     943.0     200.0

X1    11275        6       0.0     200.0     295.0     295.0     295.0       1.0       0.0
CI    100.0    936.62   295.025       2.0       2.0      85.0      0.01
GR    946.0       0.0     944.8      52.0     944.8      71.0     944.5     100.0     944.0     160.0
GR    944.0     200.0
  BOTTOM OF DROP # 5

BOTTOM OF DROP # 5

X1    11315       10       0.0     200.0      40.0      40.0      40.0       1.0       0.0
CI    100.0    936.69    40.019       2.0       2.0      85.0      0.01
GR    946.0       0.0     946.1      14.0     945.3      46.0     945.3      66.0     945.1     100.0
GR    944.9     122.0     944.2     154.0     944.2     157.0     944.0     163.0     944.0     200.0

NC    0.045     0.045     0.045       0.0       0.0
  TOP OF DROP # 5
TOP OF DROP # 5

X1    11323       11       0.0     200.0       8.0       8.0       8.0       1.0       0.0
CI    100.0     944.7     8.019       2.0       2.0      85.0      0.01
GR    946.0       0.0     946.0      19.0     945.5      45.0     945.5      71.0     945.2     100.0
GR    945.0     115.0     944.4     141.0     944.4     150.0     944.0     164.0     944.0     200.0
GR    946.0    1040.0
T1      94129
T2      Bullard Wash Outfall Study
T3


JOB PARAMETERS :
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J1  ICHECK    INQ     NINV    IDIR    STRT   METRIC    HVINS       Q    WSEL      FQ

