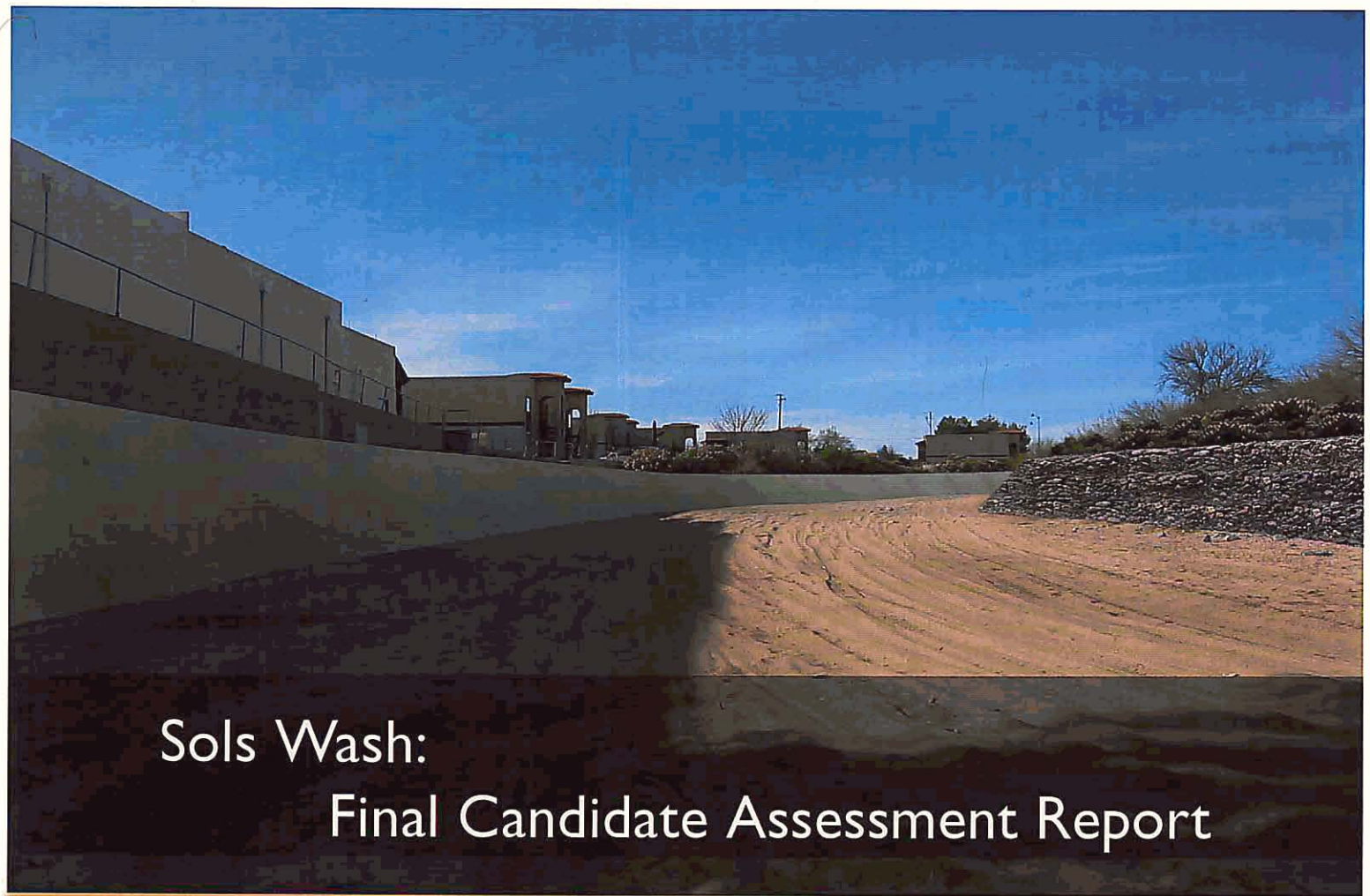

Sols Wash:
Final Candidate Assessment Report

Monday, August 16th, 2004

Prepared For:
Flood Control District of Maricopa County
FCD 2002C030

Prepared By:

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1 EXECUTIVE SUMMARY

The purpose of this report is to document the results of the Sols Wash Candidate Assessment Report. Results from this study are intended to identify design considerations for the ADOT US 93 Bypass Project and assist with the development of future Intergovernmental Agreements (IGAs) for projects between the Town of Wickenburg, the Arizona Department of Transportation (ADOT), and the Flood Control District of Maricopa County (District).

The CAR was initiated by the District to identify future projects that would eliminate flooding from Sols Wash and the Hassayampa River to downtown Wickenburg, and to ensure that ADOT's improvements will be compatible with the Sols Wash improvements. Additionally, in an effort to reduce project costs and to ensure the safety of those affected by flooding in the project area, the construction of each agency's project is mutually dependent on the other. So, if measurable flood protection is desired, both the District's project and ADOT's project should be constructed simultaneously.

The project study area consists of approximately 1.5 mile of Sols Wash within the Town of Wickenburg as shown on Figure 2. This project area includes a quarter mile of the Hassayampa River south of the Sols Wash confluence, Hospital Wash located just west of the US 93 Tegner Bridge, and Sols Wash from the confluence of Hassayampa River to a quarter mile west of Hospital Wash.

Data collection, and hydrologic and hydraulic analysis, was performed to fully determine the flooding hazards in the area. The analysis confirmed that there were additional breakouts over US 93 (Tegner Street) just north of the US 93 Tegner Bridge. This additional breakout area increases the identified FEMA flooding hazard just north of Sols Wash and east of Tegner Street as shown on Figure 3. This additional flooding hazard necessitated the investigation of Hospital Wash with additional alternatives.

A limited alternative analysis to mitigate flooding hazards was subsequently performed. These alternatives included the "do nothing" alternative, and 3 structural solutions. One of the structural solutions was to maximize the visual aesthetics and multiple uses. The study team and the stakeholders reduced these alternatives to one preferred, which was a combination of two of the alternatives (as shown on Figure 5). During this process, it was discovered that the proposed solution of channelization and levees on Sols Wash caused increased flooding to the mobile home park located at the confluence of Hospital Wash and Sols Wash. This area was then mitigated with another set of levees that ringed the facilities as part of the preferred alternative.

The preferred alternative shown on the plan and profiles, Figures 7 through 14, is estimated to cost approximately $3.2 million dollars. This alternative will remove 122 residential structures, 12 commercial structures from the floodplain, provide 100-year access on Tegner Street, and include incidental multi-use and aesthetic improvements.

2 INTRODUCTION

2.1 Project Name & Title

The Flood Control District of Maricopa County contracted with AZTEC to perform a Candidate Assessment Report (CAR) for the Sols Wash Improvements. A supplement was added to the original contract to add Hospital Wash to the study. During the preliminary analysis of Sols Wash, it was determined that the flow from Hospital Wash contributes to the flooding problems within the study area.

2.2 Project Purpose

The purpose of this report is to assess the existing drainage system within both Sols and Hospital Wash in the Town of Wickenburg. The CAR is intended to identify the need for improvements in the study area, discuss any fatal flaws with respect to ADOT's proposed improvements and finally make recommendations to protect the Town of Wickenburg from further flooding in the project vicinity. The Sols Wash CAR is slightly different since a future condition had to be considered as an existing condition in the hydraulic models (the proposed US93 ADOT bridge over the Sols Wash). The District and AZTEC utilized ADOT's most up-to-date proposed design plans for the study; however, it should be noted that the final bridge design constructed by ADOT may differ from the cross-section used in the models.

2.3 Project Need

In an effort to determine how the existing drainage facilities operate during a record storm event, AZTEC acquired historical flood data from the Town of Wickenburg. This information was a key component in determining the need for improvements in the project area. It was noted that the project area floods even during minor events. It has been estimated that 122 residences and 12 businesses are currently affected by the 100 year event in the project area that is intended to be improved. This information and the District's desire to ensure the public's safety were sufficient enough to establish a need for improvements in the study area.

Photo 1: Along the downstream side of existing US93 Tegner Bridge over Sols Wash looking north (October, 2000)

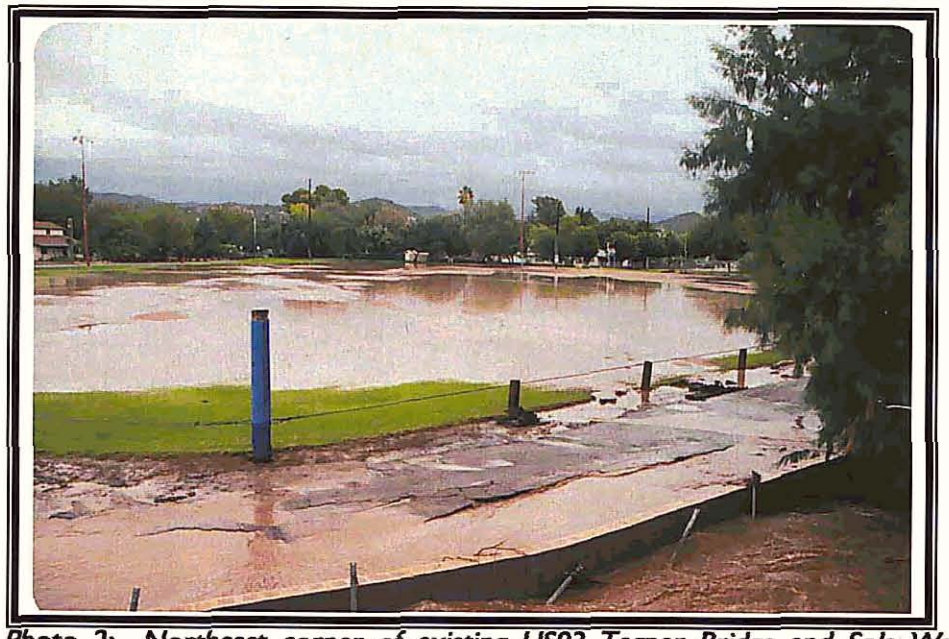

Photo 2: Northeast corner of existing US93 Tegner Bridge and Sols Wash looking northeast into Coffinger Park (October, 2000)

2.4 Project Participation

From the onset of this study the District and it's project partner, the Town of Wickenburg, involved the ADOT in the study and decision process. The District worked closely with Town representatives on the recommended improvements. ADOT was included because the Transportation Department is in final design of US93 that includes proposed bridge crossings at both the Sols Wash and the Hassayampa River.

The District intends to meet with the Town of Wickenburg to discuss an Inter-Governmental Agreement. After this juncture, it is possible the project will move toward final design with the anticipated involvement of ADOT.

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3 PROJECT OVERVIEW AND HISTORY

3.1 Project Overview

AZTEC was retained to completed a Candidate Assessment Report for possible improvements for Sols Wash within the Town of Wickenburg. The assessment report includes the collection of data to establish a need, performing hydraulic analyses (both existing and several proposed alternatives), identification of fatal flaws with ADOT's proposed improvements and make a recommendation to the District.

3.2 Project Location

The project is located in the Town of Wickenburg approximately 60 miles to the north west of downtown Phoenix. The study area begins at the confluence of Sols Wash with the Hassayampa River and extends westward past the Tegner Street Bridge (existing US93 bridge). The limits of the analysis end approximately 2000-feet upstream of the confluence of Sols and Hospital Wash into both reaches. The Project Overview is shown in Figure 2 and 3. This area includes portions of Section 1 and 2 of Township 7 north, Range 5 of the Gila and Salt River Meridian, Maricopa County, Arizona.

3.3 Project History

A preliminary hydraulic analysis was completed for a section of Sols Wash from the proposed US93 Bridge to an upstream point approximately 1500-feet past the Tegner Street Bridge. During this initial analysis, it was determined that improvements would extend into Hospital Wash and that flows from Hospital Wash and the existing Mobile Home Park would have to be included in this study. As a result, approximately 2000-feet of Hospital Wash and another 2000-feet of Sols Wash were included in the project extents.

Along with obtaining historical data and photographs, an existing conditions hydraulic model was established. J.E. Fuller had completed a CLOMR for the project area in July 2002. The Conditional Letter of Map Revision was based on changes to the south side of Sols Wash, north of the Tegner Street Bridge, because of the proposed Goldmine Village Development. The hydraulic model developed for the CLOMR was used as the existing conditions model by AZTEC for comparison purposes. The CLOMR model established, and historical data confirmed, the 100-year flood plain delineation as it relates to the properties in the study area.

3.4 Project Authorization

AZTEC works under the direction and guidance of the Flood Control District of Maricopa County. Any changes or modifications to the original scope must be approved by the District. The Town of Wickenburg has also been involved in determining the recommended alternative. It is the District's desire to work closely with representatives from the Town to remedy the flooding situation resulting from the flows within Sols Wash in the project area.

4 EXISTING CONDITIONS

4.1 Hydrology

A new hydrologic study of the area was not completed for this report. Three different Q100's have been documented from various studies regarding Sols Wash. The three entities governing these studies are the Wickenburg ADMS, the Corps of Engineers and FEMA. During a scoping meeting for this project, it was determined the CAR should be based on the FEMA discharge (Appendix, Attachment J – Meeting Minutes dated 12-18-03). As a result of this meeting, a peak 100-year discharge of 15045 cfs was used for the subsequent analyses.

TABLE 1: DESIGN DISCHARGE

GOVERNING AGENCY	Q100 (cfs)
FEMA	15,045
Corps of Engineers	24,000
Wickenburg ADMS	21,000

4.2 Hydraulics

4.2.1 Study Details

The CLOMR completed by J.E. Fuller dated July 2002 as part of the Goldmine Village Development would be used as the main section of the hydraulic base model for the study. However, the accepted CLOMR did not extend downstream to the tie in with the Hassayampa River. Because of the proposed US 93 Bridge, it was required that a downstream portion be added. The final base model used by AZTEC (AZTEC's base model) is the J.E. Fuller CLOMR with five sections of the ADOT model blended at the downstream limits. AZTEC created the Hospital Wash cross-sections used for modeling from digital mapping and topography.

The project has been separated into three distinct sections. Study Area 1 includes Sols Wash west of the Tegner Bridge, along with Hospital Wash, and has been referred to as the upstream section. The second area is Sols Wash between the proposed US 93 By-pass to the Tegner Bridge (existing US 93) and is considered the downstream section. And the third area is located along the west side of the Hassayampa River, south of the existing US93 Bridge.

An existing conditions model was completed for both Sols Wash and Hospital Wash, Study Area 1 (Models I and III, respectively). Model I is AZTEC's base model and extends through both the downstream and upstream sections. Based on the baseline information, levee improvements were added to both washes as required to eliminate overtopping and the models were rerun (Models II and IV, respectively). The results for Models I-IV have been included in the Appendix of this report.

Study Area 2 is bounded on the north by Coffinger Park and on the south by grocery store complex along a well-defined bank except in the vicinity of River Street that allows flooding to the south. The initial study (*Analysis of Preliminary Hydraulic Models)* submitted to the District 03/22/04 and reviewed during Progress Meeting (P.M.) No. 2 presented several alternative channel sections. The four alternatives presented were the 'Do Nothing Alternative', a concrete channel, a reno mattress/gabion channel section and finally a CSA channel. During the P.M. No. 2 the positive and negative aspects of each of the alternatives were discussed. Such items as maintenance, sediment deposition and

degradation, costs, visual appearance/appeal, impacts to Coffinger Park and equestrian/ATV access were discussed. Based on these discussions a determination was made to use a composite channel on the downstream section of the project. The composite channel has a natural bottom (for equestrian compatibility and ease of maintenance), a concrete lined south bank and a gabion/reno mattress north bank (See Figure 8, Detail A). A concrete lined slope, versus a CSA side slope, along the south side was chosen because of spatial constraints resulting in impacts into the park property. The CSA bank stabilization would encroach into the park area by approximately 12-ft-15-ft as compared to the concrete lining. This distance is significant when trying to minimize negative affects to the park including the removal of existing trees, roads and possibly structures. The gabions mattress slope protection was chosen for its visual appeal due to its proximity to the park. Progress Meeting Minutes No. 2 are included in the Appendix, Attachment J and dated 4-05-04. Figures relating to the alternative analysis that were previously submitted to the District for review have been included in the Appendix, Attachment N.

During the examination of Study Area 3, it was determined that flooding occurs to the west along the Hassayampa River western bank. The flooding in this area converges with the flooding to the south in Study Area 2. It was realized that levee protection needed to be added to the west bank of the Hassayampa for approximately 1800 lf. The levee will tie into ADOT's proposed protection at approximately the location of the existing US 93 Hassayampa River Bridge and extend southward. The northern tie in point may shift slightly if the proposed ADOT project changes as it moves toward final design.