       0       3        0       0     0.0        0      0.0  3200.0   906.3

J2  NPROF   IPLOT    PRFVS   XSECV   XSECH      FN   ALLDC     IBW   CHNIM   ITRACE

     15       1      0.0     0.0     0.0     0.0     0.0    -6.0     0.0
```

PROJECT TITLE : Bullard Wash Outfall Study

PROJECT NUMBER : 94129 6/12/1995

SPECIAL NOTE :

An asterisk (*) to the left of the cross-section number indicates a special note is present in the SUMMARY OF WARNING AND STATUS MESSAGES section.

SUMMARY PRINTOUT : Bullard Wash Outfall Study

94129

Cross-Section Number SECNO	Minimum C. S. Elevation (ft MSL) ELMIN	Computed W. S. Elevation (ft MSL) CWSEL	Discharge Flow (cfs) Q	Channel Mean Flow Velocity (ft/s) VCH	W.S. Elev Diff per Section (ft) DIFWSX	Water Surface Top Width (ft) TOPWID	Flow Depth (ft) DEPTH	Mean Velocity Head (ft) HV	Left W. S. Station (ft) SSTA	Right W. S. Station (ft) ENDST	Left Overbank Flow (cfs) QLOB	Right Overbank Flow (cfs) QROB
1340.000	899.37	912.50	1400.00	.67	.00	200.00	13.13	.01	.00	200.00	.00	.00
1340.000	899.37	906.30	3200.00	3.76	.00	200.00	6.93	.22	.00	200.00	.00	.00
* 1640.000	901.64	912.50	1400.00	1.06	.00	200.00	10.86	.02	.00	200.00	.00	.00
* 1640.000	901.64	906.45	3200.00	7.90	.15	103.47	4.81	.97	48.27	151.73	.00	.00
940.000	902.15	912.51	1400.00	1.24	.02	200.00	10.36	.02	.00	200.00	.00	.00
* 1940.000	902.15	908.02	3200.00	6.16	1.57	111.95	5.87	.59	44.03	155.97	.00	.00
2240.000	902.66	912.54	1400.00	1.23	.03	200.00	9.88	.02	.00	200.00	.00	.00
2240.000	902.66	908.85	3200.00	5.75	.83	114.56	6.19	.51	42.72	157.28	.00	.00
2419.000	902.96	912.56	1400.00	1.25	.02	200.00	9.60	.02	.00	200.00	.00	.00
2419.000	902.96	909.28	3200.00	5.61	.43	115.54	6.32	.49	42.23	157.77	.00	.00
2439.000	903.00	912.55	1400.00	1.46	.00	200.00	9.55	.03	.00	200.00	.00	.00
2439.000	903.00	909.04	3200.00	8.15	-.24	65.01	6.04	1.03	67.49	132.51	.00	.00
* 2442.000	906.41	912.47	1400.00	3.55	-.08	65.01	6.06	.20	67.49	132.51	.00	.00
* 2442.000	906.41	910.62	3200.00	11.70	1.58	65.01	4.21	2.13	67.50	132.50	.00	.00
2528.000	906.56	912.51	1400.00	3.49	.03	116.72	5.95	.19	19.83	136.55	.00	.00
2528.000	906.56	911.52	3200.00	9.93	.91	65.01	4.96	1.53	67.50	132.50	.00	.00
* 2548.000	906.59	912.63	1400.00	2.39	.12	109.15	6.04	.09	45.43	154.57	.00	.00
* 2548.000	906.59	912.78	3200.00	5.31	1.26	109.75	6.19	.44	45.13	154.87	.00	.00
2730.000	906.90	912.66	1400.00	2.52	.03	108.02	5.76	.10	45.99	154.01	.00	.00
2730.000	906.90	912.92	3200.00	5.47	.14	109.09	6.02	.47	45.45	154.55	.00	.00
3030.000	907.41	912.71	1400.00	2.76	.06	106.21	5.30	.12	46.89	153.11	.00	.00

PROJECT TITLE : Bullard Wash Outfall Study

PROJECT NUMBER : 94129 6/12/1995

Cross-Section Number SECNO	Minimum C. S. Elevation (ft MSL) ELMIN	Computed W. S. Elevation (ft MSL) CWSEL	Discharge Flow (cfs) Q	Channel Mean Flow Velocity (ft/s) VCH	W.S. Elev Diff per Section (ft) DIFWSX	Water Surface Top Width (ft) TOPWID	Flow Depth (ft) DEPTH	Mean Velocity Head (ft) HV	Left W. S. Station (ft) SSTA	Right W. S. Station (ft) ENDST	Left Overbank Flow (cfs) QLOB	Right Overbank Flow (cfs) QROB
3030.000	907.41	913.19	3200.00	5.73	.27	108.13	5.78	.51	45.94	154.06	.00	.00
3330.000	907.92	912.79	1400.00	3.04	.08	104.46	4.87	.14	47.77	152.23	.00	.00
3330.000	907.92	913.51	3200.00	5.96	.31	107.32	5.59	.55	46.34	153.66	.00	.00
3630.000	908.43	912.90	1400.00	3.34	.11	102.85	4.47	.17	48.57	151.43	.00	.00
3630.000	908.43	913.86	3200.00	6.15	.36	106.70	5.43	.59	46.65	153.35	.00	.00
3930.000	908.94	913.05	1400.00	3.67	.15	101.39	4.11	.21	49.31	150.69	.00	.00
3930.000	908.94	914.26	3200.00	6.30	.40	106.25	5.32	.62	46.88	153.12	.00	.00
4230.000	909.45	913.25	1400.00	3.98	.20	100.18	3.80	.25	49.91	150.09	.00	.00
4230.000	909.45	914.69	3200.00	6.41	.43	105.92	5.24	.64	47.04	152.96	.00	.00
4530.000	909.96	913.51	1400.00	4.29	.26	99.19	3.55	.29	50.40	149.60	.00	.00
4530.000	909.96	915.14	3200.00	6.49	.45	105.68	5.18	.65	47.16	152.84	.00	.00
4830.000	910.47	913.84	1400.00	4.53	.33	98.47	3.37	.32	50.76	149.24	.00	
4830.000	910.47	915.61	3200.00	6.54	.47	105.53	5.14	.67	47.23	152.77	.00	.
5130.000	910.98	914.23	1400.00	4.71	.39	98.01	3.25	.34	51.00	149.00	.00	.00
5130.000	910.98	916.09	3200.00	6.58	.48	105.44	5.11	.67	47.28	152.72	.00	.00
5430.000	911.49	914.67	1400.00	4.81	.44	97.73	3.18	.36	51.13	148.87	.00	.00
5430.000	911.49	916.59	3200.00	6.60	.49	105.37	5.10	.68	47.31	152.69	.00	.00
5730.000	912.00	915.15	1400.00	4.89	.47	97.54	3.15	.37	51.23	148.77	.00	.00
5730.000	912.00	917.08	3200.00	6.62	.50	105.33	5.08	.68	47.34	152.66	.00	.00
6030.000	912.51	915.64	1400.00	4.91	.49	97.49	3.13	.37	51.25	148.75	.00	.0
6030.000	912.51	917.59	3200.00	6.63	.50	105.29	5.08	.68	47.35	152.65	.00	.0
6330.000	913.02	916.14	1400.00	4.92	.50	97.46	3.12	.38	51.27	148.73	.00	.0
6330.000	913.02	918.09	3200.00	6.64	.50	105.27	5.07	.68	47.36	152.64	.00	.0
6630.000	913.53	916.64	1400.00	4.93	.50	97.45	3.11	.38	51.28	148.72	.00	.0
6630.000	913.53	918.60	3200.00	6.64	.51	105.26	5.07	.68	47.37	152.63	.00	.0
6718.700	913.68	916.79	1400.00	4.93	.15	97.45	3.11	.38	51.27	148.73	.00	.0
6718.700	913.68	918.74	3200.00	6.64	.15	105.26	5.06	.68	47.37	152.63	.00	.0
6768.700	913.77	916.78	1400.00	7.18	-.02	64.88	3.01	.80	67.56	132.44	.00	
6768.700	913.77	918.44	3200.00	10.55	-.30	64.92	4.67	1.73	67.54	132.46	.00	

PROJECT TITLE : Bullard Wash Outfall Study

PROJECT NUMBER : 94129 6/12/1995

	Cross-Section Number SECNO	Minimum C. S. Elevation (ft MSL) ELMIN	Computed W. S. Elevation (ft MSL) CWSEL	Discharge Flow (cfs) Q	Channel Mean Flow Velocity (ft/s) VCH	W.S. Elev Diff per Section (ft) DIFWSX	Water Surface Top Width (ft) TOPWID	Flow Depth (ft) DEPTH	Mean Velocity Head (ft) HV	Left W. S. Station (ft) SSTA	Right W. S. Station (ft) ENDST	Left Overbank Flow (cfs) QLOB	Right Overbank Flow (cfs) QROB
	6865.900	913.93	917.54	1400.00	5.98	.76	64.89	3.61	.56	67.56	132.44	.00	.00
*	6865.900	913.93	920.66	3200.00	7.33	2.22	64.97	6.73	.83	67.52	132.48	.00	.00
	6935.700	914.05	917.57	1400.00	6.13	.03	64.89	3.52	.58	67.56	132.44	.00	.00
	6935.700	914.05	920.68	3200.00	7.44	.02	64.97	6.63	.86	67.52	132.48	.00	.00
	7033.000	914.22	918.05	1400.00	5.64	.47	64.86	3.83	.49	67.57	132.43	.00	.00
	7033.000	914.22	921.79	3200.00	6.51	1.11	64.93	7.57	.66	67.54	132.46	.00	.00
	7083.000	914.31	918.22	1400.00	4.92	.17	80.65	3.91	.38	59.68	140.32	.00	.00
	7083.000	914.31	922.09	3200.00	5.10	.30	96.14	7.78	.40	51.93	148.07	.00	.00
	7160.000	914.43	918.27	1400.00	5.00	.05	80.40	3.84	.39	59.80	140.20	.00	.00
	7160.000	914.43	922.12	3200.00	5.17	.02	95.78	7.69	.42	52.11	147.89	.00	.00
	7200.000	914.50	918.18	1400.00	6.10	-.09	69.72	3.68	.58	65.14	134.86	.00	.00
	7200.000	914.50	922.02	3200.00	6.07	-.09	85.10	7.53	.57	57.45	142.55	.00	.00
	7206.000	919.53	922.16	1400.00	8.83	3.98	65.53	2.63	1.21	67.24	132.76	.00	.00
*	7206.000	919.53	923.99	3200.00	11.22	1.97	72.85	4.46	1.96	63.58	136.42	.00	.00
*	7350.000	919.77	923.06	1400.00	6.93	.89	68.12	3.28	.75	65.94	134.06	.00	.00
	7350.000	919.77	925.04	3200.00	9.28	1.05	76.05	5.26	1.34	61.97	138.03	.00	.00
*	7356.000	924.80	927.43	1400.00	8.86	4.37	65.49	2.62	1.22	67.26	132.74	.00	.00
*	7356.000	924.80	929.26	3200.00	11.23	4.22	72.83	4.46	1.96	63.59	136.41	.00	.00
*	7500.000	925.05	928.33	1400.00	6.92	.91	68.14	3.29	.74	65.93	134.07	.00	.00
	7500.000	925.05	930.31	3200.00	9.28	1.05	76.06	5.27	1.34	61.97	138.03	.00	.00
*	7506.000	930.11	932.73	1400.00	8.86	4.40	65.49	2.62	1.22	67.26	132.74	.00	.00
*	7506.000	930.11	934.55	3200.00	11.28	4.24	72.76	4.44	1.98	63.62	136.38	.00	.00
	7547.000	930.18	933.33	1400.00	7.27	.60	67.58	3.15	.82	66.21	133.79	.00	.00
	7547.000	930.18	935.33	3200.00	9.49	.78	75.65	5.15	1.40	62.18	137.82	.00	.00
	7760.000	930.54	934.21	1400.00	6.13	.87	69.67	3.67	.58	65.17	134.83	.00	.0
	7760.000	930.54	936.32	3200.00	8.32	.99	78.12	5.78	1.07	60.94	139.06	.00	.0
	7800.000	930.61	934.31	1400.00	6.04	.11	69.84	3.70	.57	65.08	134.92	.00	.0
	7800.000	930.61	936.44	3200.00	8.24	.12	78.31	5.83	1.05	60.84	139.16	.00	.0
	7847.000	930.69	934.42	1400.00	6.02	.11	69.90	3.73	.56	65.05	134.95	.00	.0
	7847.000	930.69	936.56	3200.00	8.18	.13	78.46	5.87	1.04	60.77	139.23	.00	.0

PROJECT TITLE : Bullard Wash Outfall Study

PROJECT NUMBER : 94129 6/12/1995

Cross-Section Number SECNO	Minimum C. S. Elevation (ft MSL) ELMIN	Computed W. S. Elevation (ft MSL) CWSEL	Discharge Flow (cfs) Q	Channel Mean Flow Velocity (ft/s) VCH	W.S. Elev Diff per Section (ft) DIFWSX	Water Surface Top Width (ft) TOPWID	Flow Depth (ft) DEPTH	Mean Velocity Head (ft) HV	Left W. S. Station (ft) SSTA	Right W. S. Station (ft) ENDST	Left Overbank Flow (cfs) QLOB	Right Overbank Flow (cfs) QROB
8100.000	931.12	934.97	1400.00	5.81	.55	70.36	3.85	.53	64.82	135.18	.00	.00
8100.000	931.12	937.21	3200.00	7.82	.65	79.36	6.09	.95	60.32	139.68	.00	.00
8400.000	931.63	935.55	1400.00	5.68	.58	70.69	3.92	.50	64.66	135.34	.00	.00
8400.000	931.63	937.85	3200.00	7.62	.64	79.92	6.22	.90	60.04	139.96	.00	.00
8670.000	932.09	936.04	1400.00	5.63	.49	70.82	3.95	.49	64.59	135.41	.00	.00
8670.000	932.09	938.37	3200.00	7.53	.52	80.16	6.28	.88	59.92	140.08	.00	.00
8970.000	932.60	936.56	1400.00	5.61	.52	70.86	3.96	.49	64.57	135.43	.00	.00
8970.000	932.60	938.93	3200.00	7.47	.55	80.32	6.33	.87	59.84	140.16	.00	.00
9270.000	933.11	937.08	1400.00	5.61	.52	70.87	3.97	.49	64.56	135.44	.00	.00
9270.000	933.11	939.47	3200.00	7.43	.54	80.43	6.36	.86	59.78	140.22	.00	.00
9570.000	933.62	937.59	1400.00	5.60	.52	70.88	3.97	.49	64.56	135.44	.00	.00
9570.000	933.62	940.00	3200.00	7.40	.53	80.51	6.38	.85	59.74	140.26	.00	
* 9870.000	934.13	938.20	1400.00	3.69	.61	101.28	4.07	.21	49.36	150.64	.00	[illegible]
* 9870.000	934.13	940.83	3200.00	4.85	.83	111.81	6.70	.37	44.09	155.91	.00	.00
10170.000	934.64	938.41	1400.00	4.02	.20	100.06	3.77	.25	49.97	150.03	.00	.00
10170.000	934.64	941.01	3200.00	5.14	.18	110.49	6.37	.41	44.75	155.25	.00	.00
10410.000	935.15	938.67	1400.00	4.31	.27	99.10	3.52	.29	50.45	149.55	.00	.00
10410.000	935.15	941.23	3200.00	5.42	.22	109.32	6.08	.46	45.34	154.66	.00	.00
10680.000	935.61	938.98	1400.00	4.53	.30	98.47	3.37	.32	50.77	149.23	.00	.00
10680.000	935.61	941.46	3200.00	5.66	.23	108.39	5.85	.50	45.81	154.19	.00	.00
10980.000	936.12	939.37	1400.00	4.71	.39	98.00	3.25	.34	51.00	149.00	.00	.00
10980.000	936.12	941.76	3200.00	5.90	.30	107.54	5.64	.54	46.23	153.77	.00	.00
11275.000	936.62	939.80	1400.00	4.81	.43	97.74	3.18	.36	51.13	148.87	.00	.00
11275.000	936.62	942.10	3200.00	6.09	.34	106.90	5.48	.58	46.55	153.45	.00	.00
11315.000	936.69	939.85	1400.00	4.84	.04	97.67	3.16	.36	51.17	148.83	.00	.00
11315.000	936.69	942.14	3200.00	6.12	.04	106.82	5.45	.58	46.59	153.41	.00	.00
* 11323.000	944.00	945.19	1400.00	6.47	5.35	645.16	1.19	.37	56.51	701.67	.00	703.99
* 11323.000	944.00	945.75	3200.00	7.63	3.61	903.03	1.75	.47	32.00	935.03	.00	1736.12

SUMMARY PRINTOUT : Bullard Wash Outfall Study

94129

	Cross-Section Number SECNO	Channel Reach Length (ft) XLCH	Flow Depth (ft) DEPTH	Mean Velocity Head (ft) HV	Computed W. S. Elevation (ft MSL) CWSEL	Water Surface Top Width (ft) TOPWID	Channel Boundary Shear (lb/s ft) SHEAR	Cross-Section Area (sq ft) AREA
	1340.000	.00	13.13	.01	912.50	200.00	.01	2090.50
	1340.000	.00	6.93	.22	906.30	200.00	.31	850.50
*	1640.000	300.00	10.86	.02	912.50	200.00	.02	1323.65
*	1640.000	300.00	4.81	.97	906.45	103.47	1.39	405.04
	1940.000	300.00	10.36	.02	912.51	200.00	.03	1130.08
*	1940.000	300.00	5.87	.59	908.02	111.95	.80	519.23
	2240.000	300.00	9.88	.02	912.54	200.00	.03	1142.15
	2240.000	300.00	6.19	.51	908.85	114.56	.69	556.13
	419.000	179.00	9.60	.02	912.56	200.00	.03	1119.69
	2419.000	179.00	6.32	.49	909.28	115.54	.65	570.34
	2439.000	20.00	9.55	.03	912.55	200.00	.01	955.83
	2439.000	20.00	6.04	1.03	909.04	65.01	.47	392.65
*	2442.000	3.00	6.06	.20	912.47	65.01	.09	394.05
*	2442.000	3.00	4.21	2.13	910.62	65.01	1.02	273.44
	2528.000	86.00	5.95	.19	912.51	116.72	.09	401.16
	2528.000	86.00	4.96	1.53	911.52	65.01	.71	322.21
*	2548.000	40.00	6.04	.09	912.63	109.15	.06	586.05
*	2548.000	40.00	6.19	.44	912.78	109.75	.29	602.45
	2730.000	182.00	5.76	.10	912.66	108.02	.07	555.43
	2730.000	182.00	6.02	.47	912.92	109.09	.31	584.52
	3030.000	300.00	5.30	.12	912.71	106.21	.08	507.02
	3030.000	300.00	5.78	.51	913.19	108.13	.35	558.27
	3330.000	300.00	4.87	.14	912.79	104.46	.10	460.98
	3330.000	300.00	5.59	.55	913.51	107.32	.38	536.55
	3630.000	300.00	4.47	.17	912.90	102.85	.13	419.25

Cross-Section Number SECNO	Channel Reach Length (ft) XLCH	Flow Depth (ft) DEPTH	Mean Velocity Head (ft) HV	Computed W. S. Elevation (ft MSL) CWSEL	Water Surface Top Width (ft) TOPWID	Channel Boundary Shear (lb/s ft) SHEAR	Cross-Section Area (sq ft) AREA
3630.000	300.00	5.43	.59	913.86	106.70	.41	520.12
3930.000	300.00	4.11	.21	913.05	101.39	.16	381.84
3930.000	300.00	5.32	.62	914.26	106.25	.43	508.00
4230.000	300.00	3.80	.25	913.25	100.18	.19	351.43
4230.000	300.00	5.24	.64	914.69	105.92	.45	499.35
4530.000	300.00	3.55	.29	913.51	99.19	.22	326.71
4530.000	300.00	5.18	.65	915.14	105.68	.46	492.86
4830.000	300.00	3.37	.32	913.84	98.47	.25	308.99
4830.000	300.00	5.14	.67	915.61	105.53	.47	488.96
5130.000	300.00	3.25	.34	914.23	98.01	.28	297.52
5130.000	300.00	5.11	.67	916.09	105.44	.47	486.53
5430.000	300.00	3.18	.36	914.67	97.73	.29	290.78
5430.000	300.00	5.10	.68	916.59	105.37	.48	484.81
5730.000	300.00	3.15	.37	915.15	97.54	.30	286.20
5730.000	300.00	5.08	.68	917.08	105.33	.48	483.57
6030.000	300.00	3.13	.37	915.64	97.49	.30	285.00
6030.000	300.00	5.08	.68	917.59	105.29	.48	482.74
6330.000	300.00	3.12	.38	916.14	97.46	.31	284.29
6330.000	300.00	5.07	.68	918.09	105.27	.48	482.19
6630.000	300.00	3.11	.38	916.64	97.45	.31	283.88
6630.000	300.00	5.07	.68	918.60	105.26	.48	481.83
6718.700	88.00	3.11	.38	916.79	97.45	.31	284.00
6718.700	88.00	5.06	.68	918.74	105.26	.48	481.85
6768.700	138.70	3.01	.80	916.78	64.88	.22	195.10
6768.700	138.70	4.67	1.73	918.44	64.92	.44	303.19
6865.900	97.20	3.61	.56	917.54	64.89	.15	234.15
* 6865.900	97.20	6.73	.83	920.66	64.97	.20	436.74
6935.700	69.80	3.52	.58	917.57	64.89	.16	228.53
6935.700	69.80	6.63	.86	920.68	64.97	.21	430.34

PROJECT TITLE : Bullard Wash Outfall Study

PROJECT NUMBER : 94129 6/12/1995

	Cross-Section Number SECNO	Channel Reach Length (ft) XLCH	Flow Depth (ft) DEPTH	Mean Velocity Head (ft) HV	Computed W. S. Elevation (ft MSL) CWSEL	Water Surface Top Width (ft) TOPWID	Channel Boundary Shear (lb/s ft) SHEAR	Cross-Section Area (sq ft) AREA
	7033.000	97.30	3.83	.49	918.05	64.86	.24	248.04
	7033.000	97.30	7.57	.66	921.79	64.93	.29	491.61
	7083.000	50.00	3.91	.38	918.22	80.65	.17	284.83
	7083.000	50.00	7.78	.40	922.09	96.14	.15	627.32
	7160.000	77.00	3.84	.39	918.27	80.40	.17	279.92
	7160.000	77.00	7.69	.42	922.12	95.78	.15	618.53
	7200.000	40.00	3.68	.58	918.18	69.72	.26	229.49
	7200.000	40.00	7.53	.57	922.02	85.10	.22	527.13
*	7206.000	6.00	2.63	1.21	922.16	65.53	.61	158.57
*	7206.000	6.00	4.46	1.96	923.99	72.85	.85	285.18
*	7350.000	144.00	3.28	.75	923.06	68.12	.35	201.92
	7350.000	144.00	5.26	1.34	925.04	76.05	.55	344.83
*	7356.000	6.00	2.62	1.22	927.43	65.49	.61	157.96
*	7356.000	6.00	4.46	1.96	929.26	72.83	.85	284.88
*	7500.000	144.00	3.29	.74	928.33	68.14	.35	202.19
	7500.000	144.00	5.27	1.34	930.31	76.06	.55	344.97
*	7506.000	6.00	2.62	1.22	932.73	65.49	.61	157.96
*	7506.000	6.00	4.44	1.98	934.55	72.76	.86	283.69
	7547.000	41.00	3.15	.82	933.33	67.58	.68	192.69
	7547.000	41.00	5.15	1.40	935.33	75.65	1.01	337.18
	7760.000	213.00	3.67	.58	934.21	69.67	.46	228.55
	7760.000	213.00	5.78	1.07	936.32	78.12	.75	384.80
	7800.000	40.00	3.70	.57	934.31	69.84	.45	231.64
	7800.000	40.00	5.83	1.05	936.44	78.31	.74	388.52
	7847.000	47.00	3.73	.56	934.42	69.90	.44	232.66
	7847.000	47.00	5.87	1.04	936.56	78.46	.72	391.39
	8100.000	253.00	3.85	.53	934.97	70.36	.41	240.77
	8100.000	253.00	6.09	.95	937.21	79.36	.66	409.18
	8400.000	300.00	3.92	.50	935.55	70.69	.39	246.49
	8400.000	300.00	6.22	.90	937.85	79.92	.62	420.19

PROJECT TITLE : Bullard Wash Outfall Study

PROJECT NUMBER : 94129 6/12/1995

Cross-Section Number SECNO	Channel Reach Length (ft) XLCH	Flow Depth (ft) DEPTH	Mean Velocity Head (ft) HV	Computed W. S. Elevation (ft MSL) CWSEL	Water Surface Top Width (ft) TOPWID	Channel Boundary Shear (lb/s ft) SHEAR	Cross-Section Area (sq ft) AREA
8670.000	270.00	3.95	.49	936.04	70.82	.38	248.84
8670.000	270.00	6.28	.88	938.37	80.16	.60	425.16
8970.000	300.00	3.96	.49	936.56	70.86	.38	249.60
8970.000	300.00	6.33	.87	938.93	80.32	.59	428.27
9270.000	300.00	3.97	.49	937.08	70.87	.38	249.70
9270.000	300.00	6.36	.86	939.47	80.43	.59	430.54
9570.000	300.00	3.97	.49	937.59	70.88	.38	249.93
9570.000	300.00	6.38	.85	940.00	80.51	.58	432.15
* 9870.000	300.00	4.07	.21	938.20	101.28	.16	379.19
* 9870.000	300.00	6.70	.37	940.83	111.81	.24	659.62
10170.000	300.00	3.77	.25	938.41	100.06	.19	348.44
10170.000	300.00	6.37	.41	941.01	110.49	.27	622.93
10410.000	300.00	3.52	.29	938.67	99.10	.23	324.47
10410.000	300.00	6.08	.46	941.23	109.32	.31	590.85
10680.000	270.00	3.37	.32	938.98	98.47	.25	308.84
10680.000	270.00	5.85	.50	941.46	108.39	.34	565.41
10980.000	300.00	3.25	.34	939.37	98.00	.28	297.43
10980.000	300.00	5.64	.54	941.76	107.54	.37	542.37
11275.000	295.00	3.18	.36	939.80	97.74	.29	290.94
11275.000	295.00	5.48	.58	942.10	106.90	.40	525.43
11315.000	40.00	3.16	.36	939.85	97.67	.17	289.25
11315.000	40.00	5.45	.58	942.14	106.82	.23	523.26
* 11323.000	8.00	1.19	.37	945.19	645.16	.47	407.17
* 11323.000	8.00	1.75	.47	945.75	903.03	.57	835.04

SUMMARY PRINTOUT TABLE 150 : Bullard Wash Outfall Study

94129

	Cross-Section Number SECNO	Channel Reach Length (ft) XLCH	Top of Roadway Elevation (ft MSL) ELTRD	Max. Low Chord Elevation (ft MSL) ELLC	Minimum C. S. Elevation (ft MSL) ELMIN	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	Critical W. S. Elevation (ft MSL) CRIWS	Energy Gradient Elevation (ft MSL) EG	Energy Gradient Slope * 10,000 10K*S	Channel Mean Flow Velocity (ft/s) VCH	Cross-Section Area (sq ft) AREA	Index Q (0.01 * Convey.) .01K
	1340.000	.00	.00	.00	899.37	1400.00	912.50	.00	912.51	.12	.67	2090.50	4109.68
	1340.000	.00	.00	.00	899.37	3200.00	906.30	.00	906.52	11.85	3.76	850.50	929.53
*	1640.000	300.00	.00	.00	901.64	1400.00	912.50	.00	912.52	.52	1.06	1323.65	1935.61
*	1640.000	300.00	.00	.00	901.64	3200.00	906.45	.00	907.42	56.99	7.90	405.04	423.90
	1940.000	300.00	.00	.00	902.15	1400.00	912.51	.00	912.54	.87	1.24	1130.08	1504.82
*	1940.000	300.00	.00	.00	902.15	3200.00	908.02	.00	908.61	27.71	6.16	519.23	607.85
	2240.000	300.00	.00	.00	902.66	1400.00	912.54	.00	912.56	.85	1.23	1142.15	1519.86
	2240.000	300.00	.00	.00	902.66	3200.00	908.85	.00	909.37	22.74	5.75	556.13	670.98
	119.000	179.00	.00	.00	902.96	1400.00	912.56	.00	912.58	.90	1.25	1119.69	1477.93
	2419.000	179.00	.00	.00	902.96	3200.00	909.28	.00	909.77	21.15	5.61	570.34	695.75
	2439.000	20.00	.00	.00	903.00	1400.00	912.55	.00	912.59	.49	1.46	955.83	1998.99
	2439.000	20.00	.00	.00	903.00	3200.00	909.04	.00	910.07	12.39	8.15	392.65	909.28
*	2442.000	3.00	.00	.00	906.41	1400.00	912.47	.00	912.67	2.34	3.55	394.05	914.28
*	2442.000	3.00	.00	.00	906.41	3200.00	910.62	910.62	912.74	38.78	11.70	273.44	513.89
	2528.000	86.00	.00	.00	906.56	1400.00	912.51	.00	912.70	4.33	3.49	401.16	672.65
	2528.000	86.00	.00	.00	906.56	3200.00	911.52	.00	913.06	23.04	9.93	322.21	666.62
*	2548.000	40.00	.00	.00	906.59	1400.00	912.63	.00	912.72	1.78	2.39	586.05	1049.94