4.2.2 STUDY RESULTS

4.2.2.1 Study Area 1

The existing condition (represented in J.E. Fuller's CLOMR) for the reach was initially modeled (Appendix, Attachment A). Subsequently, Model I (Appendix, Attachment B) was developed utilizing the CLOMR as the main section of the study. However, the accepted CLOMR did not extend downstream to the tie in with the Hassayampa River. Because of the proposed US 93 Bridge, it was required that this downstream portion be included. The final base model used by AZTEC (AZTEC's base model) is the J.E. Fuller CLOMR with five sections of the ADOT model blended at the downstream limits. A revised section for the proposed ADOT Bridge over the Sols Wash has been added. The models submitted on March 23rd, 2004, had a preliminary bridge section that had 5 spans versus 7 spans. Included in the CLOMR model was the riprap bank protection along the south bank of Sols Wash, which has already been installed for the Goldmine Village Development.

A levee was then placed along the north bank beginning approximately 1000' upstream into Hospital wash and continuing downstream past the confluence with Sols Wash and tying in at the existing U.S. 93 Bridge. This levee is the improvement in the upstream reach to alleviate breakouts occurring and eventually flooding across Tegner Street as a result of the 100-year flood. The final results of the model showed that the levee raised the water surface slightly. As the model progresses further downstream, the water surface ties back into the AZTEC base model prior to the existing U.S. 93 Bridge (Tegner Bridge). This model was then used as the base model for developing alternative sections between the U.S. 93 Bridge and the proposed ADOT Bridge.

During the initial analysis of Sols Wash, it was determined that Hospital Wash likely contributes to the breakout over U.S. 93. As a result, any improvements to eliminate breakouts over the existing U.S. 93 would have to consider the effects of Hospital Wash and a long term approach to flooding in the Mobile Home Park. Hospital Wash was analyzed using the 100-year discharge of 900 cfs and beginning with a 10-year discharge water surface in Sols Wash at the confluence of the flows.

Hospital Wash along had minimal breakout of its natural banks, less than 35 cfs. However, in conjunction with the flows from Sols Wash, there was breakout of the combination of the two washes over the banks of Hospital Wash.

Cross-sections were cut using Auto Cad on the 3-D contour map acquired from the District. A HEC-RAS analysis was then performed using the geometric data developed from cross section to develop the Hospital Wash existing conditions model (Model III). The model shows that Hospital Wash flows actually break out of the channel and flow northeast towards Tegner Street. The information depicts that Hospital Wash could possibly flood Tegner Street before the flows in Sols Wash peaked.

As in the Sols Wash analysis, a levee was then located along the north bank to determine the effects of cutting off any breakout from Hospital Wash (Model IV). This model also developed the required levee height for Hospital Wash improvements. The results showed the analysis of Sols Wash controlled the levee heights determined for Hospital Wash.

When Model IV (Appendix, Attachment E) was analyzed, it was determined that the flood elevation within the Mobile Home Park is raised 0.6'. Although the Mobile Home Park is currently floods during the design storm event, the proposed improvements worsen the affects. As a result, the District must mitigate for the increase. This report discusses two alternatives for mitigation. The District could add additional levee improvements on the north and south side of the Mobile Home Park. This alternative would include the reconstruction to one of the park's entrances, while removing another entrance from use. Another alternative is to buy out the homeowners living in the park. These two options and associated costs are included in the Future Studies section 6.1 of this report.

4.2.2.2 Study Area 2

The downstream reach was modeled with the composite channel section (See Figure 8, Detail A). This channel was deemed most desirable based on input from the District representatives, the Town of Wickenburg and design criteria. Some of the design criteria considered was a stable flow regime, velocities through the channel, possible sediment deposition and equestrian trails located along and at the bottom of the channel section.

The cross section used in the Appendix, Attachment F is constructed by lining the south bank with a concrete slope and using Reno mattresses/gabions to line the north bank and levees through the full length of the subject reach on both banks (See Figures 9 – 14). Several bottom widths were analyzed to determine the section that would not cause backwater effects on the bridge at Tegner Street. The most narrow width possible is required to minimize the effects to the trees and the adjacent parking area along the north bank. A side slope of 1.5:1 was used on both sides in order to minimize the width of the sections. A 14' top levee width was included to serve as a maintenance road on the north bank.

A natural bottom between the two improved banks will be maintained and sloped according to the results of the equilibrium slope analysis. The results of the equilibrium slope analysis show that a drop structure immediately downstream of the Tegner Street Bridge may be required. See Section 4.3 for a detailed discussion of further studies on this section.

4.2.2.3 Study Area 3

While completing the analysis for Study Area 2, it was determined that additional flow was contributing to the area from the south. The flow was overtopping the western bank of the Hassayampa and flooding the area to the west. It was realize that approximately 1800 lf of levee would need to be

added in this location otherwise the improvements on the south side of Sols Wash would be negated. Refer to Figure 5 for the proposed 100-year flood boundaries.

4.3 Sediment Transport

As part of the Sols Wash Candidate Assessment report to evaluate an improved channel between the existing and proposed U.S. 93 bridges, the effects of sedimentation and scour were also investigated. The procedures used were appropriate to the Level II analysis according to the 'three level approach" outlined in the Arizona Department of Water Resources publication " Design Manual for Engineering Analysis of Fluvial Systems". Since the purpose of this report was to assess the need and evaluate the cost for any improvements required resulting from the proposed ADOT project, procedures outlined in the Level II were deemed sufficient to provide the data necessary to make an economic evaluation of the alternatives presented in this report.

A comparison of the field surveyed cross sections along Sols Wash and those provided by the Corps FIS study have been included. Refer to Appendix I, for a plan view of the cross-section locations (Figure 17). The profiles for each cross-section have been provided in Figures 18 –21.

Field data was obtained by ADOT for the proposed US 93 project. ADOT provided this information to the District on the condition that it supplement field observations and in the future be used to verify gradation sizes obtained by testing in the subject reach for Sols and Hospital Wash. The sieve analysis from ADOT had 3 samples and was taken downstream of the Tegner Bridge. The D50 samples yielded a gradation size of approximately 1.2 mm and the D90 samples ranged from about 2.5 to 7.0 mm. The calculations have been recomputed based on the new information and are provided in the Appendix, Attachment G.

Additionally, initial gradation sizes were used to determine the sediment transport results and are also included in Attachment G for comparison purposes. This initial selection of data was based using the District's library to research other studies on similar watersheds in Arizona for data pertaining to sediment and bed material. In particular the study, "Agua Fria River Sediment Transport study was looked at for similarities to Sols Wash. A gradation curve developed at this section was used in the present study to determine the sediment sizes used in the calculations. D_{50} = 2.1 mm and D_{90} =32 mm was extrapolated from the graph.

Hydraulic data was determined from the HEC-RAS model of the selected channel alternative, a composite channel, which will employ concrete lining on the south bank and Reno Mattress lining on the north bank. The center of the channel was left in its natural condition and would be subject to degradation, which is determined later in this study. Therefore, the toe down depth will be required in the upstream portion of the reach. This channel, selected to reduce impacts to the adjacent park and to convey the 100-year flow (Q=15,045 cfs) through the reach without impacting the bridge at Tegner Street and development upstream. The 10-year flow of 7,109 cfs was used as the bank full discharge in the sediment calculations. A Manning's "n" factor was assumed to be 0.026 for the natural channel, 0.016 for the concrete lining and 0.04 for the Reno Mattress lining. The existing slope for the channel is 0.00725 ft/ft.

The potential for armoring was not anticipated to be a factor in this reach of Sols Wash due to the lack of any cobbles in the streambed. In order to eliminate it as a factor, the armoring size was calculated using procedures employing the Peter-Meyer, Muller equation and graphically with the Shields Diagram. The material size required for armoring was found to be about 2.4 inches. Prior to final

designs, it will be required to do a soils investigation of this reach as well as for other reaches upstream in the study area.

The natural slope through the subject reach is 0.0072, which was found to be the average of the channel slope upstream of the Tegner Street Bridge within the project area. The limiting slope or stable slope was then determined to evaluate the potential for degradation in the subject reach because of the changes in hydraulics caused by the new composite section. Three methods were used to determine the stable slope using the 10-year flood, which is the bank full discharge. The use of the Schoklitsch Bedload Equation the Meyer-Peter, Muller Method and the Shields Diagram method yielded an average stable slope of 0.0001 ft/ft. The depth of degradation equals to 6.2 ft., using the stable slope technique or three-slope method. If a control structure was built at the upstream section of the proposed ADOT bridge, then the depth of degradation the upstream bridge would be the difference between the existing slope of .0072 and the computed stable slope, is approximately 10 ft. Due to this depth of degradation an 10 ft. drop structure should be considered downstream of the Tegner Street bridge in the final design. This overall difference could be distributed over several small consecutive drops within this section of the reach.