*	2548.000	40.00	.00	.00	906.59	3200.00	912.78	.00	913.22	8.54	5.31	602.45	1095.00
	2730.000	182.00	.00	.00	906.90	1400.00	912.66	.00	912.75	2.09	2.52	555.43	967.67
	2730.000	182.00	.00	.00	906.90	3200.00	912.92	.00	913.39	9.36	5.47	584.52	1046.08
	3030.000	300.00	.00	.00	907.41	1400.00	912.71	.00	912.83	2.77	2.76	507.02	841.50
	3030.000	300.00	.00	.00	907.41	3200.00	913.19	.00	913.70	10.77	5.73	558.27	975.23
	3330.000	300.00	.00	.00	907.92	1400.00	912.79	.00	912.93	3.71	3.04	460.98	726.76
	3330.000	300.00	.00	.00	907.92	3200.00	913.51	.00	914.06	12.16	5.96	536.55	917.80
	3630.000	300.00	.00	.00	908.43	1400.00	912.90	.00	913.07	4.98	3.34	419.25	627.54

Cross-Section Number SECNO	Channel Reach Length (ft) XLCH	Top of Roadway Elevation (ft MSL) ELTRD	Max. Low Chord Elevation (ft MSL) ELLC	Minimum C. S. Elevation (ft MSL) ELMIN	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	Critical W. S. Elevation (ft MSL) CRIWS	Energy Gradient Elevation (ft MSL) EG	Energy Gradient Slope * 10,000 10K*S	Channel Mean Flow Velocity (ft/s) VCH	Cross-Section Area (sq ft) AREA	Index Q (0.01 * Convey.) .01K
3630.000	300.00	.00	.00	908.43	3200.00	913.86	.00	914.45	13.37	6.15	520.12	875.08
3930.000	300.00	.00	.00	908.94	1400.00	913.05	.00	913.25	6.66	3.67	381.84	542.67
3930.000	300.00	.00	.00	908.94	3200.00	914.26	.00	914.88	14.38	6.30	508.00	844.00
4230.000	300.00	.00	.00	909.45	1400.00	913.25	.00	913.49	8.62	3.98	351.43	476.72
4230.000	300.00	.00	.00	909.45	3200.00	914.69	.00	915.32	15.15	6.41	499.35	822.02
4530.000	300.00	.00	.00	909.96	1400.00	913.51	.00	913.79	10.84	4.29	326.71	425.25
4530.000	300.00	.00	.00	909.96	3200.00	915.14	.00	915.79	15.78	6.49	492.86	805.65
4830.000	300.00	.00	.00	910.47	1400.00	913.84	.00	914.16	12.91	4.53	308.99	389.57
4830.000	300.00	.00	.00	910.47	3200.00	915.61	.00	916.28	16.17	6.54	488.96	795.86
5130.000	300.00	.00	.00	910.98	1400.00	914.23	.00	914.58	14.55	4.71	297.52	367.06
5130.000	300.00	.00	.00	910.98	3200.00	916.09	.00	916.77	16.42	6.58	486.53	[illegible]79
5430.000	300.00	.00	.00	911.49	1400.00	914.67	.00	915.03	15.64	4.81	290.78	35[illegible]
5430.000	300.00	.00	.00	911.49	3200.00	916.59	.00	917.26	16.60	6.60	484.81	785.[illegible]
5730.000	300.00	.00	.00	912.00	1400.00	915.15	.00	915.52	16.44	4.89	286.20	345.28
5730.000	300.00	.00	.00	912.00	3200.00	917.08	.00	917.76	16.73	6.62	483.57	782.39
6030.000	300.00	.00	.00	912.51	1400.00	915.64	.00	916.01	16.66	4.91	285.00	342.99
6030.000	300.00	.00	.00	912.51	3200.00	917.59	.00	918.27	16.82	6.63	482.74	780.33
6330.000	300.00	.00	.00	913.02	1400.00	916.14	.00	916.52	16.79	4.92	284.29	341.63
6330.000	300.00	.00	.00	913.02	3200.00	918.09	.00	918.77	16.88	6.64	482.19	778.97
6630.000	300.00	.00	.00	913.53	1400.00	916.64	.00	917.02	16.87	4.93	283.88	340.86
6630.000	300.00	.00	.00	913.53	3200.00	918.60	.00	919.28	16.92	6.64	481.83	778.06
6718.700	88.00	.00	.00	913.68	1400.00	916.79	.00	917.17	16.86	4.93	284.00	340.99
6718.700	88.00	.00	.00	913.68	3200.00	918.74	.00	919.43	16.92	6.64	481.85	777.89
6768.700	138.70	.00	.00	913.77	1400.00	916.78	.00	917.58	11.83	7.18	195.10	406.97
6768.700	138.70	.00	.00	913.77	3200.00	918.44	.00	920.17	15.12	10.55	303.19	822.92
6865.900	97.20	922.00	.00	913.93	1400.00	917.54	.00	918.10	6.59	5.98	234.15	545.45
* 6865.900	97.20	922.00	.00	913.93	3200.00	920.66	.00	921.49	4.81	7.33	436.74	1458.53
6935.700	69.80	.00	.00	914.05	1400.00	917.57	.00	918.16	7.12	6.13	228.53	[illegible]
6935.700	69.80	.00	.00	914.05	3200.00	920.68	.00	921.54	5.04	7.44	430.34	14.

PROJECT TITLE : Bullard Wash Outfall Study

PROJECT NUMBER : 94129 6/12/1995

	Cross-Section Number SECNO	Channel Reach Length (ft) XLCH	Top of Roadway Elevation (ft MSL) ELTRD	Max. Low Chord Elevation (ft MSL) ELLC	Minimum C. S. Elevation (ft MSL) ELMIN	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	Critical W. S. Elevation (ft MSL) CRIWS	Energy Gradient Elevation (ft MSL) EG	Energy Gradient Slope * 10,000 10K*S	Channel Mean Flow Velocity (ft/s) VCH	Cross-Section Area (sq ft) AREA	Index Q (0.01 * Convey.) .01K
	7033.000	97.30	926.00	.00	914.22	1400.00	918.05	.00	918.54	10.09	5.64	248.04	440.69
	7033.000	97.30	926.00	.00	914.22	3200.00	921.79	.00	922.45	6.15	6.51	491.61	1290.47
	7083.000	50.00	.00	.00	914.31	1400.00	918.22	.00	918.60	7.57	4.92	284.83	508.90
	7083.000	50.00	.00	.00	914.31	3200.00	922.09	.00	922.50	3.67	5.10	627.32	1670.85
	7160.000	77.00	.00	.00	914.43	1400.00	918.27	.00	918.66	7.98	5.00	279.92	495.54
	7160.000	77.00	.00	.00	914.43	3200.00	922.12	.00	922.53	3.82	5.17	618.53	1636.82
	7200.000	40.00	.00	.00	914.50	1400.00	918.18	.00	918.76	12.84	6.10	229.49	390.69
	7200.000	40.00	.00	.00	914.50	3200.00	922.02	.00	922.60	5.59	6.07	527.13	1353.13
*	7206.000	6.00	.00	.00	919.53	1400.00	922.16	922.16	923.37	40.22	8.83	158.57	220.76
*	7206.000	6.00	.00	.00	919.53	3200.00	923.99	923.99	925.95	34.65	11.22	285.18	543.63
*	7350.000	144.00	.00	.00	919.77	1400.00	923.06	.00	923.80	19.01	6.93	201.92	321.08
	7350.000	144.00	.00	.00	919.77	3200.00	925.04	.00	926.38	19.57	9.28	344.83	723.30
*	7356.000	6.00	.00	.00	924.80	1400.00	927.43	927.43	928.65	40.70	8.86	157.96	219.45
*	7356.000	6.00	.00	.00	924.80	3200.00	929.26	929.26	931.22	34.76	11.23	284.88	542.76
*	7500.000	144.00	.00	.00	925.05	1400.00	928.33	.00	929.08	18.93	6.92	202.19	321.75
	7500.000	144.00	.00	.00	925.05	3200.00	930.31	.00	931.65	19.55	9.28	344.97	723.72
*	7506.000	6.00	.00	.00	930.11	1400.00	932.73	932.73	933.95	40.70	8.86	157.96	219.45
*	7506.000	6.00	.00	.00	930.11	3200.00	934.55	934.55	936.53	35.20	11.28	283.69	539.33
	7547.000	41.00	.00	.00	930.18	1400.00	933.33	.00	934.15	38.04	7.27	192.69	226.99
	7547.000	41.00	.00	.00	930.18	3200.00	935.33	.00	936.73	36.25	9.49	337.18	531.47
	7760.000	213.00	.00	.00	930.54	1400.00	934.21	.00	934.79	22.50	6.13	228.55	295.16
	7760.000	213.00	.00	.00	930.54	3200.00	936.32	.00	937.39	24.44	8.32	384.80	647.33
	7800.000	40.00	.00	.00	930.61	1400.00	934.31	.00	934.88	21.61	6.04	231.64	301.19
	7800.000	40.00	.00	.00	930.61	3200.00	936.44	.00	937.49	23.76	8.24	388.52	656.45
	7847.000	47.00	.00	.00	930.69	1400.00	934.42	.00	934.98	21.32	6.02	232.66	303.21
	7847.000	47.00	.00	.00	930.69	3200.00	936.56	.00	937.60	23.25	8.18	391.39	663.65
	8100.000	253.00	.00	.00	931.12	1400.00	934.97	.00	935.50	19.19	5.81	240.77	319.60
	8100.000	253.00	.00	.00	931.12	3200.00	937.21	.00	938.16	20.37	7.82	409.18	709.05
	8400.000	300.00	.00	.00	931.63	1400.00	935.55	.00	936.05	17.86	5.68	246.49	331.25
	8400.000	300.00	.00	.00	931.63	3200.00	937.85	.00	938.75	18.83	7.62	420.19	737.44

Cross-Section Number SECNO	Channel Reach Length (ft) XLCH	Top of Roadway Elevation (ft MSL) ELTRD	Max. Low Chord Elevation (ft MSL) ELLC	Minimum C. S. Elevation (ft MSL) ELMIN	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	Critical W. S. Elevation (ft MSL) CRIWS	Energy Gradient Elevation (ft MSL) EG	Energy Gradient Slope * 10,000 10K*S	Channel Mean Flow Velocity (ft/s) VCH	Cross-Section Area (sq ft) AREA	Index Q (0.01 * Convey.) .01K
8670.000	270.00	.00	.00	932.09	1400.00	936.04	.00	936.53	17.35	5.63	248.84	336.07
8670.000	270.00	.00	.00	932.09	3200.00	938.37	.00	939.25	18.19	7.53	425.16	750.37
8970.000	300.00	.00	.00	932.60	1400.00	936.56	.00	937.05	17.19	5.61	249.60	337.63
8970.000	300.00	.00	.00	932.60	3200.00	938.93	.00	939.80	17.80	7.47	428.27	758.49
9270.000	300.00	.00	.00	933.11	1400.00	937.08	.00	937.56	17.17	5.61	249.70	337.84
9270.000	300.00	.00	.00	933.11	3200.00	939.47	.00	940.33	17.52	7.43	430.54	764.43
9570.000	300.00	.00	.00	933.62	1400.00	937.59	.00	938.08	17.12	5.60	249.93	338.32
9570.000	300.00	.00	.00	933.62	3200.00	940.00	.00	940.85	17.33	7.40	432.15	768.64
* 9870.000	300.00	.00	.00	934.13	1400.00	938.20	.00	938.41	6.80	3.69	379.19	536.82
* 9870.000	300.00	.00	.00	934.13	3200.00	940.83	.00	941.20	6.48	4.85	659.62	1256.87
10170.000	300.00	.00	.00	934.64	1400.00	938.41	.00	938.66	8.86	4.02	348.44	[illegible]41
10170.000	300.00	.00	.00	934.64	3200.00	941.01	.00	941.42	7.71	5.14	622.93	[illegible]
10410.000	300.00	.00	.00	935.15	1400.00	938.67	.00	938.96	11.08	4.31	324.47	420.[illegible]
10410.000	300.00	.00	.00	935.15	3200.00	941.23	.00	941.69	9.06	5.42	590.85	1063.37
10680.000	270.00	.00	.00	935.61	1400.00	938.98	.00	939.30	12.93	4.53	308.84	389.28
10680.000	270.00	.00	.00	935.61	3200.00	941.46	.00	941.96	10.36	5.66	565.41	994.35
10980.000	300.00	.00	.00	936.12	1400.00	939.37	.00	939.71	14.56	4.71	297.43	366.87
10980.000	300.00	.00	.00	936.12	3200.00	941.76	.00	942.30	11.76	5.90	542.37	933.09
11275.000	295.00	.00	.00	936.62	1400.00	939.80	.00	940.16	15.61	4.81	290.94	354.34
11275.000	295.00	.00	.00	936.62	3200.00	942.10	.00	942.68	12.96	6.09	525.43	888.82
11315.000	40.00	.00	.00	936.69	1400.00	939.85	.00	940.21	9.19	4.84	289.25	461.84
11315.000	40.00	.00	.00	936.69	3200.00	942.14	.00	942.72	7.59	6.12	523.26	1161.76
* 11323.000	8.00	.00	.00	944.00	1400.00	945.19	945.19	945.56	100.67	6.47	407.17	139.53
* 11323.000	8.00	.00	.00	944.00	3200.00	945.75	945.75	946.22	79.84	7.63	835.04	358.14

SUMMARY PRINTOUT TABLE 150 : Bullard Wash Outfall Study

94129

	Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	W.S. Elev Diff per Profile (ft) DIFWSP	W.S. Elev Diff per Section (ft) DIFWSX	W.S. Elev Diff per Know/Comp (ft) DIFKWS	Water Surface Top Width (ft) TOPWID	Channel Reach Length (ft) XLCH
	1340.000	1400.00	912.50	.00	.00	.00	200.00	.00
	1340.000	3200.00	906.30	-6.20	.00	.00	200.00	.00
*	1640.000	1400.00	912.50	.00	.00	.00	200.00	300.00
*	1640.000	3200.00	906.45	-6.05	.15	.00	103.47	300.00
	1940.000	1400.00	912.51	.00	.02	.00	200.00	300.00
*	1940.000	3200.00	908.02	-4.50	1.57	.00	111.95	300.00
	2240.000	1400.00	912.54	.00	.03	.00	200.00	300.00
	2240.000	3200.00	908.85	-3.69	.83	.00	114.56	300.00
	419.000	1400.00	912.56	.00	.02	.00	200.00	179.00
	2419.000	3200.00	909.28	-3.28	.43	.00	115.54	179.00
	2439.000	1400.00	912.55	.00	.00	.00	200.00	20.00
	2439.000	3200.00	909.04	-3.51	-.24	.00	65.01	20.00
*	2442.000	1400.00	912.47	.00	-.08	.00	65.01	3.00
*	2442.000	3200.00	910.62	-1.86	1.58	.00	65.01	3.00
	2528.000	1400.00	912.51	.00	.03	.00	116.72	86.00
	2528.000	3200.00	911.52	-.98	.91	.00	65.01	86.00
*	2548.000	1400.00	912.63	.00	.12	.00	109.15	40.00
*	2548.000	3200.00	912.78	.15	1.26	.00	109.75	40.00
	2730.000	1400.00	912.66	.00	.03	.00	108.02	182.00
	2730.000	3200.00	912.92	.27	.14	.00	109.09	182.00
	3030.000	1400.00	912.71	.00	.06	.00	106.21	300.00
	3030.000	3200.00	913.19	.48	.27	.00	108.13	300.00
	3330.000	1400.00	912.79	.00	.08	.00	104.46	300.00
	3330.000	3200.00	913.51	.71	.31	.00	107.32	300.00
	3630.000	1400.00	912.90	.00	.11	.00	102.85	300.00

PROJECT TITLE : Bullard Wash Outfall Study

PROJECT NUMBER : 94129 6/12/1995

Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	W.S. Elev Diff per Profile (ft) DIFWSP	W.S. Elev Diff per Section (ft) DIFWSX	W.S. Elev Diff per Know/Comp (ft) DIFKWS	Water Surface Top Width (ft) TOPWID	Channel Reach Length (ft) XLCH
3630.000	3200.00	913.86	.96	.36	.00	106.70	300.00
3930.000	1400.00	913.05	.00	.15	.00	101.39	300.00
3930.000	3200.00	914.26	1.21	.40	.00	106.25	300.00
4230.000	1400.00	913.25	.00	.20	.00	100.18	300.00
4230.000	3200.00	914.69	1.44	.43	.00	105.92	300.00
4530.000	1400.00	913.51	.00	.26	.00	99.19	300.00
4530.000	3200.00	915.14	1.63	.45	.00	105.68	300.00
4830.000	1400.00	913.84	.00	.33	.00	98.47	300.00
4830.000	3200.00	915.61	1.77	.47	.00	105.53	300.00
5130.000	1400.00	914.23	.00	.39	.00	98.01	300.00
5130.000	3200.00	916.09	1.86	.48	.00	105.44	300.00
5430.000	1400.00	914.67	.00	.44	.00	97.73	300.00
5430.000	3200.00	916.59	1.91	.49	.00	105.37	300.00
5730.000	1400.00	915.15	.00	.47	.00	97.54	300.00
5730.000	3200.00	917.08	1.94	.50	.00	105.33	300.00
6030.000	1400.00	915.64	.00	.49	.00	97.49	300.00
6030.000	3200.00	917.59	1.95	.50	.00	105.29	300.00
6330.000	1400.00	916.14	.00	.50	.00	97.46	300.00
6330.000	3200.00	918.09	1.95	.50	.00	105.27	300.00
6630.000	1400.00	916.64	.00	.50	.00	97.45	300.00
6630.000	3200.00	918.60	1.95	.51	.00	105.26	300.00
6718.700	1400.00	916.79	.00	.15	.00	97.45	88.00
6718.700	3200.00	918.74	1.95	.15	.00	105.26	88.00
6768.700	1400.00	916.78	.00	-.02	.00	64.88	138.70
6768.700	3200.00	918.44	1.67	-.30	.00	64.92	138.70
6865.900	1400.00	917.54	.00	.76	.00	64.89	97.20
6865.900	3200.00	920.66	3.12	2.22	.00	64.97	97.20
6935.700	1400.00	917.57	.00	.03	.00	64.89	69.80
6935.700	3200.00	920.68	3.11	.02	.00	64.97	69.80

PROJECT TITLE : Bullard Wash Outfall Study

PROJECT NUMBER : 94129 6/12/1995

	Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	W.S. Elev Diff per Profile (ft) DIFWSP	W.S. Elev Diff per Section (ft) DIFWSX	W.S. Elev Diff per Know/Comp (ft) DIFKWS	Water Surface Top Width (ft) TOPWID	Channel Reach Length (ft) XLCH
	7033.000	1400.00	918.05	.00	.47	.00	64.86	97.30
	7033.000	3200.00	921.79	3.75	1.11	.00	64.93	97.30
	7083.000	1400.00	918.22	.00	.17	.00	80.65	50.00
	7083.000	3200.00	922.09	3.87	.30	.00	96.14	50.00
	7160.000	1400.00	918.27	.00	.05	.00	80.40	77.00
	7160.000	3200.00	922.12	3.84	.02	.00	95.78	77.00
	7200.000	1400.00	918.18	.00	-.09	.00	69.72	40.00
	7200.000	3200.00	922.02	3.85	-.09	.00	85.10	40.00
*	7206.000	1400.00	922.16	.00	3.98	.00	65.53	6.00
*	7206.000	3200.00	923.99	1.83	1.97	.00	72.85	6.00
*	7350.000	1400.00	923.06	.00	.89	.00	68.12	144.00
	7350.000	3200.00	925.04	1.98	1.05	.00	76.05	144.00
*	7356.000	1400.00	927.43	.00	4.37	.00	65.49	6.00
*	7356.000	3200.00	929.26	1.84	4.22	.00	72.83	6.00
*	7500.000	1400.00	928.33	.00	.91	.00	68.14	144.00
	7500.000	3200.00	930.31	1.98	1.05	.00	76.06	144.00
*	7506.000	1400.00	932.73	.00	4.40	.00	65.49	6.00
*	7506.000	3200.00	934.55	1.82	4.24	.00	72.76	6.00
	7547.000	1400.00	933.33	.00	.60	.00	67.58	41.00
	7547.000	3200.00	935.33	2.00	.78	.00	75.65	41.00
	7760.000	1400.00	934.21	.00	.87	.00	69.67	213.00
	7760.000	3200.00	936.32	2.11	.99	.00	78.12	213.00
	7800.000	1400.00	934.31	.00	.11	.00	69.84	40.00
	7800.000	3200.00	936.44	2.12	.12	.00	78.31	40.00
	7847.000	1400.00	934.42	.00	.11	.00	69.90	47.00
	7847.000	3200.00	936.56	2.15	.13	.00	78.46	47.00
	8100.000	1400.00	934.97	.00	.55	.00	70.36	253.00
	8100.000	3200.00	937.21	2.24	.65	.00	79.36	253.00
	8400.000	1400.00	935.55	.00	.58	.00	70.69	300.00
	8400.000	3200.00	937.85	2.30	.64	.00	79.92	300.00

PROJECT TITLE : Bullard Wash Outfall Study

PROJECT NUMBER : 94129 6/12/1995

Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	W.S. Elev Diff per Profile (ft) DIFWSP	W.S. Elev Diff per Section (ft) DIFWSX	W.S. Elev Diff per Know/Comp (ft) DIFKWS	Water Surface Top Width (ft) TOPWID	Channel Reach Length (ft) XLCH
8670.000	1400.00	936.04	.00	.49	.00	70.82	270.00
8670.000	3200.00	938.37	2.34	.52	.00	80.16	270.00
8970.000	1400.00	936.56	.00	.52	.00	70.86	300.00
8970.000	3200.00	938.93	2.37	.55	.00	80.32	300.00
9270.000	1400.00	937.08	.00	.52	.00	70.87	300.00
9270.000	3200.00	939.47	2.39	.54	.00	80.43	300.00
9570.000	1400.00	937.59	.00	.52	.00	70.88	300.00
9570.000	3200.00	940.00	2.41	.53	.00	80.51	300.00
* 9870.000	1400.00	938.20	.00	.61	.00	101.28	300.00
* 9870.000	3200.00	940.83	2.63	.83	.00	111.81	300.00
10170.000	1400.00	938.41	.00	.20	.00	100.06	300.00
10170.000	3200.00	941.01	2.61	.18	.00	110.49	300.00
10410.000	1400.00	938.67	.00	.27	.00	99.10	300.00
10410.000	3200.00	941.23	2.56	.22	.00	109.32	300.00
10680.000	1400.00	938.98	.00	.30	.00	98.47	270.00
10680.000	3200.00	941.46	2.49	.23	.00	108.39	270.00
10980.000	1400.00	939.37	.00	.39	.00	98.00	300.00
10980.000	3200.00	941.76	2.39	.30	.00	107.54	300.00
11275.000	1400.00	939.80	.00	.43	.00	97.74	295.00
11275.000	3200.00	942.10	2.30	.34	.00	106.90	295.00
11315.000	1400.00	939.85	.00	.04	.00	97.67	40.00
11315.000	3200.00	942.14	2.29	.04	.00	106.82	40.00
* 11323.000	1400.00	945.19	.00	5.35	.00	645.16	8.00
* 11323.000	3200.00	945.75	.56	3.61	.00	903.03	8.00

SUMMARY OF WARNING AND STATUS MESSAGES :

Section 1640, profile 1, conveyance change outside acceptable range.

Section 1640, profile 2, conveyance change outside acceptable range.

Section 1940, profile 2, conveyance change outside acceptable range.

Section 2442, profile 1, conveyance change outside acceptable range.

Section 2442, profile 2, critical depth assumed.

Section 2442, profile 2, probable minimum specific energy.

Section 2442, profile 2, 20 trials attempted to balance water surface elevation.

Section 2548, profile 1, conveyance change outside acceptable range.

Section 2548, profile 2, conveyance change outside acceptable range.

Section 6865.899, profile 2, conveyance change outside acceptable range.

ction 7206, profile 1, critical depth assumed.

Section 7206, profile 1, probable minimum specific energy.

Section 7206, profile 1, 20 trials attempted to balance water surface elevation.

Section 7206, profile 2, critical depth assumed.

Section 7206, profile 2, probable minimum specific energy.

Section 7206, profile 2, 20 trials attempted to balance water surface elevation.

Section 7350, profile 1, conveyance change outside acceptable range.

Section 7356, profile 1, critical depth assumed.

Section 7356, profile 1, probable minimum specific energy.

Section 7356, profile 1, 20 trials attempted to balance water surface elevation.

Section 7356, profile 2, critical depth assumed.

ection 7356, profile 2, probable minimum specific energy.

Section 7356, profile 2, 20 trials attempted to balance water surface elevation.

Section 7500, profile 1, conveyance change outside acceptable range.

Section 7506, profile 1, critical depth assumed.

Section 7506, profile 1, probable minimum specific energy.

Section 7506, profile 1, 20 trials attempted to balance water surface elevation.

Section 7506, profile 2, critical depth assumed.

Section 7506, profile 2, probable minimum specific energy.

Section 7506, profile 2, 20 trials attempted to balance water surface elevation.

Section 9870, profile 1, conveyance change outside acceptable range.

Section 9870, profile 2, conveyance change outside acceptable range.

Section 11323, profile 1, critical depth assumed.

Section 11323, profile 1, probable minimum specific energy.

Section 11323, profile 1, 20 trials attempted to balance water surface elevation.

Section 11323, profile 2, critical depth assumed.

Section 11323, profile 2, probable minimum specific energy.

Section 11323, profile 2, 20 trials attempted to balance water surface elevation.

38 Warning and status message(s) generated

END OF OUTPUT

==========
B O S S H E C - 2 (tm)
==========

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Version : 3.10
Serial Number : 0010276.250

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PROGRAM ORIGIN :

Boss Hec-2 (tm) is an enhanced version of the U.S. Army Corps of Engineers Hydrologic Engineering Center HEC-2 program for water-surface profile computations. Program based upon the September 1990 version, updated on August 1991.

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PROJECT DESCRIPTION :

PROJECT TITLE : Bullard Wash Outfall Study
PROJECT NUMBER : 94129
'SCRIPTION : Segment 2 Lateral Channel EAST LOCAL TRIBUTARY COLLECTOR CHANNEL
NEER : Wood, Patel & Associates, Inc.
DATE OF RUN : 1/24/1995
TIME OF RUN : 1:43 pm

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T1      94129
T2      Bullard Wash Outfall Study
T3      Segment 2 Lateral Channel
T4      * 100-year flow = 850 cfs
T4        Starting water surface elevation corresponds to Bullard Wash
T4        Channel water surface elevation at station 7140.
```