Using the Equilibrium slope method, which is defined as the slope at which the sediment transport capacity of the channel is equal to the incoming sediment supply, the equilibrium slope was calculated to be 0.0067 ft/ft. This was determined by calculating the inflow sediment discharge in the natural channel, which had a slope of 0.0072 then by iteration calculating a slope in the new channel with the same sediment transport capacity. This shows that the new channel with the composite section will degrade and if the ADOT Bridge is assumed to be the pivot point, the total depth of degradation at the Tegner Street Bridge will be 2.5 feet. A local scour analysis was completed for the study channels and was used to determine the tow down depths for both Hospital Wash and Sols Wash (Appendix, Attachment G).

4.4 Modal

4.4.1 Vehicular

During discussions with the Town of Wickenburg, it was relayed to AZTEC that traffic ways have been affected by past flooding. Most recently, the existing US93 was overtopped in October 2000. Not only was the road inundated, but several residences downstream experienced significant flood damage. The proposed improvements on the north side of Sols Wash, west of the Tegner Street Bridge will eliminate the flooding for the 100-year event. The proposed levee will maintain the flow within the Sols Wash channel.

The existing US93 (Tegner Street) Bridge was rebuilt in 1999, as a 6-span, continuous slab bridge with concrete floors. During the hydraulic analysis of the base conditions, it was determined that the 100-year Q exceeds the low chord elevation on the upstream side at the bridge, see Figure 5, Detail B. In order to provide additional protection for the structure and passing vehicles during times of 100-year peak flows, a freeboard of 4-feet must be maintained on the bridge. A new 2-foot high structural wall section would need to be added to the existing bridge. This section must be connected so that it withstands the approaching water force from the upstream side. Refer to the Recommendation section entitled Tegner Street Bridge Structural for further details.

Coffinger Park, which is located on the north side of Sols Wash, has an access road and overflow parking adjacent to Sols Wash. The proposed improvements will affect the north bank of Sols Wash. The existing trees, which are predominately Mesquite, Salt Cedar and Cottonwood, would require removal due to spatial limitations adequate protection against flooding for the park and the adjacent

residences. The park access road will remain in place and will act as a loop around the park. The overflow parking will be removed. If these additional parking spaces are required, there appears to be several locations that could be utilized.

River Street, located west of the proposed US93 Sols Wash Bridge, is scheduled for removal as part of this project. Considerations for roadway access between the north and south bank at the existing River Street crossing is not required at this location. On the north side of Sols Wash, River Street, will become part of the loop road around Coffinger Park. On the south side of the wash, River Street will dead end into the proposed levee improvements. Appropriate barriers and demarcation will be added to instruct vehicles as to the change. The Town has expressed a desire to have some type of foot bridge constructed to maintain pedestrian traffic between the north and south bank of Sols Wash in this area. This should be considered during the final design phase of this project.

4.4.2 Pedestrian

As shown on the bridge section noted on Figure 8, Detail C, a sidewalk is located along the existing concrete parapet section and open steel railing. The proposed 2-foot wall section is intended to provide an additional level of protection to both passing vehicles and pedestrians. See the Recommendations section 5.3 Tegner Street Bridge Structural for additional information.

4.4.3 Equestrian Trails

The Town of Wickenburg has planned to have equestrian trials in the vicinity of Coffinger Park. Access points will be proposed between the bank/levee and the bottom of the wash. This will allow the horse and rider to enter the park from the wash area, after the improvements have been installed. See Figure 8, Detail E and Section A-A.

4.5 Environmental

4.5.1 Existing Conditions

AZTEC staff conducted a site reconnaissance survey of the study on April 19, 2004. The study area is located at the confluence of Sols Wash and the Hassayampa River in Wickenburg, Maricopa County, Arizona, and includes the channels of the Hassayampa River, Sols Wash, Hospital Wash and a portion of the adjacent floodplain between Sols Wash and the Hassayampa River. The study area is located within the Arizona Upland subdivision of the Sonoran Desertscrub Biotic Community at elevations ranging from 2,000 to 2,100 feet above mean sea level. Vegetation along the channels of these three ephemeral watercourses is dominated by seepwillow, burrobush, desert broom, and stands of cottonwood, willow, and exotic salt cedar that vary in size and density, with salt cedar becoming more prevalent along Sols Wash west of Tegner Street (US 93). Low- to high-density residential, commercial, and recreational development dominates the landscape in the floodplain adjacent to these watercourses, where vegetation consists mostly of non-native ornamental species. Aside from off-road vehicle travel, the channels of these watercourses are relatively undisturbed, except the southwest bank of Sols Wash west of Tegner Street, where vegetation has been removed and replaced with bank protection.

4.5.2 Potential Concerns

Clean Water Act: The Hassayampa River, Sols Wash, and Hospital Wash are likely jurisdictional waters of the United States as regulated by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act. Should construction activities involve work in the channels of these watercourses, a jurisdictional delineation of waters of the U.S. is recommended to determine potential Section 404 permit requirements.

Special Status Species: The U.S. Fish and Wildlife Service list of threatened, endangered, proposed, candidate, and conservation species potentially occurring in Maricopa County was reviewed. Within the study area, there is no designated critical habitat for any Endangered Species Act-listed species; however, potentially suitable habitat for the endangered Southwestern willow flycatcher and the candidate yellow-billed cuckoo occur along portions of the Hassayampa River and Sols Wash. In addition, both of theses species are known to occur in The Nature Conservancy Hassayampa River Preserve located downstream of the study area. Therefore, it is recommended that a Biological Evaluation for the project be prepared to determine potential requirements for compliance with the Endangered Species Act. Coordination with Arizona Game and Fish Department is also recommended to determine potential presence of other special status species in the study area. Typically this involves sending a letter to the Arizona Game and Fish Department requesting a Heritage Data Management System query for the study area.

Hazardous Materials: A hazardous materials records check should be conducted in order to identify any existing hazardous material sites in the study area. Any hazardous materials that may be encountered during future projects would require treatment in accordance with federal, state, and local hazardous material regulations.

Cultural Resources: The presence of cultural resources in the study should be established through coordination with the Arizona State Museum (ASM) and the State Historic Preservation Office (SHPO). If the study area has not been entirely surveyed for cultural resources, a survey meeting ASM and SHPO standards should be conducted prior to any construction activities. If cultural resources are identified in the study area that may be affected by future flood control undertakings, the appropriate measures should be taken to ensure that these resources are treated in accordance with all applicable State and Federal preservation laws and regulations.

4.6 Property Information

4.6.1 Jurisdiction and Ownership

The proposed improvements will occur adjacent to and within the Sols and Hospital Wash. According to the Maricopa County official government website, the following property owners would be affected by the proposed improvements and all the properties are located in the Wickenburg jurisdiction. See Figure 15 for mapped locations.

1. George David Underdown
   286 North Frontier Street
   Wickenburg, AZ 85390

2. George D. and Glori Underdown
   286 North Frontier Street
   Wickenburg, AZ 85390

3. Town of Wickenburg
   Coffinger Park
   155 North Tegner Street, Suite A
   Wickenburg, AZ 85390

4. P & J Investors, Inc.
   510 North Tegner Street, Suite A
   Wickenburg, AZ 85390

5. Hershkowitz, Philip w/Sarah
   53610 North Lazy Fox Drive
   Wickenburg, AZ 85390

6. and 7. Palm Drive LLC
   8532 East Kein Drive
   Scottsdale, AZ 85250

4.6.2 Land Use

The existing development adjacent to the project limits varies along the reach. The development is a mixture of residential, commercial, Coffinger Park – Town owned and maintained, and undeveloped areas. Further development is anticipated in those undeveloped areas within the next 10 – 15 years.

4.6.3 Zoning

The zoning (as per the City and the Assessor), as of August 2003, for the affected areas are as follows:

1. R1-12 - Single Family Residential zoning District – 12,000 sf per dwelling unit/lot
2. R1-12 - Single Family Residential zoning District – 12,000 sf per dwelling unit/lot
3. R1-12 - Single Family Residential zoning District – 12,000 sf per dwelling unit/lot
4. R1-12 - Single Family Residential zoning District – 12,000 sf per dwelling unit/lot
5. R1-6 / R6 – Single Family Residential zoning District 6,000 sf per dwelling unit/lot
6. MHP – Mobile Home Park
7. MHP – Mobile Home Park

4.7 Manning's 'N' Value Sensitivity Analysis

As part of this report, a Sensitivity Analysis was completed for the portion of Sols Wash located between the existing US93 Bridge and the proposed US93 Bridge (ADOT). This area of the reach is shown in Figures 9 – 12 as section 1 and 2. The model results are in the Appendix, Attachment F and have been run with the composite section. The Sensitivity Analysis exhibits the effects on the 100-year water surface elevation if the Manning's 'N' value is altered. The 'n' value shown in Table 2 represents the value used for the bottom or floor of the recommended channel sections. It is assumed that a change in the 'n' value for the concrete slope protection and the gabion mattress is not anticipated. The column labeled 'n=0.03' represents the composite section since that was the value ('n'=0.026) established for the natural bottom. As expected, the water surface elevation is raised for sections 0.22 through 0.79. A change in the Manning's 'N' value, ranging from 0.02 to 0.05, does not affect the water surface elevation for sections 0.13 and 0.19 just prior to entering the proposed ADOT Bridge. Supporting data related to this analysis is included in the Appendix, Attachment L.

Table 2: Sensitivity Analysis (Refer to Figure 4 for Section locations)

Water Surface Elevations in Section for "n" value				
Section	n = 0.02	n = 0.03	n = 0.04	n = 0.05
0.13	47.45	49.40	49.40	49.40
0.19	49.40	49.70	49.70	49.70
0.22	51.58	52.04	52.04	52.49
0.27	52.00	54.65	56.07	54.12
0.35	56.50	56.46	57.98	56.51
0.40	60.38	60.83	61.09	61.82
0.43	61.23	63.64	63.64	63.43
0.48	63.02	63.89	64.11	64.21
0.52	63.64	64.21	64.85	65.39
0.57	63.72	64.67	65.74	66.55
0.61	66.37	66.89	67.40	68.44
0.66	68.62	69.70	70.45	70.96
0.71	68.78	71.02	71.54	71.86
0.76	71.11	71.96	72.44	73.01
0.79	73.80	73.90	73.95	74.26

5 RECOMMENDATIONS

5.1 Hospital Wash

Based on the information gathered during the study for this report and the hydraulic models presented in Attachment C and E, it is recommended that a levee be installed along the north side of Hospital Wash. The limits are shown on Figure 14 and are located from Sta. 10+00 to approximately Sta. 18+00. The levee will aid in the elimination of breakout flows originating in Sols Wash and extending northward past the limits of Hospital Wash. The water surface elevations occurring during a 100-year storm event are shown in the table below.

Table 3: Hospital Wash Levee Height Determination

CROSS-SECTION		APPROXIMATE STATION	HOSPITAL WASH IMPROVEMENT WS	SOLS WASH IMPROVEMENT W	LEVEE HEIGHT
Hosp.	Sols				
	0.76	10+00		2071.96	2074.96
6		10+40	2070.45		
5		12+10	2069.61		
4	0.71	14+00	2068.84	2071.02	2074.02
3		16+30	2066.59		
2		16+50	2066.55		
1	0.66	17+60	2066.54	2069.70	2072.70

The cross-section numbers and stations along the downstream section of Hospital Wash are noted. Column 3 represents the water surface elevations that would result if levee improvements area added in Hospital Wash using the 100-year Q of 900 cfs. Column 4 shows the resulting water surface elevations in Hospital Wash from an analysis of what would happen in Sols Wash with the Hospital Wash levee improvements. By comparing these two columns, it can be surmised that the flows in Sols Wash control the proposed levee heights in Hospital Wash. Once the controlling levee heights along the wash were determined, an analysis of the effects in the Mobile Home Park (located at the confluence of Hospital Wash and the north branch of Sols Wash) was required. When examining the WS elevations between the base model and the Sols Wash levee improvements model (Appendix, Attachment B and C) the changes can be seen. Both sections 0.76 and 0.71 cross the Mobile Home Park.

Table 4: WS Elevation Mobile Home Park

SECTION	ATTACHMENT B MIXED FLOW WS ELEV	ATTACHMENT C MIXED FLOW WS ELEV	WS ELEV DIFFERENTIAL
0.76 (10+00)	2071.94	2071.90	-0.04'
0.71 (14+00)	2070.40	2071.02	+0.62'

Since the levee improvements raise the water surface elevation using the Q100, the difference must be mitigated. The existing ground line at Sta. 14+00 within the Mobile Home Park is approximately 2069.50. This section of the Mobile Home Park currently floods approximately 11-inches. With the installation of the levee improvements, the area will flood approximated 18-inches. One option to mitigate for this negative impact is the addition of a levee system around north, east and south sides of the Mobile Home Park (See Figure 16). Since the flows from Sols Wash caused the flooding in this

area, a significant length of levee would need to be constructed on the south side of the Mobile Home Park (the north bank of the north branch of Sols Wash). In order to prevent the flow from entering the Mobile Home Park from the west, the levee would need to extend approximately 2200 lf upstream. In addition, a levee would also need to be placed on the south side of Hospital Wash. The Hospital Wash levees would eliminate one of the accesses to the Mobile Home Park.

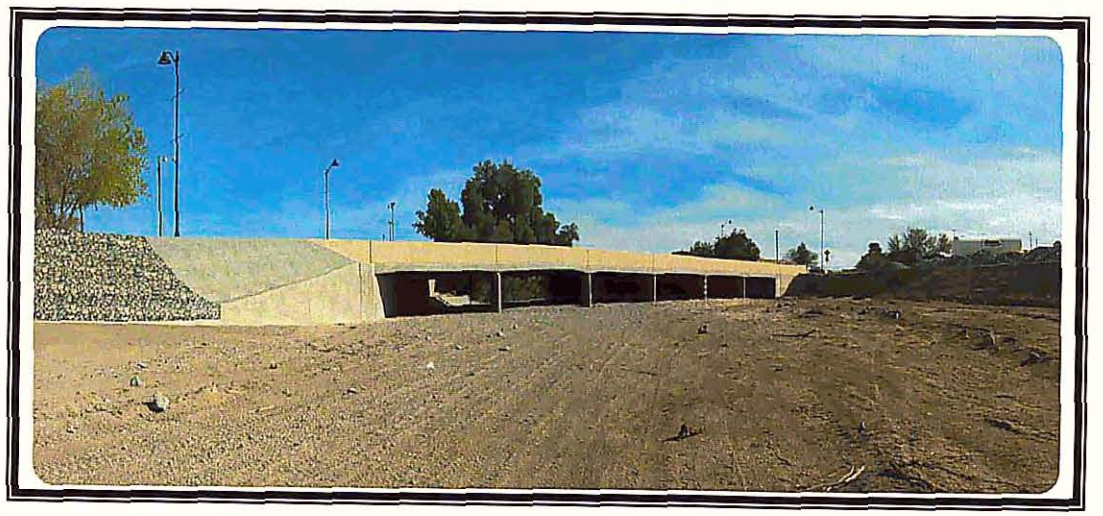
A second alternate for mitigating the increased water surface elevation is to buy out the homeowners in the Mobile Home Park. Although this option is usually a last resort for the District, significant cost associated with other forms of mitigation can make those options prohibitive. It is recommended based on the information presented in this report to construct the levee protection for the Mobile Home Park. See Section 6.1 Mobile Home Park – Future Studies for more information.

5.2 Sols Wash west of Existing US93 Bridge

Based on the information gathered from historical flooding data and Model II (Appendix, Attachment C), a levee along the north side of Sols Wash from Sta. 18+00 to Sta. 29+74 (the existing US93) is warranted. The preliminary levee location is shown on Figure 13 and 14. The typical cross-section is labeled as Detail B on Figure 8. This section of levee, in conjunction with the north bank Hospital Wash levee, will eliminate the flows from overtopping the north bank of Sols and Hospital Wash on the west side of the Tegner Street Bridge and eventually crossing over Tegner Street north of the Cowboy Cafe. The estimate of costs associated with the levee improvements is detailed in Section 5.6.