JOB PARAMETERS :

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	-1.0	0	0.0	850.0	922.2	
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	-1	1	0.0	0.0	0.0	0.0	0.0	-6.0	0.0	

USER-DEFINED SUMMARY TABLES (J3) :

38	42	1	43	26	51	4	8	10	53
54	13	15		150					

REQUESTED CROSS-SECTION PRINTOUTS (J5) :

-10	-10

NC	0.019	0.019	0.019	0.1	0.3

CONFLUENCE WITH MAIN CHANNEL
CONFLUENCE WITH MAIN CHANNEL

X1	38.5	7	0.0	200.0	0.0	0.0	0.0	1.0	0.0	
CI	100.0	917.41	0.019	2.0	2.0	-8.0	0.01			
GR	928.0	0.0	924.0	0.1	922.0	100.0	924.0	120.0	925.6	128.0
GR	928.0	138.0	928.0	200.0						
X1	300	8	0.0	200.0	261.5	261.5	261.5	1.0	0.0	
CI	100.0	918.14	261.019	2.0	2.0	8.0	0.01			
GR	926.8	0.0	926.0	28.0	926.0	100.0	926.0	118.0	932.0	143.0
GR	933.0	163.0	934.0	188.0	934.0	200.0				
X1	600	10	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	918.93	300.019	2.0	2.0	8.0	0.01			
GR	928.0	0.0	928.0	35.0	926.0	93.0	926.4	100.0	928.0	136.0
GR	930.0	147.0	932.0	153.0	934.0	163.0	934.0	186.0	933.3	200.0

X1	900	10	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	919.82	300.019	2.0	2.0	8.0	0.01			
GR	927.7	0.0	926.0	5.0	926.0	43.0	928.0	57.0	928.0	67.0
GR	930.0	93.0	932.0	110.0	938.0	121.0	938.0	142.0	936.6	200.0
X1	1200	11	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	920.66	300.019	2.0	2.0	8.0	0.01			
GR	930.0	0.0	926.0	7.0	926.0	26.0	930.0	32.0	932.0	39.0
GR	932.9	67.0	934.0	75.0	938.0	90.0	938.0	100.0	934.0	151.0
GR	934.0	200.0								
X1	1500	9	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	921.50	300.019	2.0	2.0	8.0	0.01			
GR	930.0	0.0	930.0	29.0	934.0	38.0	934.0	44.0	936.0	99.0
GR	936.0	100.0	936.0	125.0	934.0	149.0	934.0	200.0		
X1	1800	11	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	922.34	300.019	2.0	2.0	8.0	0.01			
GR	933.5	0.0	930.0	7.0	930.0	28.0	932.0	37.0	934.0	96.0
GR	934.3	100.0	934.7	106.0	935.9	126.0	935.9	132.0	934.0	147.0
GR	934.0	200.0								

BOTTOM OF DROP STRUCTURE

OM OF DROP STRUCTURE

X.	2094	8	0.0	200.0	294.0	294.0	294.0	1.0	0.0	
CI	100.0	923.17	294.019	2.0	2.0	8.0	0.01			
GR	931.4	0.0	931.4	17.0	932.0	35.0	932.9	85.0	932.9	100.0
GR	932.9	120.0	932.5	172.0	932.7	200.0				

TOP OF DROP STRUCTURE

TOP OF DROP STRUCTURE

X1	2100	10	0.0	200.0	300.0	300.0	300.0	1.0	0.0	
CI	100.0	929.17	6.019	2.0	2.0	-8.0	0.01			
GR	940.0	0.0	931.4	0.1	931.4	17.0	932.0	35.0	932.9	85.0
GR	932.9	100.0	932.9	120.0	932.5	172.0	932.7	199.9	940.0	200.0

PROJECT TITLE : Bullard Wash Outfall Study

PROJECT NUMBER : 94129 1/24/1995

SPECIAL NOTE :

An asterisk (*) to the left of the cross-section number indicates a special note is present in the SUMMARY OF WARNING AND STATUS MESSAGES section.

SUMMARY PRINTOUT : Bullard Wash Outfall Study
Segment 2 Lateral Channel
94129

Cross-Section Number SECNO	Minimum C. S. Elevation (ft MSL) ELMIN	Computed W. S. Elevation (ft MSL) CWSEL	Discharge Flow (cfs) Q	Channel Mean Flow Velocity (ft/s) VCH	W.S. Elev Diff per Section (ft) DIFWSX	Water Surface Top Width (ft) TOPWID	Flow Depth (ft) DEPTH	Mean Velocity Head (ft) HV	Left W. S. Station (ft) SSTA	Right W. S. Station (ft) ENDST	Left Overbank Flow (cfs) QLOB	Right Overbank Flow (cfs) QROB
* 38.500	917.41	922.21	850.00	10.06	.00	27.21	4.80	1.57	86.40	113.60	.00	.00
300.000	918.14	923.56	850.00	8.32	1.35	29.69	5.42	1.07	85.15	114.85	.00	.00
600.000	918.93	924.28	850.00	8.48	.72	29.42	5.35	1.12	85.29	114.71	.00	.00
900.000	919.82	925.03	850.00	8.85	.75	28.85	5.21	1.22	85.57	114.43	.00	
1200.000	920.66	925.90	850.00	8.79	.87	28.94	5.24	1.20	85.53	114.47	.00	.00
1500.000	921.50	926.76	850.00	8.73	.86	29.03	5.26	1.18	85.49	114.51	.00	.00
1800.000	922.34	927.59	850.00	8.73	.83	29.03	5.25	1.18	85.48	114.52	.00	.00
2094.000	923.17	928.40	850.00	8.78	.81	28.95	5.23	1.20	85.53	114.47	.00	.00
* 2100.000	929.17	933.96	850.00	10.08	5.56	27.17	4.79	1.58	86.41	113.59	.00	.00

SUMMARY PRINTOUT TABLE 150 : Bullard Wash Outfall Study
---------- Segment 2 Lateral Channel
94129

Cross-Section Number SECNO	Channel Reach Length (ft) XLCH	Top of Roadway Elevation (ft MSL) ELTRD	Max. Low Chord Elevation (ft MSL) ELLC	Minimum C. S. Elevation (ft MSL) ELMIN	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	Critical W. S. Elevation (ft MSL) CRIWS	Energy Gradient Elevation (ft MSL) EG	Energy Gradient Slope * 10,000 10K*S	Channel Mean Flow Velocity (ft/s) VCH	Cross-Section Area (sq ft) AREA	Index Q (0.01 * Convey.) .01K
* 38.500	.00	.00	.00	917.41	850.00	922.21	922.21	923.78	40.58	10.06	84.52	133.44
300.000	261.00	.00	.00	918.14	850.00	923.56	.00	924.64	24.32	8.32	102.22	172.37
600.000	300.00	.00	.00	918.93	850.00	924.28	.00	925.40	25.66	8.48	100.19	167.78
900.000	300.00	.00	.00	919.82	850.00	925.03	.00	926.24	28.77	8.85	96.04	158.48
1200.000	300.00	.00	.00	920.66	850.00	925.90	.00	927.10	28.24	8.79	96.70	159.94
1500.000	300.00	.00	.00	921.50	850.00	926.76	.00	927.94	27.76	8.73	97.32	161.33
[illegible]0.000	300.00	.00	.00	922.34	850.00	927.59	.00	928.78	27.72	8.73	97.37	161.44
2094.000	294.00	.00	.00	923.17	850.00	928.40	.00	929.60	28.19	8.78	96.76	160.08
* 2100.000	6.00	.00	.00	929.17	850.00	933.96	933.96	935.54	40.88	10.08	84.29	132.94

SUMMARY PRINTOUT TABLE 150 : Bullard Wash Outfall Study
---------- Segment 2 Lateral Channel
94129

Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	W.S. Elev Diff per Profile (ft) DIFWSP	W.S. Elev Diff per Section (ft) DIFWSX	W.S. Elev Diff per Know/Comp (ft) DIFKWS	Water Surface Top Width (ft) TOPWID	Channel Reach Length (ft) XLCH
* 38.500	850.00	922.21	.00	.00	.01	27.21	.00
300.000	850.00	923.56	.00	1.35	.00	29.69	261.00
600.000	850.00	924.28	.00	.72	.00	29.42	300.00

Cross-Section Number SECNO	Discharge Flow (cfs) Q	Computed W. S. Elevation (ft MSL) CWSEL	W.S. Elev Diff per Profile (ft) DIFWSP	W.S. Elev Diff per Section (ft) DIFWSX	W.S. Elev Diff per Know/Comp (ft) DIFKWS	Water Surface Top Width (ft) TOPWID	Channel Reach Length (ft) XLCH
900.000	850.00	925.03	.00	.75	.00	28.85	300.00
1200.000	850.00	925.90	.00	.87	.00	28.94	300.00
1500.000	850.00	926.76	.00	.86	.00	29.03	300.00
1800.000	850.00	927.59	.00	.83	.00	29.03	300.00
2094.000	850.00	928.40	.00	.81	.00	28.95	294.00
* 2100.000	850.00	933.96	.00	5.56	.00	27.17	6.00

SUMMARY OF WARNING AND STATUS MESSAGES :

Section 38.5, profile 1, critical depth assumed.

Section 2100, profile 1, critical depth assumed.

Section 2100, profile 1, probable minimum specific energy.

Section 2100, profile 1, 20 trials attempted to balance water surface elevation.

4 Warning and status message(s) generated

END OF OUTPUT

APPENDIX E

DESIGN CALCULATIONS FOR RECOMMENDED ALTERNATIVE

DESIGNED BY SW	DATE 6/21/95	SHEET NO. 1	PAGE NO.
CHECKED BY CSB	DATE 6-28-95	OF 1	JOB NO. 12278
REVIEWED BY	DATE	SUBJECT:	
APPROVED BY	DATE		

HEC-1: EAST LOCAL TRIBUTARY COLLECTOR CHANNEL

THE HEC-1 MODEL DOES NOT READILY SHOW THE TOTAL FLOW RATE THAT OCCURS IN THE EAST LOCAL TRIBUTARY. DUE TO THE HEC-1 LIMITATION OF THE NUMBER OF HYDROGRAPHS IN THE STACK, THE ADDITION OF HYDROGRAPHS AT THIS STEP IS SOMEWHAT UNCONVENTIONAL OR OUT OF ORDER.

REFER TO THE DRAINAGE AREA MAP FOR THE FOLLOWING SUB BASIN LOCATIONS: SUB BASIN 299, 317, 336. THESE ARE THE SUB BASINS THAT CONTRIBUTE TO THE EAST LOCAL TRIBUTARY. SUB BASINS 300, 301, 318, 319 AND 337 HAVE THE POTENTIAL TO CONTRIBUTE FLOW, HOWEVER, THE MODEL INDICATES THAT ALL THE FLOW AT CP337 IS STORED AND ROUTED DIRECTLY SOUTH. THEREFORE CP337 DOES NOT CONTRIBUTE TO THE EAST LOCAL TRIBUTARY.

INORDER TO "SEE" THE FLOW RATE ACCUMULATED AT CP336 FROM ONLY THE LOCAL SUB BASINS, THE MAIN BULLARD WASH HYDROGRAPH MUST NOT BE INCLUDED. AGAIN, THE HEC-1 MODEL CURRENTLY ADDS THE FLOWS FROM SUB BASINS 299 AND 317 DIRECTLY TO THE MAIN WASH PRIOR TO SUB BASIN 336.

THE APPROXIMATE FLOW RATE IN THE EAST LOCAL TRIBUTARY CAN BE CHECKED BY ADDING THE INDIVIDUAL FLOW RATES BEFORE ROUTING ANY OF THE FLOWS:

SUB BASIN 299:	289 cfs
SUB BASIN 317:	341 cfs
SUB BASIN 336:	552 cfs
* TOTAL	1182 cfs

* THIS TOTAL IS REDUCED SIGNIFICANTLY THROUGH ROUTING STEPS AND HYDROGRAPH ADDITIONS.