5.3 Tegner Street Bridge Structural

The existing southwest edge of the Sols Wash Bridge was constructed with an ADOT standard combination pedestrian-traffic bridge railing. The railing system consists of a concrete parapet section that is topped with an open steel railing Figure 8, Detail C. As part of the proposed Sols Wash improvements, the open steel railing will be removed and replaced with a concrete extension. The top of the concrete extension will be set at approximately 2'-0" above the top of the existing concrete parapet section resulting in a total height of approximately 4'-9" above the top of the bridge deck Figure 8, Detail D. The top of the existing open steel railing will be the approximate height of the newly extended concrete parapet wall.



Simulation Photo: Existing US 93 Tegner Bridge from the West
Simulation showing Gabions into North side of Structure

The extension will serve as a headwall that will provide the required freeboard against overtopping for the bridge because the connecting levees will be raised to the same elevation. This modification is feasible; however, complete investigative design calculations are required to demonstrate that the additional height will not jeopardize any aspect of the existing structure. Key areas that will need investigation include the effect of traffic impact on the taller barrier section, increased stream flow forces on the parapet and structure and an analysis of the additional forces that are transferred into the edge of the bridge deck.

5.4 Sols Wash Between Existing US93 Tegner Bridge and Proposed ADOT US93 Bridge

This section of Sols Wash was considered to be the core study area. Historical photos suggested that significant flooding to the north occurred in this reach. A composite channel section has been recommended for this portion of Sols Wash, See Figure 8, Detail A. The composite channel section was chosen during Progress Meeting No. 2. The composite section was selected based on spatial limitations/requirements, visual appearance, southern bank constraints and equestrian trail needs. Along the south bank, a 1.5:1 concrete side slope was chosen. Several commercial properties and several multiplex residences are situated on the south side of Sols Wash. These properties are located relatively close to the edge of the south bank. Many attempts have been made to protect the bank such as concrete walls and large reinforced concrete pieces acting as rip-rap. Due to these attempts, the appearance of the south bank is unappealing. In an attempt to make the bank more visually appealing while protecting the properties, a concrete side slope is recommended. The side slope will be constructed without removing the existing conditions. The Town of Wickenburg does not have as-builts on the existing slope protection measures and to eliminate any chance of slope failure, the existing improvements will remain.

Simulation Photo: Sols Wash Composite Channel Simulation
Looking Downstream from Existing US 93 Tegner Bridge

The channel bottom is to remain in its natural state. The Town of Wickenburg uses Sols Wash as part of its equestrian trail system and for ATV's. Along with the Town's desires, significant evidence did not exist supporting degradation of the channel bottom. Therefore, protection of the channel bottom was not required. These reasons along with ease of maintenance resulted in the recommendation to keep the channel bottom natural.

The north bank is to be constructed with a gabion mattress. In addition, a 14-foot maintenance road is to be located at the top of the levee (See Figure 8, Detail A). At some point along the north bank of this section of Sols Wash, an access point is to be added (See Figure 8, Detail E and Section A-A). The actual location will be determined during final design based on the additional width requirements and the Town of Wickenburg equestrian trail system. The probable costs associated with the composite channel section have been included.

5.5 Hassayampa River Levee (Study Area 3)

Based on information concluded from the Sols Wash Study and the 100-year flood boundaries shown the FIRM for the area, approximately 1800 lf of levee has been proposed. This new levee would extend from the southern end of ADOT's proposed bank stabilization on the western edge to a point approximately 1/3 mile to the south. The levee would protect those properties to the west and northwest up toward the southern bank of Sols Wash.

5.6 Utility Realignment

A 12" water line appears to cross on the west side of the new ADOT Bridge and an 8" water line crosses Sols Wash on the south/east side of the Tegner Street Bridge. Depending on the depths, the pipes may need to be realigned. The required toe down for the gabions and concrete side slope may interfere with the current pipe depths. This will be identified during the final design. A 4-inch water line is located along the north side of Sols Wash adjacent to Coffinger Park. Dependent upon the proposed improvements, this line may also need to be relocated.

There are three sanitary sewer lines that may interfere with the proposed improvements in the channel. Two of the pipes, an 18-inch and a 21-inch, cross Sols Wash. In addition, an extension of the 21-inch line is located on the north side of Sols Wash along the edge of Coffinger Park. The actual location and depth of these pipes would need to be identified during the final design to determine possible conflicts. The existing water and sewer lines are shown on Figures 9 – 13.

5.7 Opinion of Probable Costs

5.7.1 'Do Nothing' Option

The option to take no action has been investigated for the Sols and Hospital Wash channels. The channels and the existing US93 Bridge would remain as currently constructed and the only change that would occur to the area would be the construction of ADOT's US93 roadway and bridge. Assuming that ADOT's proposed construction does not add any adverse impacts to the region, an examination of the associated costs are noted.

a. Flood Insurance Costs

Based on information from the Maricopa County Assessors Office and local insurance companies, an estimate of yearly flood insurance costs can be determined. Refer to Figure 3 for the existing 100-year flood plain and Figure 5 for those areas which would be removed from the flood plain based on the recommended improvements. A study of the assessor's office mapping showed approximately 122 residences and 12 businesses affected by the 100-year flood boundaries. If the recommended

improvements are made, those residences and businesses would no longer be required to pay flood insurance. The current property value is estimated at $10.5 million. The annual flood insurance for those properties is approximately $32,600. In order to accurately study the cost savings, a study period of 50 years has been determined with 4% inflation and 4% increase in property value. If the affected properties continue to pay flood insurance over the study life, the current value of those annual costs is approximately $1.6 million. This cost savings would be realized by the affected properties.

b. Maintenance Costs

After significant flood events any bank material lost would need to be restored. Based on similar studies and the storm event, this cost could range from approximately $4,000 to $ 500,000 using $7.00/cy for replacement. In addition, labor and equipment would be required to help with emergency flood control and clean up efforts.

5.7.2 Hospital Wash

Table 5: Hospital Wash Levee Improvements Opinion of Probable Costs

Pay Item	Description	Quantity	Unit	Unit Cost	Probable Cost
1	Public Information and Notification	1	LS	$5,500	$5,500.00
2	Mobilization	1	LS	$6,700	$6,700.00
3	Permits/Mitigation	1	LS	$25,000	$25,000.00
4	Earthwork (Excavation)	860	CY	$5.00	$4,300.00
5	Earthwork (Fill)	2,852	CY	$7.00	$19,964.00
6	Gabion Mattress	311	CY	$80.00	$24,880.00
7	Land Acquisition (assume residential zoning)	24,000	SF	$0.99	$23,760.00
8	Design and Construction Management	1	LS	$32,800	$32,800.00
9	Contingency (30%)	1	LS	$39,000	$39,000.00
			TOTAL		**$181,900.00**

5.7.3 Sols Wash West of Existing US93

Table 6: Sols Wash West of Existing US93 Opinion of Probable Costs

Pay Item	Description	Quantity	Unit	Unit Cost	Probable Cost
1	Public Information and Notification	1	LS	$15,000	$15,000.00
2	Mobilization	1	LS	$20,000	$20,000.00
3	Permits/Mitigation	1	LS	$26,000	$26,000.00
4	Earthwork (Excavation)	1,261	CY	$5.00	$6,305.00
5	Earthwork (Fill)	13,045	CY	$7.00	$91,315.00
6	Gabion Mattress	785	CY	$80.00	$62,800.00
7	Land Acquisition (residential zoning & flood plain)	52,830	SF	$0.99	$52,302.00
8	Structural Improvements to Tegner	1	LS	$20,000	$20,000.00

	Street Bridge				
9	Design and Construction Management	1	LS	$88,800	$88,800.00
10	Contingency (30%)	1	LS	$110,000	$110,000.00
			TOTAL		**$492,500.00**

5.7.4 Sols Wash Between Existing US93 and Proposed ADOT US93 Bridge

Table 7: Sols Wash Between Existing US93 and Proposed ADOT US93 Bridge Opinion of Probable Costs

Pay Item	Description	Quantity	Unit	Unit Cost	Probable Cost
1	Public Information and Notification	1	LS	$15,000	$15,000.00
2	Mobilization	1	LS	$53,500	$53,500.00
3	Permits/Mitigation	1	LS	$30,500	$30,500.00
4	Earthwork (Excavation)	4,770	CY	$5.00	$23,850.00
5	Earthwork (Fill)	27,670	CY	$7.00	$193,690.00
6	Gabion Mattress	1,520	CY	$80.00	$121,600.00
7	Concrete Lining	1,475	SF	$0.99	$147,500.00
8	Utility Line Relocation	1,200	LS	$13,960.00	$36,000.00
9	Tree Removal & Disposal	1	LS	$40,000.00	$40,000.00
10	Land Acquisition (Residential/Commercial/Floodplain)	62,000	SF	$0.99	$61,380.00
11	Design and Construction Management	1	LS	$219,480	$219,480.00
12	Contingency (30%)	1	LS	$275,000	$275,000.00
			TOTAL		**$1,217,500.00**