A BETTER ESTIMATE CAN BE FOUND BY EITHER REMOVING THE MAIN BULLARD WASH HYDROGRAPH AT CP335 AND USING THE RESULTING CP336 HYDROGRAPH OR SIMPLY USE THE ROUTED HYDROGRAPH 1I336 AND SUB BASIN 336 BELOW:

1I336	311 cfs	
SUBBASIN 336	552 cfs	
TOTAL	863 cfs	≈ 850 cfs DESIGN Q

SC 3020

UNITS: TOL ≡ 0.001 degC ≡ K degF ≡ R

kip ≡ 1000·lbf N ≡ newton kN ≡ 1000·newton MPa ≡ 10^6·Pa kPa ≡ 10^3·Pa

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$plf \equiv \frac{lbf}{ft}$ $psf \equiv \frac{lbf}{ft^2}$ $pcf \equiv \frac{lbf}{ft^3}$ $psi \equiv \frac{lbf}{in^2}$ $pci \equiv \frac{lbf}{in^3}$ pft ≡ lbf·ft pin ≡ lbf·in

$klf \equiv \frac{kip}{ft}$ $ksf \equiv \frac{kip}{ft^2}$ $kcf \equiv \frac{kip}{ft^3}$ $ksi \equiv \frac{kip}{in^2}$ $kci \equiv \frac{kip}{in^3}$ kft ≡ kip·ft kin ≡ kip·in

$L := 34 \cdot ft$ $b := 1 \cdot ft$ $t := 24 \cdot in$ $S := \frac{b \cdot t^2}{6}$ $A_c := t \cdot b$ $\gamma_c := 150 \cdot pcf$

$h := 6 \cdot ft$ $\gamma_w := 62.4 \cdot pcf$

$w_{dl} := t \cdot \gamma_c \cdot b$ $w_{dl} = 300 \cdot plf$

$w_{ll} := h \cdot \gamma_w \cdot b$ $w_{ll} = 374.4 \cdot plf$

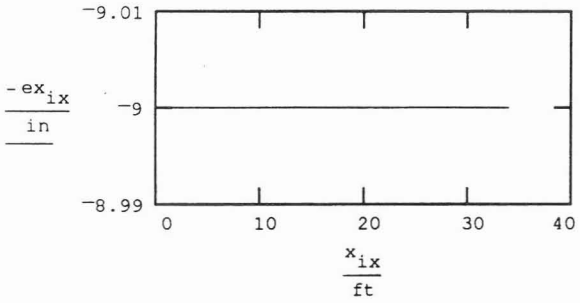
$hp1 := 0.4 \cdot L$ $hp2 := L - hp1$

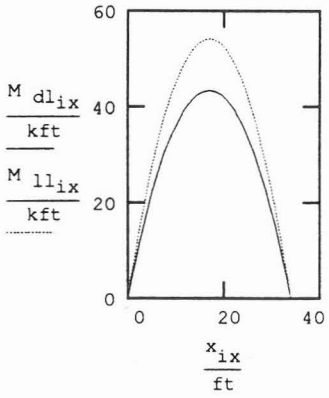
$bc := 3 \cdot in$ $ee := \frac{t}{2} - bc$

$$ex(x) := ee + \left(\frac{t}{2} - bc - ee\right) \cdot \left[\frac{x}{hp1} \cdot (x < hp1) \ldots + (x \ge hp1) \cdot (x \le hp2) \ldots + \frac{L - x}{hp1} \cdot (x > hp2) \right]$$

$np := 40$ $ix := 0, 1 .. np$ $x_{ix} := \frac{L}{np} \cdot ix$

$ex_{ix} := ex(x_{ix})$ $M_{dl_{ix}} := \frac{w_{dl} \cdot x_{ix}}{2} \cdot (L - x_{ix})$ $M_{ll_{ix}} := \frac{w_{ll} \cdot x_{ix}}{2} \cdot (L - x_{ix})$





$ss := 6 \cdot in$ $ns := \frac{b}{ss}$ $ns = 2$

$f_{psi} := 202.5 \cdot ksi$ $f_{psf} := 170 \cdot ksi$ $A_{ps} := 0.1531 \cdot in^2$

$P_{psi} := ns \cdot A_{ps} \cdot f_{psi}$ $\quad P_{psi} = 62.006 \cdot kip$ $\quad \frac{P_{psi}}{ns} = 31.003 \cdot kip$

$P_{psf} := ns \cdot A_{ps} \cdot f_{psf}$ $\quad P_{psf} = 52.054 \cdot kip$ $\quad \frac{P_{psf}}{ns} = 26.027 \cdot kip$

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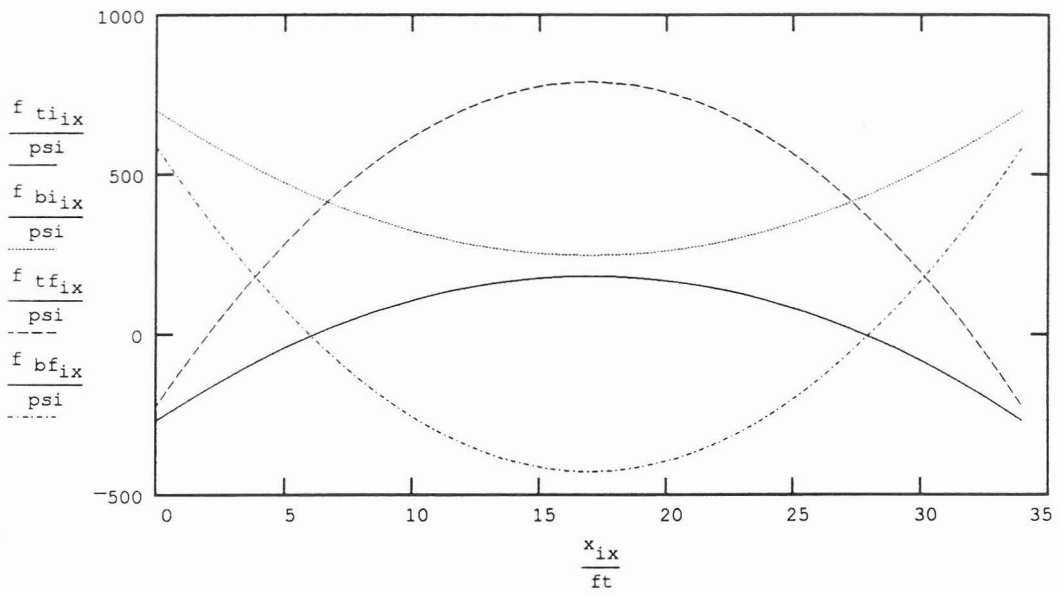
$$f_{tpsi_{ix}} := \frac{P_{psi}}{A_c} - \frac{P_{psi} \cdot ex_{ix}}{S} \qquad f_{bpsi_{ix}} := \frac{P_{psi}}{A_c} + \frac{P_{psi} \cdot ex_{ix}}{S}$$

$$f_{tpsf_{ix}} := \frac{P_{psf}}{A_c} - \frac{P_{psf} \cdot ex_{ix}}{S} \qquad f_{bpsf_{ix}} := \frac{P_{psf}}{A_c} + \frac{P_{psf} \cdot ex_{ix}}{S}$$

$$f_{mdl_{ix}} := \frac{M_{dl_{ix}}}{S} \qquad f_{mll_{ix}} := \frac{M_{ll_{ix}}}{S}$$

$$f_{ti_{ix}} := f_{tpsi_{ix}} + f_{mdl_{ix}} \qquad f_{tf_{ix}} := f_{tpsf_{ix}} + f_{mdl_{ix}} + f_{mll_{ix}}$$

$$f_{bi_{ix}} := f_{bpsi_{ix}} - f_{mdl_{ix}} \qquad f_{bf_{ix}} := f_{bpsf_{ix}} - f_{mdl_{ix}} - f_{mll_{ix}}$$



$\min(f_{ti}) = -269.121 \cdot psi$ $\quad \left(\frac{\min(f_{bf})}{6 \cdot \sqrt{psi}}\right)^2 = 5081.256 \cdot psi$

$\max(f_{bi}) = 699.715 \cdot psi$

$\max(f_{tf}) = 789.184 \cdot psi$ $\quad \frac{\max(f_{bi})}{0.4} = 1749.287 \cdot psi$

$\min(f_{bf}) = -427.698 \cdot psi$

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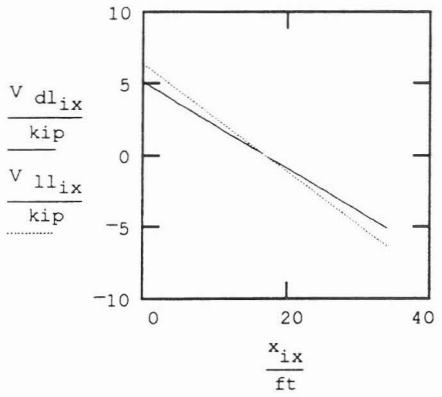
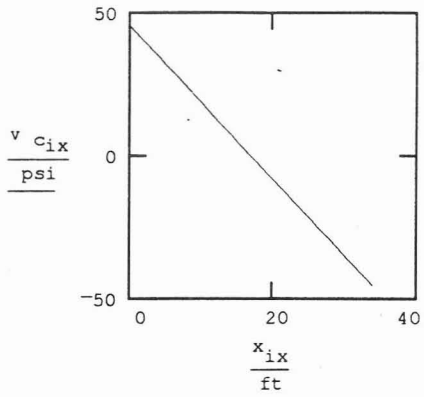
$$V_{dl_{ix}} := w_{dl} \cdot \left(\frac{L}{2} - x_{ix}\right) \qquad V_{ll_{ix}} := w_{ll} \cdot \left(\frac{L}{2} - x_{ix}\right)$$

$$v_{c_{ix}} := \frac{V_{dl_{ix}} + V_{ll_{ix}}}{b \cdot (t - bc)} \qquad \max(v_c) = 45.495 \cdot psi \qquad \left(\frac{\max(v_c)}{0.9 \cdot \sqrt{psi}}\right)^2 = 2555.329 \cdot psi$$



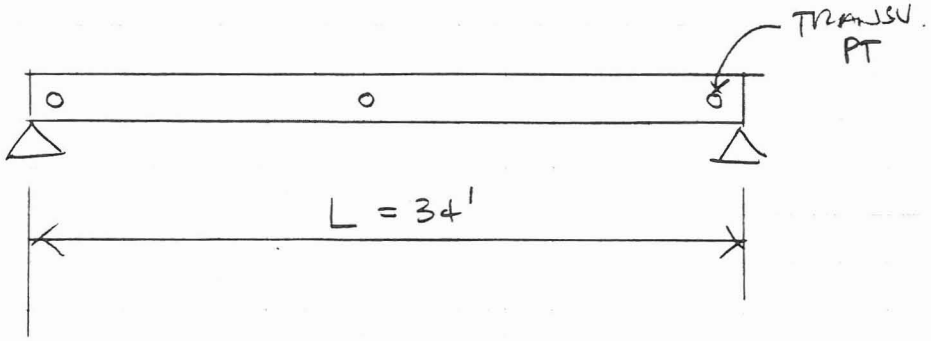


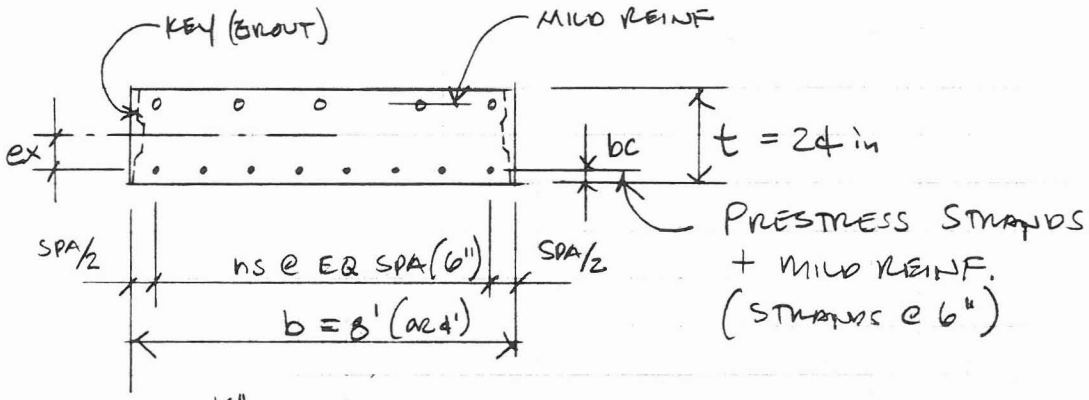
CONCLUSIONS
==========

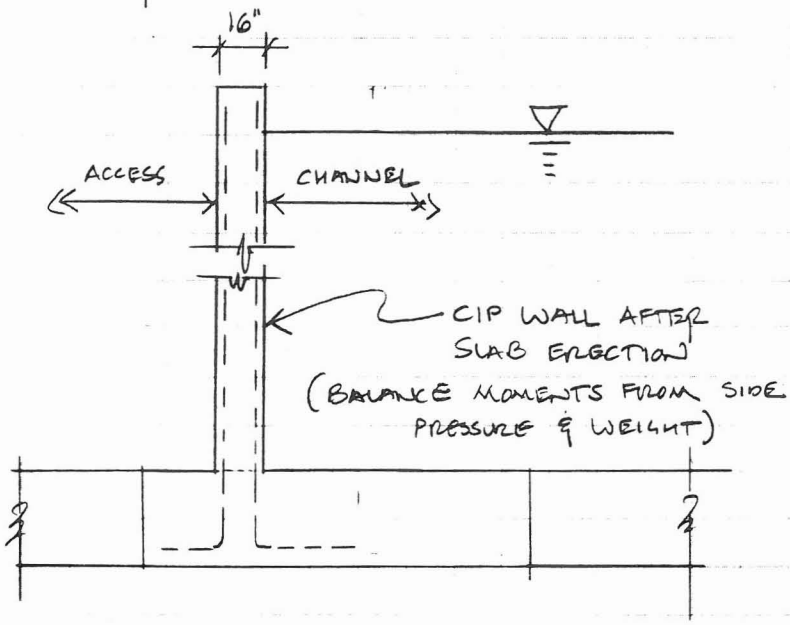
THE PRELIMINARY CALCULATIONS SHOW CONVEYING THE WASH OVER THE CANAL IS FEASIBLE BY SPANNING THE CANAL WITH A 24 INCH DEEP SUPERSTRUCTURE USING SOLID PRECAST PRESTRESSED CONCRETE PLANKS. THE JOINTS BETWEEN THE PLANKS WOULD HAVE GROUTED KEYS AND THE PLANKS WOULD BE POST TENSIONED TRANSVERSELY USING HIGH STRENGTH PRESTRESSING BARS. THE REQUIRED PRESTRESSED PLANK CONCRETE STRENGTH WOULD BE BETWEEN 5000 AND 6000 PSI, AND THE REQUIRED PRESTRESSING CONSISTS OF STRAIGHT STRANDS AT ABOUT 6 INCH SPACING. THIS SUPERSTRUCTURE WOULD BE SUPPORTED BY CAST-IN-PLACE ABUTMENT CAP BEAMS FOUNDED ON DRILLED SHAFTS. ADDITIONAL PLANKS COULD BE ADDED OUTSIDE THE CHANNEL WALL TO PROVIDE A PASSAGE FOR CANAL MAINTENANCE VEHICLES. IMPROVEMENTS IN THE SUPERSTRUCTURE DESIGN COULD INCLUDE DESIGNING USING A REDUCED AMOUNT OF PRESTRESSING (PARTIAL PRESTRESSING) AND MILD REINFORCING TO RESIST THE APPLIED LOADS FROM FLOWS IN THE WASH. THIS WILL REDUCE THE POTENTIAL PROBLEMS ASSOCIATED WITH THE HIGH LIVE TO DEAD LOAD RATIOS AND HIGH PRESTRESSING STRESSES IN THE CONCRETE WHICH WOULD RESULT FROM A FULLY PRESTRESSED DESIGN. REFINEMENTS IN THE DESIGN COULD ALSO ACHIEVE THE NECESSARY LOAD CAPACITY WITH A PLANK THICKNESS OF LESS THAN 24 INCHES.

STANLEY CONSULTANTS

Computed by KR	Date 1/20/95	Job No. 12278	Page No.
Checked by SW	Date 1/23/95	Subject BULLARD WASH BID CANAL CROSSING	
Reviewed by	Date		
Approved by	Date	Sheet No. 5 of 5	







SPECIAL SECTION @ CHANNEL SIDE

SPEEDIE AND ASSOCIATES
GEOTECHNICAL / ENVIRONMENTAL / MATERIALS ENGINEERS
11029 N. 24th AVE., SUITE 505 • PHOENIX, ARIZONA 85029

MECHANICAL ANALYSIS OF SOIL AND AGGREGATE

PROJECT: Billard Wash
LOCATION: Goodyear, AZ
CLIENT: Flood Control
MAT'L SOURCE: Between 96" diameter manhole and BID canal 2-3' deep
MAT'L DESCRIPTION: dark brown clay
SAMPLE LOCATION:
SAMPLE ID: #1

PROJECT NO: 950008VA
LAB NO: 95-055
SAMPLED BY: Client
DATE SAMPLED:
TESTED BY: JC
DATE TESTED: 1/13/95

TESTS REQUIRED: SA

MECHANICAL ANALYSIS (ASTM C136)

Sieve	Weight	% Ret	% Pass	Spec
1-1/2"				
1"				
3/4"				
1/2"				
3/8"				
1/4"	0			
#4	0			
Retained #4				
Passing #4 (wet)		WBW (wet)	442.1	
Passing #4 (dry)		WBW(dry)	386	
Total Weight		WAW	27	
#8	0			
#10	0			
#16	1	0		
#30	1	0		
#40	1	0		
#50	1	0	100	
#100	9	1	99	
#200	17	5	93.5	
-#200	2	93.5		
Total	386		JC	
Elutriation	359			

ADDITIONAL RESULTS

Liquid Limit (ASTM D4318)	
Plastic Limit (ASTM D4318)	
Plasticity Index (ASTM D4318)	
Fineness Modulus (ASTM C33)	
Specific Gravity, ssd (ASTM C127 & 128)	
Specific Gravity, od (ASTM C127 & 128)	
% Absorption (ASTM C127 & 128)	
Unit Weight (pcf) (ASTM C29)	
Sand Equivalent (ASTM D2419)	
L.A. Abrasion % Loss (ASTM C131)	
100 Revs	
500 Revs	
pH	
Resistivity (ohms-cm)	
Soluble Salts (ppm)	

MOISTURE CONTENT

Wet Wt.	487.9
Dry Wt.	426.0
% Moisture	14.5

SPEEDIE AND ASSOCIATES
GEOTECHNICAL / ENVIRONMENTAL / MATERIALS ENGINEERS
11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029

MECHANICAL ANALYSIS OF SOIL AND AGGREGATE

PROJECT: Bullard Wash
LOCATION: Goodyear, AZ
CLIENT: Flood Control
MAT'L SOURCE:
MAT'L DESCRIPTION: brown sandy clay, trace gravel
SAMPLE LOCATION: bank of low flow channel between RR + Culvert
SAMPLE ID: #2

PROJECT NO: 950008TA
LAB NO: 95-0516
SAMPLED BY: Client
DATE SAMPLED:
TESTED BY: JC
DATE TESTED: 1/13/95

TESTS REQUIRED: SA

MECHANICAL ANALYSIS (ASTM C136)

Sieve	Weight	% Ret	% Pass	Spec
1-1/2"				
1"				
3/4"	0	0	100	
1/2"	4	1	99	
3/8"	3	1	98	
1/4"	3	1	97	
#4	2	0	97	
Retained #4				
Passing #4 (wet)		WBW (wet)	567.1	
Passing #4 (dry)		WBW(dry)	464	
Total Weight		WAW	21.4	
#8	9	2	95	
#10	2	0	95	
#16	6	1	94	
#30	15	3	91	
#40	18	4	87	
#50	28	6	81	
#100	71	15.6	65	
#200	45	9	55.6	
-#200	8	55.6		
Total	464			
Elutriation	250		JC	

ADDITIONAL RESULTS

Liquid Limit (ASTM D4318)	
Plastic Limit (ASTM D4318)	
Plasticity Index (ASTM D4318)	
Fineness Modulus (ASTM C33)	
Specific Gravity, ssd (ASTM C127 & 128)	
Specific Gravity, od (ASTM C127 & 128)	
% Absorption (ASTM C127 & 128)	
Unit Weight (pcf) (ASTM C29)	
Sand Equivalent (ASTM D2419)	
L.A. Abrasion % Loss (ASTM C131)	
100 Revs	
500 Revs	
pH	
Resistivity (ohms-cm)	
Soluble Salts (ppm)	

MOISTURE CONTENT

Wet Wt.	554.9
Dry Wt.	454.3
% Moisture	22.1

SPEEDIE AND ASSOCIATES

GEOTECHNICAL / ENVIRONMENTAL / MATERIALS ENGINEERS
11029 N. 24th AVE., SUITE 205 • PHOENIX, ARIZONA 85029

3/4

MECHANICAL ANALYSIS OF SOIL AND AGGREGATE

PROJECT: Bullard Wash
LOCATION: Goodyear, AZ
CLIENT: Flood Control
MAT'L SOURCE:
MAT'L DESCRIPTION: reddish brown sandy clay
SAMPLE LOCATION: Bank upstream of airport
SAMPLE ID: #3

PROJECT NO: 950008VA
LAB NO: 95-057
SAMPLED BY: Client
DATE SAMPLED:
TESTED BY:
DATE TESTED: 1/13/95

TESTS REQUIRED SA

MECHANICAL ANALYSIS (ASTM C136)

Sieve	Weight	% Ret	% Pass	Spec
1-1/2"				
1"				
3/4"				
1/2"				
3/8"				
1/4"	0			
#4	1	0	100	
Retained #4				
Passing #4 (wet)		WBW (wet)	516.6	
Passing #4 (dry)		WBW(dry)	429	
Total Weight		WAW	107	
#8	4	1	99	
#10	2	0	99	
#16	4	1	98	
#30	8	2	96	
#40	6	1	95	
#50	8	2	93	
#100	30	7	86	
#200	37	9	76.7	
-#200	7	76.7		
Total	429			
Elutriation	322			

ADDITIONAL RESULTS

Liquid Limit (ASTM D4318)	
Plastic Limit (ASTM D4318)	
Plasticity Index (ASTM D4318)	
Fineness Modulus (ASTM C33)	
Specific Gravity, ssd (ASTM C127 & 128)	
Specific Gravity, od (ASTM C127 & 128)	
% Absorption (ASTM C127 & 128)	
Unit Weight (pcf) (ASTM C29)	
Sand Equivalent (ASTM D2419)	
L.A. Abrasion % Loss (ASTM C131)	
100 Revs	
500 Revs	
pH	
Resistivity (ohms-cm)	
Soluble Salts (ppm)	

MOISTURE CONTENT

Wet Wt.	574.8
Dry Wt.	477.9
% Moisture	20.3

SPEEDIE AND ASSOCIATES
GEOTECHNICAL / ENVIRONMENTAL / MATERIALS ENGINEERS
11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029

MECHANICAL ANALYSIS OF SOIL AND AGGREGATE

PROJECT: Bullard Wash
LOCATION: Goodyear, AZ
CLIENT: Flood Control
MAT'L SOURCE:
MAT'L DESCRIPTION: Lt brown sandy clay
SAMPLE LOCATION: field next to #3
SAMPLE ID: #4

PROJECT NO: 950008TA
LAB NO: 95-058
SAMPLED BY: Client
DATE SAMPLED:
TESTED BY: JC
DATE TESTED: 1/13/95

TESTS REQUIRED: SA

MECHANICAL ANALYSIS (ASTM C136)

Sieve	Weight	% Ret	% Pass	Spec
1-1/2"				
1"				
3/4"				
1/2"	0	0		
3/8"	1	0		
1/4"	1	0		
#4	0	0		
Retained #4				
Passing #4 (wet)		WBW (wet)		517.9
Passing #4 (dry)		WBW(dry)		495
Total Weight		WAW		144
#8	2	0		
#10	1	0	100	
#16	4	1	99	
#30	10	2	97	
#40	8	2	95	
#50	10	2	93	
#100	35	7	86	
#200	55	~~11~~ 12	74.3	
-#200	17	74.3		
Total	495		JC	
Elutriation	351			

ADDITIONAL RESULTS

Liquid Limit (ASTM D4318)	
Plastic Limit (ASTM D4318)	
Plasticity Index (ASTM D4318)	
Fineness Modulus (ASTM C33)	
Specific Gravity, ssd (ASTM C127 & 128)	
Specific Gravity, od (ASTM C127 & 128)	
% Absorption (ASTM C127 & 128)	
Unit Weight (pcf) (ASTM C29)	
Sand Equivalent (ASTM D2419)	
L.A. Abrasion % Loss (ASTM C131)	
100 Revs	
500 Revs	
pH	
Resistivity (ohms-cm)	
Soluble Salts (ppm)	

MOISTURE CONTENT

Wet Wt.	483.6
Dry Wt.	462.1
% Moisture	4.6

BULLARD WASH OUTFALL STUDY

Recommended Alignment 06/12/95

The following sediment flow values were calculated using the Zeller-Fullerton equation:

q(s) = 0.0064 * n^1.77 * V^4.32 * G^0.45 / (Y(h)^0.30 * D(50)^0.61)
where G = 0.5 * (D(84.1)/D(50) + D(50)/D(15.9))

(Source: Zeller, M. E. and W. T. Fullerton, 1983, "A Theoretically Derived Sediment Transport Equation for Sand Bed Channels in Arid Regions," Proc. of the D. B. Simons Symposium on Erosion and Sedimentation, R. M. Li and P. F. Lagasse, eds.)

AVAILABLE DATA:

	Upstream Supply Reach	Segment 1	Segment 3
Channel Data:			
Bottom Width (ft):	30	55	85
Side Slopes (H:V):	160	2	2
Manning's "n":	0.045	0.025	0.025
Channel Slope (ft/ft):	0.0036	0.0017	0.0017
Flow (cfs):	1400	1400	1400
Soil Data:			
D15.9 (mm):	0.001	0.001	0.001
D50 (mm):	0.01	0.03	0.006
D84.1 (mm):	0.14	0.38	0.04

RESULTS:

Flow (cfs):	1400	1400	1400
Depth (ft):	1.98	3.97	3.10
Hyd. Depth (ft):	1.04	3.53	2.90
Top Width (ft):	664.4	70.9	97.4
Avg Velocity (fps):	2.03	5.60	4.95
Sediment Flow (cfs/ft):	0.03	0.37	0.35
Sediment Flow (cfs):	18.96	26.01	34.47

TASK: DETERMINE THE TOE-DOWN ELEVATION FOR THE BANK PROTECTION AT BULLARD WASH

SECTION (4)

NO TOE-DOWN PROTECTION IS PROVIDED FOR THIS SECTION. THIS SECTION WILL BE COMPOSED OF AN EARTH CHANNEL. THE CHANNEL IS LOCATED IN THE GILA RIVER FLOODPLAIN AND WILL REQUIRE ANNUAL MAINTENANCE. A DROP STRUCTURE WILL BE LOCATED SOUTH OF THE BID CANAL.

SECTION (3)

SECTION 3 INCLUDES THE AREA FROM MC-85 TO THE BID CANAL. THE POTENTIAL FOR SCOUR IN THIS AREA IS REDUCED FOR THE FOLLOWING REASONS:

1) CUTOFF WALL AT DOWNSTEAM END OF THE MC-85 RCBC

2) CONCRETE CAP AT THE GRAVITY DRAIN SEWER LINE

3) CONCRETE CAP AT THE PALO VERDE WATERLINE NEAR THE BID CANAL

4) CONCRETE CROSSING STRUCTURE AT THE BID CANAL

5) STRAIGHT GEOMETRIC ALIGNMENT OF THE CHANNEL

THE TOTAL SCOUR IN THIS REACH WILL BE IMPACTED BY THE FOLLOWING PARAMETERS:

1) LONG TERM DEGRADATION — NO
✓ 2) LOW FLOW CHANNEL INCISEMENT - (YES)
✓ 3) LOCAL SCOUR - YES (AT STRUCTURES - MINIMAL)
4) GENER SCOUR - NO
5) BEND SCOUR - NO
✓ 6) BED FORMS - YES

LOW FLOW CHANNEL INCISEMENT : ASSUME 2 FT

BED FORMS : $h_a/2 = (0.027 V^2)/2 = 0.66'$ USE 1 FT ($V = 7$ fps)

SAFETY FACTOR : 1.3 (1.3X3) = 3.9 ft

USE DEPTH OF FLOW AS MINIMUM VALUE FOR TOEDOWN

∴ TOEDOWN = 6.0 FT (SECTION 2730)

SECTION ②

THIS SECTION IS HAS A LINED CHANNEL BOTTOM FROM MC - 85 TO STATION .

∴ TOE-DOWN ANALYSES WILL NOT BE REQUIRED IN THIS REACH

SECTION ①

* CALCULATE BEND SCOUR FOR CURVE AT HEC-2 SECTION 11275:

$$Z_{bs} = \frac{0.0685\, Y_{max}\, V_m^{0.8}}{Y_h^{0.4}\, S_e^{0.3}} \left(2.1 \left(\frac{\sin^2(\alpha/2)}{\cos \alpha} \right)^{0.2} - 1 \right)$$

Ref: City of Tucson

$$\frac{r_c}{T} = \frac{\cos\alpha}{4\sin^2(\alpha/2)}$$

TOPWIDTH (T) = 120 ft.
RADIUS (r_c) = 300 ft.

SOLVING FOR α,

$\alpha = 33.57°$

$$\therefore \quad z_{bs} = \frac{0.0635(5.4)(6.12)^{0.8}}{(4.9)^{0.4}(.000759)^{0.3}}\left(2.1\left(\frac{\sin^2(33.57/2)}{\cos 33.57}\right)^{0.2} - 1\right)$$

$= 2.3$ ft.

USING DATA FROM HEC-2 CROSS SECTION 11315

SAY **3 ft.**

* CALCULATE LATERAL INFLOW SCOUR DEPTH BETWEEN SECTIONS 9270 AND 11323:

ESTIMATED LATERAL INFLOW PER UNIT OF CHANNEL LENGTH

$$q = \frac{50\% \text{ OF FLOW}}{800 \text{ ft.}} = \frac{1600 \text{ cfs}}{800 \text{ ft}} = 2\ \frac{\text{cfs}}{\text{ft}} = 0.19\ \frac{m^3/s}{m}$$

$$S = 4.75\ \frac{H^{0.2}\, q^{0.5}}{D_{90}^{0.32}} - h_d$$

(SCHOKLITCH 1932 FROM SIMONS, L. & ASSOC., "Design Guidelines & Criteria – Channels & Hydraulic Structures in Sandy Soil," June 1981)

WHERE H = VERTICAL DISTANCE BETWEEN EGL AND DOWNSTREAM WATER SURFACE, meters
q = DISCHARGE/UNIT WIDTH, m^3/s PER m
D_{90} in mm
h_d = DOWNSTREAM DEPTH, m

$$S = 4.75 \frac{(1.2)^{0.2}(0.19)^{0.5}}{(0.2)^{0.32}} - 1.8 = 1.8\,m = 5.9\ ft.$$

SAY 6 ft.

*CALCULATE TOEDOWN DEPTH FOR REMAINING REACHES OF SEGMENT 1:

LOW FLOW CHANNEL INCISEMENT: ASSUME 2 FT.

BED FORMS: $\frac{0.027\,V^2}{2} = \frac{0.027(8)^2}{2} = 0.86$ ft.

USE 1 ft.

SAFETY FACTOR = 1.3 $(1.3)(3) = 3.9$ ft.

USE DEPTH OF FLOW AS MINIMUM VALUE FOR TOEDOWN

∴ TOEDOWN = 6 ft.

*SEGMENT 1 SUMMARY:

TOEDOWN = 6 ft EXCEPT AS NOTED:

SECTION 10170 TO 11323, WEST BANK, TOEDOWN = 1.3(2+1+6) = 12 ft.

CURVE AT SECTION 11275 ±, EAST BANK, TOEDOWN = 1.3(2+1+3) = 8 ft.

CALCULATE CUTOFF WALL DEPTH FOR SEGMENT (4) DROP STRUCTURE (DOWNSTREAM OF BID CANAL):

$$S = 4.75 \frac{H^{0.2} q^{0.5}}{D_{90}^{0.32}} - h_d \qquad \text{(SCHOKLITSCH 1932)}$$

(VARIABLES DEFINED ON SHEET 3)

$$S = 4.75 \frac{(1.1)^{0.2}\left(4.6 \frac{m^3/s}{m}\right)^{0.5}}{(20)^{.32}} - 1.8 = 2.2\,m = 7.2\,ft.$$

↑ assumed D_{90}

∴ USE 8 ft CUTOFF WALL DEPTH

NOTE: SOIL GRADATION DATA WAS NOT AVAILABLE FOR THIS LOCATION IN GILA RIVER. DURING FINAL DESIGN, REFINEMENT OF THE ASSUMED D_{90} ABOVE IS RECOMMENDED.

WOOD/PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

PROJECT: BULLARD WASH
PROJECT NO. 94129 SHEET NO. 1 OF 1
CALCULATED BY: AJR DATE: 8-21-95
CHECKED BY: DATE:

SEGMENT 4 – GABION MATTRESS OPTION

THIS OPTION FOR SEGMENT 4 INCLUDES A COMPOSITE CHANNEL CONSISTING OF AN EARTH BOTTOM AND A GABION MATTRESS BANK LINING. TOTAL SCOUR IN THIS REACH WILL BE IMPACTED BY

1. LONG TERM DEGRADATION – NO
2. LOW FLOW CHANNEL INCISEMENT – YES
3. LOCAL SCOUR – YES
4. GENERAL SCOUR – NO – DEPOSITION IN GILA RIVER FLOWS
5. BEND SCOUR – NO
6. BED FORMS – YES

USE NORMAL DEPTH OF FLOW FOR THIS SEGMENT RATHER THAN GILA RIVER 100-YEAR BACKWATER AS IN HEC-2 MODELS:

$n = .035$ depth = 4.25 ft. (see worksheet for trapezoidal channel)
$S = .0017$ '/ft. $V = 4.0$ fps
$z = 4$
$b = 65'$
$Q_{10} = 1400$ cfs

LOW FLOW CHANNEL INCISEMENT: ASSUME 2 ft.
BED FORMS: $h_a/2 = (0.027\,V^2)/2 = 0.2$ ft.
SAFETY FACTOR = 1.3
$1.3(2.2) = 2.9$ ft.
USE DEPTH OF FLOW AS MINIMUM TOEDOWN
∴ TOEDOWN = 4.25 ft.