5.7.5 Hassayampa River Levee

Table 8: Hassayampa River – West Bank Levee South of Existing US93 Bridge Opinion of Probable Costs

Pay Item	Description	Quantity	Unit	Unit Cost	Probable Cost
1	Public Information and Notification	1	LS	$15,000	$15,000.00
2	Mobilization	1	LS	$19,500	$19,500.00
3	Permits/Mitigation	1	LS	$32,000	$32,000.00
4	Earthwork (Excavation)	2,500	CY	$5.00	$12,500.00
5	Earthwork (Fill)	8,350	CY	$7.00	$58,450.00
6	Gabion Mattress	1,050	CY	$80.00	$84,000.00
7	Land Acquisition (Residential/Commercial/Floodplain)	65,000	SF	$0.99	$64,350.00
8	Design and Construction Management	1	LS	$86,400	$86,400.00
9	Contingency (30%)	1	LS	$107,000	$107,000.00
			TOTAL		**$479,200.00**

6 FUTURE STUDIES

6.1 Mobile Home Park

6.1.1 Improvements

As discussed in Section 5.1, the Mobile Home Park located at the confluence of Hospital Wash and the north branch of Sols Wash is adversely affected by the proposed Hospital Wash levee improvements. The Mobile Home Park currently floods by approximately 11-inches during the 100-year storm event. With the levee improvements, the Mobile Home Park floods by about 18-inches. These adverse impacts must be mitigated. The two alternatives previously discussed (in Section 5.1) were to add additional levee to protect the Mobile Home Park (Figure 16) or to buy out the homeowners. An estimate of the probable costs associated with each alternative is shown below.

6.1.2 Opinion of Probable Costs

Table 9: Mobile Home Park Levee Improvements Opinion of Probable Cost

Pay Item	Description	Quantity	Unit	Unit Cost	Probable Cost
1	Public Information and Notification	1	LS	$15,000	$15,000.00
2	Mobilization	1	LS	$32,500	$32,500.00
3	Permits/Mitigation	1	LS	$50,000	$50,000.00
4	Earthwork (Excavation)	3,870	CY	$5.00	$19,350.00
5	Earthwork (Fill)	12,850	CY	$7.00	$89,950.00
6	Gabion Mattress	1,400	CY	$80.00	$112,000.00
7	Land Acquisition	100,000	SF	$0.99	$99,000.00
8	Roadway Reconstruction	1	LS	$50,000.00	$50,000.00
9	Design and Construction Management	1	LS	$141,600	$141,600.00
10	Contingency (30%)	1	LS	$176,000.00	$176,000.00
			TOTAL		**$785,400.00**

When levees are added to protect the mobile home park, the water surface elevation is raised slightly. This increased water surface elevation extends downstream into about the western third of Goldmine Village. The existing bank protection was set at 1 foot above the water surface elevation. The mobile home park levee improvements raise the downstream water elevation 0.3 feet. The slope protection and the site elevation on the western 1/3 of the development would also need to be raised 0.3 feet to compensate for the loss. This would add an additional $20,000 – $30,000 (depending on affect area) to the costs associated with the improvements in Table 9.

The buy out alternative costs were based on information from the Maricopa County Assessor's data. The 2004 property value for the Mobile Home Park is approximately $512,000. Additional costs that may be considered would be related to individual homeowner's relocation costs. The relocation costs per household could range from $5,000 - $7,000. There are approximately 60 permanent homeowners located in the Mobile Home Park. Total Costs based on the property value and relocation fees for the affected property owners is approximately $812,000.00.

Further studies should be completed before a final decision is determined. However, based on the information presented in this report, it is recommended that the levee improvements to protect the Mobile Home Park be included in the overall construction improvements associated with the District's Sols Wash project.

Table 10: Opinion of Probable Costs

Item No.	Description of Improvement	Estimate of Probable Costs		Contingency	Total Estimate of Probable Cost
1	Hospital Wash Levee Improvements	$142,900.00		$ 39,000.00	$181,900.00
2	Sols Wash Levee Improvements West of Existing US 93	$382,500.00		$110,000.00	$492,500.00
3	Sols Wash Between Existing US 93 and Proposed ADOT US 93 Bridge	$942,500.00		$275,000.00	$1,217,500.00
4	Hassayampa River – West Bank Levee Protection South of Existing US 93 Hassayampa River Bridge	$372,200.00		$107,000.00	$479,200.00
5	Mobile Home Park Levee Improvements	$643,800.00		$141,600.00	$785,400.00
		ESTIMATE OF TOTAL COSTS			**$3,156,500.00**

6.2 Local Run-off North of Sols Wash

6.2.1 Retention

Based on the Initial Drainage Report for US93 Wickenburg Interim Improvement Project, ADOT has proposed seven new cross-culverts in the area. Five are located along the new US93 levee / roadway and the two other culverts pass under connector streets. The culverts located under the levee will transport local run-off directly into the Hassayampa, which is the direction of current flows. Each culvert will be evaluated to determine if some type of backflow preventing devise is required on the outfalls into the Hassayampa River. These culverts have been designed to handle slightly over half of the local flow. The remaining Q_{50} = 253 cfs and Q_{100} = 287 cfs is to be transported in a drainage swale along the west side of the proposed US93 and flow into Sols Wash just prior to the proposed Sols Wash Bridge. However, with the proposed levee improvements by the Flood Control District, this direct outflow into the Sols Wash would be unavailable. Because of the location and elevation for the proposed levee, the flow in the ADOT drainage way would be trapped behind the levee on the north side of Sols Wash. In an effort to make the ADOT and District improvements work cohesively, possible solutions have been briefly examined. Additional studies would need to be completed during final design. It should be noted that ADOT's final design may differ from the preliminary information used for this report.

Based on the fact that ADOT is directing less than half of the local drainage toward Sols Wash, AZTEC has completed a preliminary analysis on how to convey the flow into Sols Wash. It appears from ADOT's preliminary drawings that a section of property has been obtained for possible storm water retention. This property is located west of the proposed US93, east of the drainage way and just north of Sols Wash. This triangular shaped piece of land is less than 1-acre in size. This area appears to be sufficient in size to retain the flow being directed southward prior to entering Sols Wash if the

depth available is approximately 10-feet. Based on the Arizona Department of Water Resources Flood Mitigations Section, State Standard for Stormwater Detention / Retention, a depth of 3-feet is preferred. Using this criteria, a preliminary basin size of approximately 3-acres in size and 3-feet in depth was determined to handle the local drainage. The basin should be designed with side slopes no steeper than 4:1. The basin and side slopes should be seeded to promote vegetation, which is intended to prevent erosion. The basin bottom should be sloped at a minimum of 0-2% grade toward the south.

6.2.2 Pipe System with Flap Gates

An outlet pipe should be located along the southern side to drain the basin into Sols Wash. The pipe has been preliminarily sized at 36-inches. The outlet is to have a backflow preventing end treatment. The backflow-preventing device shall be designed to contain the flow in the basin when Sols Wash has flows which are higher than the invert of the outfall pipe. When the flows in Sols Wash drop below the invert of the outfall pipe, the basin will drain into Sols Wash.

6.2.3 Pump Station

If a drainpipe and backflow-preventing outlet are deemed unacceptable, a pumping mechanism would be required. The flow would be contained in the basin and then pumped into Sols Wash as the flows in the channel subside. During a preliminary examination of associated costs, it may be prohibitive to construct a pump station for this purpose. An initial opinion of cost ranges from approximately $250,000 to $350,000. There would also be costs associated with operation and maintenance of the facility.

7 FUTURE DESIGN CONSIDERATIONS

The following information was noted during the completion of this report as requiring additional study and analyses during the final design phase.

- For final design – core samplings should be taken both up and down stream of the Tegner Bridge in order to obtain appropriate gradation information for the final analyses.
- A more extensive/detailed 'N' value sensitivity analysis should be performed during the final design. A preliminary analysis revealed that slight changes in the 'n' value resulted in significant impacts to the levee freeboard.
- Impacts to and design solutions for the resulting increase in water surface elevations in the vicinity of the Goldmine Village Development should be examined further during the final design.
- For aesthetic purposes, "concrete stamping" replicating a rock fascia should be considered for the recommended concrete slope protection. The appearance would be more appealing than a flat concrete face and the stamping may minimize graffiti. The addition of this rock fascia will increase the cost for the concrete side slope protection.
- It is recommended that a Letter of Map Revision be added to the Scope of the final design phase. The CLOMR/LOMR should be completed during the final design.