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Project File	untitled
Worksheet	tony
Flow Element	Trapezoidal Channel — SEGMENT 4
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.001700	ft/ft
Left Side Slope	4.00	H : V
Right Side Slope	4.00	H : V
Bottom Width	65.00	ft
Discharge	1400.00	ft^3/s

Results		
Depth	4.25	ft
Flow Area	348.19	ft^2
Wetted Perimeter	100.02	ft
Top Width	98.98	ft
Critical Depth	2.32	ft
Critical Slope	0.014159	ft/ft
Velocity	4.02	ft/s
Velocity Head	0.25	ft
Specific Energy	4.50	ft
Froude Number	0.38	
Flow is subcritical.		

DESIGNED BY SW	DATE 6/26/95	SHEET NO. 1	PAGE NO.
CHECKED BY CSS	DATE 6-26-95	OF 9	JOB NO. 12278
REVIEWED BY	DATE	SUBJECT:	
APPROVED BY	DATE		

DROP STRUCTURES:

THERE WERE TWO TYPES OF DROP STRUCTURES CONSIDERED; VERTICAL AND SLOPING. THE SLOPING DROP IS SHOWN ON THE FOLLOWING PAGES AND IS PREFERRED FOR SAFETY REASONS. THE VERT DROP WAS NOT ANALYZED HYDRAULICALLY.

THE CALCULATIONS THAT FOLLOW ARE PRELIMINARY AND REPRESENT ONE ALTERNATIVE OF ACHIEVING THE NECESSARY GRADE DROP. (OTHERS MAY BE EXPLORED IN FINAL DESIGN)

FINAL DESIGN SHOULD INCORPORATE SUCH CONSTRUCTIBILITY ISSUES AS DRAIN PIPES, LINING THICKNESS, BASIN DEPTH AND SAFETY.

THE PURPOSE OF THE PRELIMINARY CALCULATIONS IS TO PROVIDE HYDRAULIC INFORMATION RELATED TO THE SPACING OF THE DROPS AND THE DROP HEIGHT. ALSO, THE PRELIMINARY DIMENSIONS WILL BE USED FOR QUANTITY AND COST ESTIMATES.

Note: sloping drop structure is copied from narrative section of this report. Calculations follow this definition sketch.

2/9

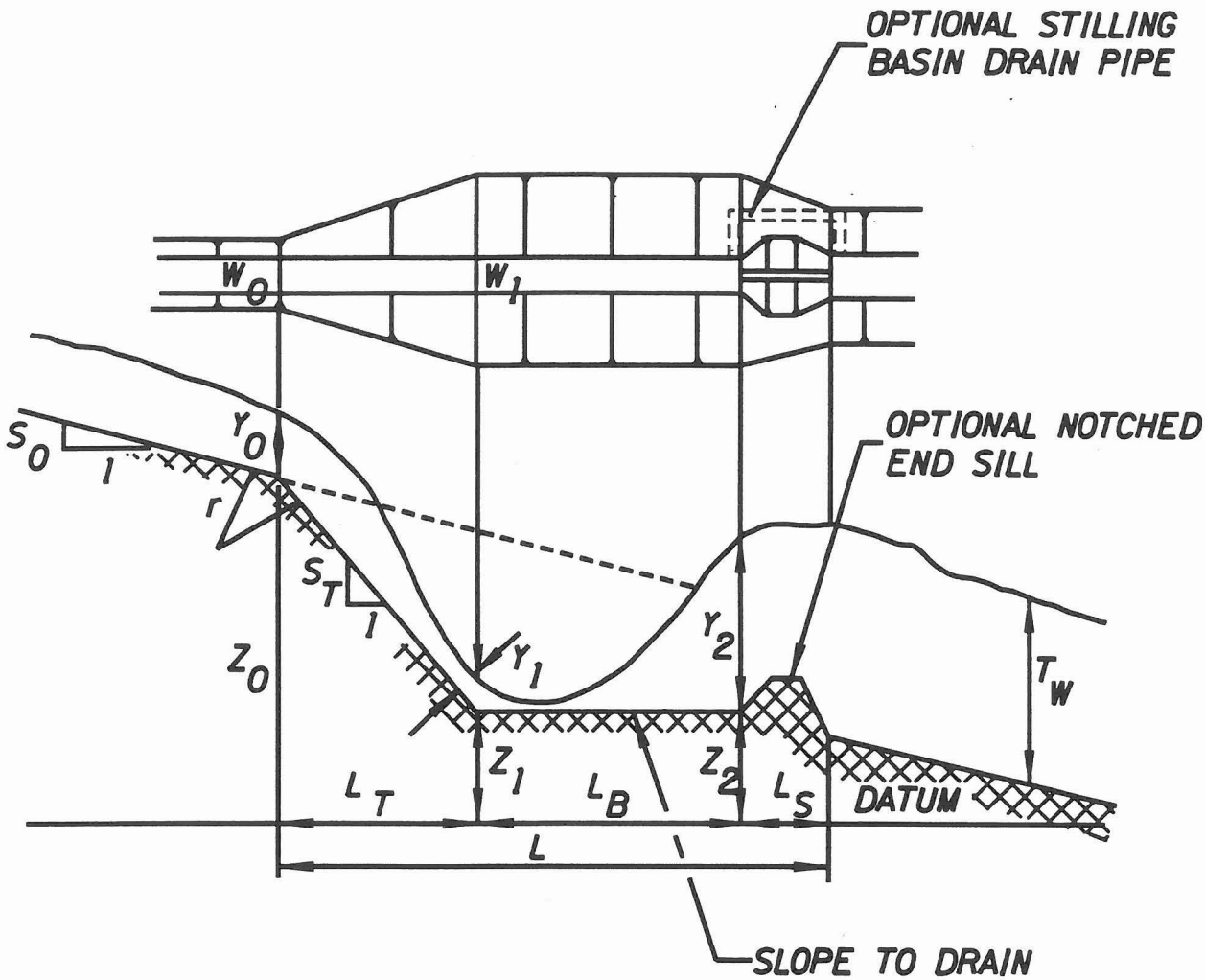


FIGURE 10

BULLARD WASH OUTFALL STUDY

SLOPING DROP STRUCTURE

WOOD/PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 234-1344

V:/941022/BULWASH3.DGN

WOOD / PATEL ASSOCIATES

DROP #1 CHECKED: SW 6/26/95

VERTICAL DROP STRUCTURE – downstream of BID Canal 06/20/95

REF: Federal Highway Administration, Hydraulic Engineering Circular No. 14, Hydraulic Design of Energy Dissipating Structures for Culverts and Channels

GIVEN:

DESIGN FLOW	3200.00	CFS
SPILLWAY WIDTH (LB)	65.00	FT
DROP HEIGHT (ho)	6.51	FT
SPILLWAY CREST ELEVATION	906.41	MSL
BASIN BOTTOM ELEVATION	899.90	MSL
SILL ELEVATION	903.00	MSL
TAILWATER DEPTH	6.00	FT

SOLUTION:

Critical depth at spillway crest (Yc):

Yc=.315*(Q/LB)^.667	4.237	ft
ho/Yc=	1.537	
h2=ho-2.15Yc=	-2.599	ft
h2/Yc=	-0.613	

For known values of ho/Yc & h2/Yc, L1/Yc can be calculated from Figure IX-A-2:

L1/Yc=	2.700	
therefore, L1=	11.439	ft
then, L2=.8xYc=	3.389	ft
and L3=1.75xYc=	7.414	ft
and L=L1+L2+L3=	22.243	ft

Note: These calculations are preliminary and will be refined during final design.

WOOD / PATEL ASSOCIATES

DROP # 2, 3, 4 at section 7506

CHECKED: fw 6/26/95

SLOPING DROP STRUCTURE 06/20/95

REF: Federal Highway Administration, Hydraulic Engineering Circular No. 14, Hydraulic Design of Energy Dissipating Structures for Culverts and Channels

GIVEN:

DESIGN FLOW	3200	cfs
SPILLWAY WIDTH (Wb)	65	ft
DROP HEIGHT (Zo-Z1)	8.91	ft
TAILWATER DEPTH (Tw)	5.3	ft
SPILLWAY CREST ELEVATION(Zo)	930.11	MSL
BASIN BOTTOM (Z1 or Z2)	921.2	MSL
SILL ELEVATION (Z3)	925.05	MSL
UPSTREAM FACE SLOPE (St)	1	H:V
DOWNSTREAM FACE SLOPE (Ss)	1	H:V
C1=	1	

← smallest Tw of the 3 sloping drops, ∴ worst-case scenario in terms of structure length for segment 2

SOLUTION:

CRITICAL DEPTH AT SPILLWAY CREST (Yc)

Yc=.315*(Q/LB)^.667 4.237 ft

Vc=Q/WIDTHxYc 11.62 fps

Solve for y1:

FROM EQUATION IV-B-7:

Q=y1Wb(2g(Zo-Z1+Yo+Y1)+Vo^2)^0.5

WHERE (left hand side), Q= 3200.00 cfs

FOR assumed value (BY TRIALS)of Y1= 1.500 ft
right hand side can be solved = 3201.62 MSL

THEREFORE, V1=Q/(Wb)(y1) 32.82 fps

Note: these calculations are preliminary and will be refined during final design.

WOOD / PATEL ASSOCIATES DROP # 2, 3, 4

CHECKED: fw 6/26/95

Solve for L:

Froude Fr1 = V1/(gy1) ^ .5	4.72	
For known value of Fr1, from fig VI-11:		
read Lb/Y1 =	36	
therefore, Lb=	54	ft
and, Lt= (Zo-Z1)xSt=	8.91	ft
and, Ls= (Z3-Z1)xSs=	3.85	ft
then, L=Lb+Lt+Ls=	66.76	ft

66.76' < 144'

∴ drop structure spacing OK

WOOD / PATEL ASSOCIATES

DROP # 5

CHECKED: fw 6/26/95

SLOPING DROP STRUCTURE at section 11323 06/20/95

REF: Federal Highway Administration, Hydraulic Engineering Circular No. 14, Hydraulic Design of Energy Dissipating Structures for Culverts and Channels

GIVEN:

DESIGN FLOW	1600	cfs
SPILLWAY WIDTH (Wb)	110	ft
DROP HEIGHT (Zo-Z1)	9	ft
TAILWATER DEPTH (Tw)	3	ft
SPILLWAY CREST ELEVATION(Zo)	944	MSL
BASIN BOTTOM (Z1 or Z2)	935	MSL
SILL ELEVATION (Z3)	936.69	MSL
UPSTREAM FACE SLOPE (St)	1	H:V
DOWNSTREAM FACE SLOPE (Ss)	1	H:V
C1=	1	

– 50% OF PEAK ESTIMATED TO ENTER THE MAIN CHANNEL AT HEADWORKS. OTHER 50% ENTERS AS SHEET FLOW OVER THE NORTH BANK.

SOLUTION:

CRITICAL DEPTH AT SPILLWAY CREST (Yc)

Yc=.315*(Q/LB)^.667 1.879 ft

Vc=Q/WIDTHxYc 7.74 fps

Solve for y1:

FROM EQUATION IV-B-7:

Q=y1Wb(2g(Zo-Z1+Yo+Y1)+Vo^2)^0.5

WHERE (left hand side) , Q= 1600.00 cfs

FOR assumed value (BY TRIALS)of Y1= 0.516 ft
right hand side can be solved = 1599.14 MSL

THEREFORE, V1=Q/(Wb)(y1) 28.19 fps

Note: These calculations are preliminary and will be refined during final design.

WOOD / PATEL ASSOCIATES

DROP #5

CHECKED: fw 6/26/95

Solve for L:

Froude Fr1 = V1/(gy1) ^ .5	6.92	
For known value of Fr1, from fig VI-11:		
read Lb/Y1 =	57	
therefore, Lb=	29.412	ft
and, Lt= (Zo-Z1)xSt=	9	ft
and, Ls= (Z3-Z1)xSs=	1.69	ft
then, L=Lb+Lt+Ls=	40.102	ft

WOOD / PATEL
ASSOCIATES

CHECKED:
fw 6/26/95

SLOPING DROP STRUCTURE – DROP # 5 06/23/95

REF: Federal Highway Administration, Hydraulic Engineering Circular No. 14, Hydraulic Design of Energy Dissipating Structures for Culverts and Channels

GIVEN:

DESIGN FLOW	3200	cfs	— 100YR PEAK DISCHARGE. ALLOWS FOR FUTURE CHANNELIZATION OF UPSTREAM REACH.
SPILLWAY WIDTH (Wb)	110	ft	
DROP HEIGHT (Zo-Z1)	11.5	ft	
TAILWATER DEPTH (Tw)	3	ft	
SPILLWAY CREST ELEVATION(Zo)	944	MSL	
BASIN BOTTOM (Z1 or Z2)	932.5	MSL	
SILL ELEVATION (Z3)	936.69	MSL	
UPSTREAM FACE SLOPE (St)	1	H:V	
DOWNSTREAM FACE SLOPE (Ss)	1	H:V	
C1=	1		

SOLUTION:

CRITICAL DEPTH AT SPILLWAY CREST (Yc)

Yc=.315*(Q/LB)^.667 2.983 ft

Vc=Q/WIDTHxYc 9.75 fps

Solve for y1:

FROM EQUATION IV-B-7:

Q=y1Wb(2g(Zo-Z1+Yo+Y1)+Vo^2)^0.5

WHERE (left hand side) , Q= 3200.00 cfs

FOR assumed value (BY TRIALS)of Y1= 0.885 ft
right hand side can be solved = 3206.36 MSL

THEREFORE, V1=Q/(Wb)(y1) 32.87 fps

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DROP #5

CHECKED: fw 6/26/95

Solve for L:

Froude Fr1 = V1/(gy1) ^ .5	6.16	
For known value of Fr1, from fig VI-11:		
read Lb/Y1 =	50	
therefore, Lb=	44.25	ft
and, Lt= (Zo-Z1)xSt=	11.5	ft
and, Ls= (Z3-Z1)xSs=	4.19	ft
then, L=Lb+Lt+Ls=	59.94	ft

APPENDIX F

QUANTITY AND COST ESTIMATES FOR RECOMMENDED ALTERNATIVE

DESIGNED BY SW	DATE 1/23/95	SHEET NO. 1	PAGE NO.
CHECKED BY GSB	DATE 1-23-95	OF 15	JOB NO. 12278
REVIEWED BY GSB	DATE 9-26-95	SUBJECT: BULLARD WASH	
APPROVED BY	DATE	RECOMMENDED ALTERNATIVE COSTS	

QUANTITIES AND COSTS:

UNIT COST

A COMPLETE TABLE IS LOCATED IN THE NARRATIVE OF THIS REPORT. THIS TABLE SUMMARIZES THOSE ITEMS INCLUDED IN THE RECOMMENDED ALT.

DESCRIPTION	UNIT	UNIT COST
EXCAVATION	C.Y.	$3.00
STRUCTURAL CONCRETE (INCLUDING REIN STEEL)	C.Y.	$250
CRUSHED GRANITE	C.Y.	$25
RAILROAD CULVERT	S.F.	$45
HIGHWAY CULVERT	S.F.	$25
FENCING AND GATES	L.F.	$8.00
RIGHT-OF-WAY		
- AGRICULTURAL	AC	$9,000
- FRONTAGE	AC	$14,000
PRE-STRESSED SLAB BRIDGE	S.F.	$40
WIRE ENCLOSED ROCK	SY	$50

THROUGHOUT THIS COST ESTIMATE OTHER ITEMS SUCH AS UTILITY RELOCATION, MISCELLANEOUS EARTHWORK AND CONCRETE, AND PIPING ARE INDIVIDUALLY ESTIMATED.

MAJOR COST ITEMS ARE INTENDED TO INCORPORATE ALL INCIDENTAL AND INSTALLATION COSTS. WHERE APPLICABLE UNIT COSTS HAVE BEEN INFLATED TO INCLUDE ITEMS THAT ARE TYPICALLY ESTIMATED SEPERATELY (IE, IRRIGATION LOW FLOW DITCHES INCLUDE ALL TURNOUTS, CUTOFFS, GATES, ACCESS/TRASH RACKS, ETC.) IT IS BEYOND THE SCOPE AND DETAIL OF THIS STUDY TO ACCOUNT FOR ALL COST ITEMS. LUMP SUMS HAVE BEEN USED WHEN POSSIBLE.

DESIGNED BY SW	DATE 1/23/95	SHEET NO. 2	PAGE NO.
CHECKED BY GSB	DATE 1-23-95	OF 15	JOB NO. 12278
REVIEWED BY	DATE	SUBJECT: BULLARD WASH	
APPROVED BY	DATE	RECOMMENDED ALTERNATIVE COSTS	

QUANTITIES AND COSTS:

SEGMENT 1

GIVEN: COMPOSITE CHANNEL WITH CONCRETE SIDES
ESTIMATED BOTTOM WIDTH = 85 ft AND 55 ft WITH TRANSITION
SIDE SLOPES: 2:1

MIN FREEBOARD PROVIDED = 1 ft
ESTIMATED FLOW DEPTH = 6 ft ±
LENGTH APPROX. 3100 ft
1 CONCRETE LINED SLOPING DROP; LINED UPSTREAM AND DOWNSTREAM FOR APPROXIMATELY 25 FEET. LENGTH OF SLOPING DROP STRUCTURE ≈ 60 FEET

LOW FLOW IRRIGATION DITCH WITHIN CHANNEL BOTTOM - CONCRETE LINED CHANNEL.

COLLECTION BERMS AT UPSTREAM END NEGLIGIBLE

EXCAVATION: ASSUMED TO EQUAL THE CI CUMULATIVE VOLUME DIFFERENCE FROM THE HEC-2 RUN. CROSS SECTION 11323 - 8400

VOLUME = 89180 C.Y.

+ 5% FOR OVER EXCAVATION AND MISC EARTHWORK

TOTAL VOLUME = 93,600 C.Y.

STRUCTURAL CONCRETE: THICKNESS: 0.5'

$WIDTH_{AVE}$ $2(\sqrt{15^2+30^2}) + (S_{IRR}) + 2(4)_{TURNDOWN} = 80$

VOLUME = (0.5)(3100)(80)/27 = 4593

DROP STRUCTURE AND BOTTOM LINING = (1.0)(85)(85)/27 = 267 CY

4860 C.Y.

MAINTENANCE ROADS: WIDTH = 14' x 2 ; 3" GRANITE: 0.25'

VOLUME = (0.25)(3100)(28) = 21700 ft³ OR 804 C.Y.

FENCING (INCLUDING GATES): (2)(3100) = 6200 L.F.

RIGHT-OF-WAY: AREA OUTSIDE AIRPORT PROPERTY (2800)(150)/43560 = 9.6 AC

SC 3020

DESIGNED BY SW DATE 1/23/95 SHEET NO. 3 PAGE NO.
CHECKED BY GB DATE 1-23-95 OF 15 JOB NO. 12278
REVIEWED BY DATE SUBJECT: BULLARD WASH
APPROVED BY DATE RECOMMENDED ALTERNATIVE COSTS

QUANTITIES AND COSTS:

SEGMENT 1 (CONTINUED)

DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
EXCAVATION	93,600	C.Y.	$ 3.00	$ 280,800
STRUCTURAL CONCRETE	4860	C.Y.	$ 250	$ 1,215,000
CRUSHED GRANITE	804	C.Y.	$ 25	$ 20,100
FENCING AND GATES	6200	L.F.	$ 8.00	$ 49,600
	CONSTRUCTION COST SUB-TOTAL			$ 1,565,500
		10% CONTINGENCY		$ 156,600
RIGHT-OF-WAY	~~3.5~~ 9.6	AC	$ 9000	$ 86,400

SEGMENT 1 TOTAL PROJECT COST $ 1,808,500

DESIGNED BY SW	DATE 1/23/95	SHEET NO. 4	PAGE NO.
CHECKED BY LBS	DATE 1-23-95	OF 15	JOB NO. 12278
REVIEWED BY	DATE	SUBJECT: BULLARD WASH	
APPROVED BY	DATE	RECOMMENDED ALTERNATIVE COST	

QUANTITIES AND COSTS:

SEGMENT 2 MAIN BULLARD WASH CHANNEL

GIVEN: CONCRETE CHANNEL
WIDTH VARIES BETWEEN 55-65 ft
SIDE SLOPES 2:1
MIN FREEBOARD 1 ft
ESTIMATED FLOW DEPTH 5 ft
LENGTH APPROX. = 1800 ft
3 SLOPING DROP STRUCTURES: INCORPORATED INTO LINING ADDITIONAL PROTECTION NOT INCLUDED IN COST.
LOW FLOW IRRIGATION CHANNEL OUTSIDE MAIN CHANNEL: CONCRETE
SPRR 6 - 10'x6' CONCRETE BOX CULVERT (RAILROAD LOADING)
MCBS 6 - 10'x6' CONCRETE BOX CULVERT

EXCAVATION: HEC-2 CI RECORD CUMULATIVE VOLUME CROSS SECTION
8400 - 6630.
VOLUME = 25,740 C.Y.
+5% 1287 C.Y. (FOR OVER-EX & MISC)
TOTAL VOLUME 27,027 C.Y.

STRUCTURAL CONCRETE: THICKNESS$_{AVE}$ = 0.5'
WIDTH = 60'$_{AVE\ BOTTOM}$ + $2(\sqrt{8^2+16^2})_{SIDES}$ + 9_{IRR} + $2(4)_{TURNOUTS}$
= 113'
VOLUME = (0.5)(1900)(113) = 101700 ft^3 OR 3767 C.Y.

MAINTANENCE ROADS: WIDTH 14' (BOTH SIDES) = 28' 3" GRANITE = 0.25'
VOLUME = (1800)(0.25)(28) = 12600 ft^3 OR 467 C.Y.

FENCING: 2(1900) = 3600 L.F.

RIGHT-OF-WAY: SOUTH OF THE AIRPORT IS THE RAILROAD AND MCBS
ASSUME DEDICATION OF RIGHT-OF-WAY BY DRAINAGE EASEMENT
0 AC

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SEGMENT Z MAIN BULLARD WASH CHANNEL (CONTINUED)

SPRR CULVERT: AREA = (20 ft)(70 ft) = 1400 S.F.

MCBS CULVERT: AREA = (74 + 6)(70 ft) = 5600 S.F.

UTILITY RELOCATION: EL PASO 8" LINE: 700 ft RELOCATION @ $60/L.F.
: $42,000

12" PETROLEUM L.S. $100,000

20" PETROLEUM L.S. $400,000

MCI FIBER OPTIC LINE: LOWER 8 FT
ASSUME 1 FT V : 40 FT H
8 X 40 X $25/FT = $8000

SEGMENT Z COLLECTOR CHANNEL

GIVEN: CONCRETE LINED CHANNEL
BOTTOM WIDTH = 8 ft
SIDE SLOPES 2:1
ESTIMATED FLOW DEPTH = 5 ft
LENGTH APPROX. = 2400 ft

1 DROP 6 FEET HIGH

EXCAVATION: HEC-2 CI RECORDS ARE NOT USED. THIS REACH HAS DEEP CUT SECTIONS ON THE ORDER OF 15 ft. HOWEVER THE EXISTING WASH WILL BE FILLED IN AND ABANDONED THUS FLATTENING THE GROUND. ACTUAL CUTS IN THIS REACH WILL BE APPROX. 10 ft FOR COST ESTIMATES

AREA = (8 x 10) + (10 x 20) = 280 ft²

VOLUME = (2400 ft)(280 ft²) = 672,000 ft³ OR 24,889 C.Y.

STRUCTURAL CONCRETE: THICKNESS 0.5'

WIDTH = $8'_{BOTTOM} + 2(\sqrt{8^2 + 16^2})$ = 44 ft

VOLUME = (0.5)(2400)(44) = 52800 ft³ OR 1956 C.Y.

MAINTANENCE ROAD: ASSUME ONE SIDE OF CHANNEL

VOLUME = (14')(0.25)(2400) = 8400 ft³ OR 310 C.Y

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SEGMENT 2 COLLECTOR CHANNEL (CONTINUED)

FENCING: 2(2400) = 4800 L.F.

RIGHT-OF-WAY: DEDICATED BY CITY OF PHOENIX OAC

UTILITY RELOCATION: EL PASO 8" 70 L.F. @ $60/L.F. $4200

IRRIGATION STRUCTURES ACROSS MC85 AND RAILROAD FOR BOTH MAIN CHANNEL AND EAST LOCAL TRIB.

ASSUME CULVERT INSTALLATION OF 36" CMP @ $100/L.F.

ALL FOUR CROSSINGS: LENGTH = (20)2 + (80)2 = 200 ft

L.S. ⇒ (200)(100) = $20,000

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SEGMENT 2

DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
MAIN BULLARD CHANNEL:				
EXCAVATION	27027	C.Y.	$ 3.00	$ 81,100
STRUCTURAL CONCRETE	3767	C.Y.	$ 250	$ 941,800
CRUSHED GRANITE	467	C.Y.	$ 25	$ 11,700
FENCING AND GATES	3600	L.F.	$ 8.00	$ 28,800
SPRR CULVERT	1400	S.F.	$ 45	$ 63,000
MCBS CULVERT	5600	S.F.	$ 25	$ 140,000
8" NATURAL GAS	1	L.S.	$ 42,000	$ 42,000
12" PETROLEUM	1	L.S.	$ 100,000	$ 100,000
20" PETROLEUM	1	L.S.	$ 400,000	$ 400,000
MCI FIBER OPTIC	1	LS	$ 8000	$ 8000
	MAIN CHANNEL		SUB-TOTAL	$ 1,816,400
EAST LOCAL TRIBUTARY COLLECTOR CHANNEL:				
EXCAVATION	24,889	C.Y.	$ 3.00	$ 74,700
STRUCTURAL CONCRETE	1,956	C.Y.	$ 250	$ 489,000
CRUSHED GRANITE	310	C.Y.	$ 25	$ 7800
FENCING AND GATES	4800	L.F.	$ 8.00	$ 38,400
8" NATURAL GAS	1	L.S.	$ 4200	$ 4200
IRRIGATION CROSSING STRUCTURES	1	L.S.	$ 20000	$ 20000
	EAST LOCAL TRIB		SUB-TOTAL	$ 634,100

$703,000

1,113,400

1,247,500

CONSTRUCTION TOTAL	$ 2,450,500
10% CONTINGENCY	$ 245,100
RIGHT OF WAY	$ 0
SEGMENT 2 TOTAL PROJECT COST	$ 2,695,600

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QUANTITIES AND COSTS:

SEGMENT 3

GIVEN: COMPOSITE CHANNEL WITH CONCRETE SIDES

ESTIMATED BOTTOM WIDTH 85 feet NARROWING TO 65 feet NORTH OF THE BID CANAL
SIDE SLOPES 2:1
ESTIMATED FLOW DEPTH = 5 ft
LENGTH = 4200 ft

1 CONCRETE VERTICAL DROP DOWNSTREAM OF SLAB BRIDGE 3' HEIGHT

SLAB BRIDGE CROSSING OF BID CANAL

CONCRETE LINING BETWEEN CANAL AND PALO VERDE PIPELINE.
PALO VERDE ENCASEMENT INCONJUCTION WITH LINING.

EXCAVATION: HEC-2 CI DATA CROSS SECTION 6630 TO 2449.

VOLUME: 102,100 C.Y. (CUT)

ALSO MODEL SHOWS 2760 C.Y. (FILL) - ADD AS EARTHWORK

TOTAL 104,900 C.Y.

5% OVER EXCAVATION 5245 C.Y.

ESTIMATED TOTAL EARTH WORK 110,100 C.Y.

STRUCTURAL CONCRETE: THICKNESS 0.5'

WIDTH $2\left(\sqrt{12^2+24^2}\right) + 2(4)_{\text{TURNOUTS}} = 62'$

VOLUME: $(0.5)(4200)(62) = 130200\ ft^3$ 4822 C.Y.

MAINTANENCE ROADS: 3" GRANITE = 0.25' WIDTH = 14' x 2 = 28'

VOLUME = $(0.25)(4200)(28) = 29400\ ft^3$ 1089 C.Y.

FENCING: LENGTH $2(4200) =$ 8400 L.F.

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SEGMENT 3 (CONTINUED)

BID CANAL CROSSING:

1.) SLAB BRIDGE: LENGTH = WIDTH OF UPSTREAM CHANNEL + EXTENSIONS

= 65' + 2(20')

= 105'

WIDTH = WIDTH OF CANAL / SPAN

= 34'

TOP AREA = (105)(34) = 3570 S.F.

2.) ASSOCIATED LINING, CHANNEL PROTECTION, DROP STRUCTURE

A.) LINING UPSTREAM OF CANAL ⇒ LENGTH APPROX 300' THIS WILL EXTEND UPSTREAM OF THE PALO VERDE PIPELINE TO PREVENT SCOUR.

CHANNEL WILL TRANSITION FROM 85' BOTTOM WIDTH TRAPEZOID TO 65' BOTTOM WIDTH RECTANGLE. FOR QUANTITY ESTIMATE ASSUME 75' BOTTOM WITH (2) 6' SIDES FOR TOTAL WIDTH 87'

THICKNESS = 0.5'

VOLUME = 13050 ft³ OR 483 C.Y.

B.) CANAL LINING / BANK PROTECTION

BOTTOM LINING REINFORCED CONCRETE TO SUPPORT MAINTANENCE VEHICLE. SIDES WITHIN THE BRIDGE ARE FORMED BY THE BRIDGE ABUTMENTS. UPSTREAM AND DOWNSTREAM BANK PROTECTION 4" GUNITE. COST OF BANK PROTECTION INCLUDED IN THE FOLLOWING COST FOR BOTTOM LINING.

THICKNESS = 4" OR 0.33'

LENGTH = 65 + 2(20) + 2(25) = 155' (25 ft upstream and downstream of bridge)

WIDTH = 30'

VOLUME = (0.33)(155)(30) = 1550 ft³ OR 57 C.Y.

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SEGMENT 3 (CONTINUED)

BID CANAL CROSSING (CONTINUED)

2.) ASSOCIATED LINING (CONTINUED)

c.) DOWNSTREAM DROP STRUCTURE: VERTICAL CONCRETE DROP 3' HIGH. DOWNSTREAM STILLING BASIN.

LENGTH = 100'

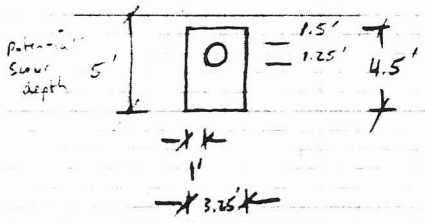
WIDTH = SEGMENT 4 WIDTH = 65 + 2(6) = 77'

VOLUME = (0.5')(77)(100) = 3850 ft³ OR 143 C.Y.

TOTAL ASSOCIATED CONCRETE = 483 + 57 + 143 = 683 C.Y.

UTILITY RELOCATION/PROTECTION:

15" SEWER: POTENTIAL SCOUR DEPTH MAX = 5 ft



AREA OF CONCRETE = $(3.25)(4.5) - \pi\left(\frac{1.25}{2}\right)^2 =$

$14.63 - 1.227 = 13.4\ ft^2$

LENGTH OF PIPE = 105'

CONCRETE FORMED $200/C.Y.

15" SEWER $20/L.F.

VOLUME OF CONCRETE: (13.4)(105) = 1407 ft³ OR 52 C.Y.

52 × $200 $10,400

RELOCATE PIPE IN TRENCH NEXT TO EXISTING PIPE TO HELP CONSTRUCTION OF THE ENCASEMENT

PIPE 105' × $20 = $2940

15" SEWER TOTAL = $13,300

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SEGMENT 3 (CONTINUED)

RIGHT-OF-WAY: (150')(4200')/43560 = 14.46 AC

SAY 15 AC

@ $9000/AC = $135,000

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SEGMENT 3

DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
EXCAVATION	110,100	C.Y.	$3.00	$330,300
STRUCTURAL CONCRETE	4822	C.Y.	$250	$1,205,500
MAINTANENCE ROADS	1099	C.Y.	$25	$27,200
FENCING AND GATES	8400	L.F.	$8.00	$67,200
BID CANAL CROSSING:				
SLAB BRIDGE	3570	S.F.	$40	$142,800
ASSOCIATED CONCRETE	683	C.Y.	$250	$170,800
US SPRINT FIBER OPTIC	1	LS	$8000	$8000
96" PALO VERDE LINE	1	L.S.	$105,000	$105,000
15" SEWER	1	L.S.	$13,300	$13,300
IRRIGATION RELOCATIONS INSTALLATIONS	1	L.S.	$67,100	$67,100
			CONSTRUCTION COST SUBTOTAL	$2,137,200
				+703,000 (Bridges & Pipeline)
				2,840,200
			10% CONTINGENCY	$213,700
			RIGHT-OF-WAY	$135,000

SEGMENT 3 TOTAL PROJECT COSTS $2,485,900

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SEGMENT 4 (CONTINUED)

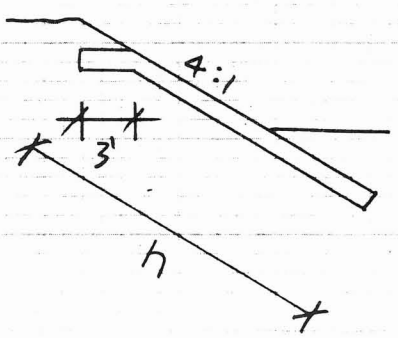
RIGHT-OF-WAY : (150')(1100')/43560 = 4 AC

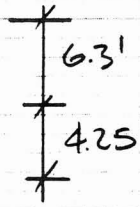
@ $9000 = $36,000

DESCRIPTION	QUANTITY	UNIT	UNIT COST	AMOUNT
* BANK LINING	5200	SY	$50	$260,000
EARTHWORK OF CHANNEL	4	AC	$2,500	$10,000
EARTHWORK OF OVERBANK	5	AC	$2,500	$12,500
			CONSTRUCTION COST SUB TOTAL	$282,500
			10% CONTINGENCY	$28,300
		**	RIGHT-OF-WAY	$36,000

SEGMENT 4 TOTAL PROJECT COST $346,800

* BANK LINING: WIRE ENCLOSED ROCK





$h = \left[(4.25+6.3)^2 + (4\times(4.25+6.3))^2\right]^{\frac{1}{2}} + 3$

$= 46.5'$

$L = 500\text{ FT} \times 2 \text{ sides} = 1000\text{ FT}$

$\text{AREA} = \frac{46.5 \times 1000}{9\text{ FT}^2/\text{YD}^2} = \boxed{5200\text{ SY}}$

UNIT COST INCLUDES OVER-EX, FILTER BEDDING, TURNDOWNS @ ENDS

** ASSUME NO R/W WOULD BE REQUIRED FOR ANY FILL PLACED ADJACENT TO CHANNEL AND THAT THERE ARE NO SIGNIFICANT COSTS FOR ARCHEOLOGICAL RECOVERY.