- The 3 part funding between the Flood Control District of Maricopa County, ADOT and the Town of Wickenburg should be determined early on in the design phase. The improvements recommended within this report have been separated to aid the different entities involved to determine which sections they will participate in providing funds. In addition, the Town of Wickenburg should pursue the possibility of other funding sources to assist with the Town's portion – such as a FEMA grant. Note: The costs shown in this report are for preliminary estimates only. Final costs should be determined based on a more detailed analysis and design.

- As note within the report, the FEMA Q was used for this CAR. The FEMA discharge was one of three documented 100-year flows for the study reach. The 3 known 100-year flows should be reevaluated to determine the Q which is most appropriate for the final design.

- The gradation coefficient used for the Zeller equation was based on parameters se in the *Design Manual for Engineering Analysis of Fluvial Systems*, page 5.55, Table 5.6a. The coefficient was based on general results from previous sieve data. During the final design, new gradation data will be obtained and the determination of the gradation coefficient should be reevaluated.

- In the section of Sols Wash between the existing Tegner Bridge and the proposed ADOT US 93 Bridge (Study Area 2), it has been noted in this report that the existing conditions on the south side are to remain. This decision is based on the possible instability of the existing improvements. As a result, careful consideration must be given to the sensitive geotechnical issues involved with construction of the new concrete slope protection. It is being noted that construction on the south side may be difficult and incur additional costs due to these circumstances. This issue should be revisited during the final design phase.

- During the analysis for this report a determination was made that it is desired that the proposed Sols Wash ADOT Bridge be considered and designed as a grade control structure. If during ADOT's final design, the bridge design changes from a box design, it is recommended that some type of weir structure be installed/constructed at the bridge to act as a grade control point. This should be reexamined during the final design.

- The JE Fuller model was modified using 24,000 cfs and compared to the CLOMR model that used 15,045 cfs. The water surface elevation was between 0.5' and 1.5' higher through most of the run. However, a 5' rise was indicated in the water surface elevation across the existing US 93 Bridge. Additional detail including modifying the breakouts would have to be run to accurately model the effects across the bridge using the 24,000 cfs. This rise would likely put the proposed buildings in the Goldmine Village Development back in the floodplain. Models II and IX have been run with the Corps of Engineer's discharge. The water surface elevations fluctuate between 1.5' and 3.6' higher than those established using the FEMA Q. Areas of concern were located at sections 0.48 through 0.76 (the Goldmine Village Development) and at the existing Tegner Bridge. Additional analysis will be required during the final design.

- For Study Area 3, the wrap around effects of flooding, a detailed analysis was not completed. During a preliminary study of the Fema Flood Plain map it was realized that backwater flow from the Hassayampa River converged with overbank flow from the south bank of Sols Wash (west of the prop. US93). The water surface elevation was determined at the approximate location of convergence. This elevation was then used to set the distance for the downstream

extents of the west bank levee. A 1-foot measure down elevation was set and then followed downstream until that elevation was reached. This preliminary analysis established the extents. For the preliminary estimate of costs, a levee design similar to that shown along the north bank of Sols Wash was used. Further study would need to be completed to determine the actual length and design of the proposed levee along the west side of the Hassayampa River.

- A preliminary local scour analysis was completed for this report and used to determine the toe down depths for the study channels (Appendix, Attachment G). Further study should be completed during final design to verify the toe down depths.

- It was recommended in Section 4.3 of this report that a 10' drop structure was required. It has been identified that additional studied regarding the drop or a series of drop structures is warranted during the final design. This recommendation will help alleviate the near critical flow conditions downstream of the Tegner Bridge. It is desired to have flow conditions in this reach be sub-critical. The resultant flow regime should be analyzed during the final design with the recommended drops to verify and acceptable Froude number. It is anticipated that the drop or series of drops will also reduce the velocities in the channel. This will most likely result in a velocity that falls within the Hydraulic Design Manuals maximum velocity guideline. This issue should also be addressed during the final design.

- Section 4.5 of this report noted potential environmental concerns. The exact permits and requirements related to those permits will be established during the final design phase.

LIST OF FIGURES

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Figure 6: 15% CONSTRUCTION PLANS – COVER SHEET
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Figure 8: 15% CONSTRUCTION PLANS TYPICAL SECTIONS / DETAILS
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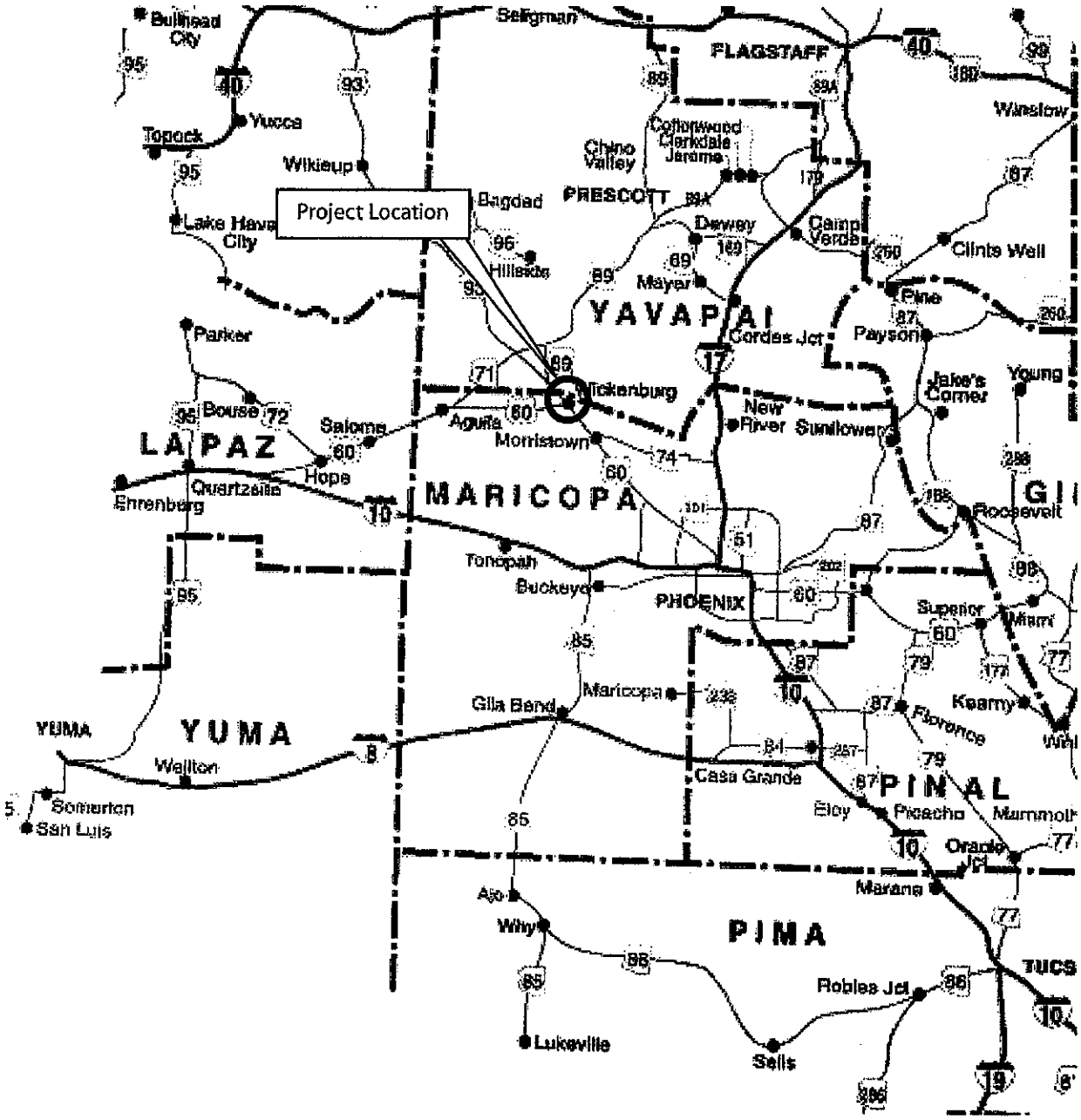
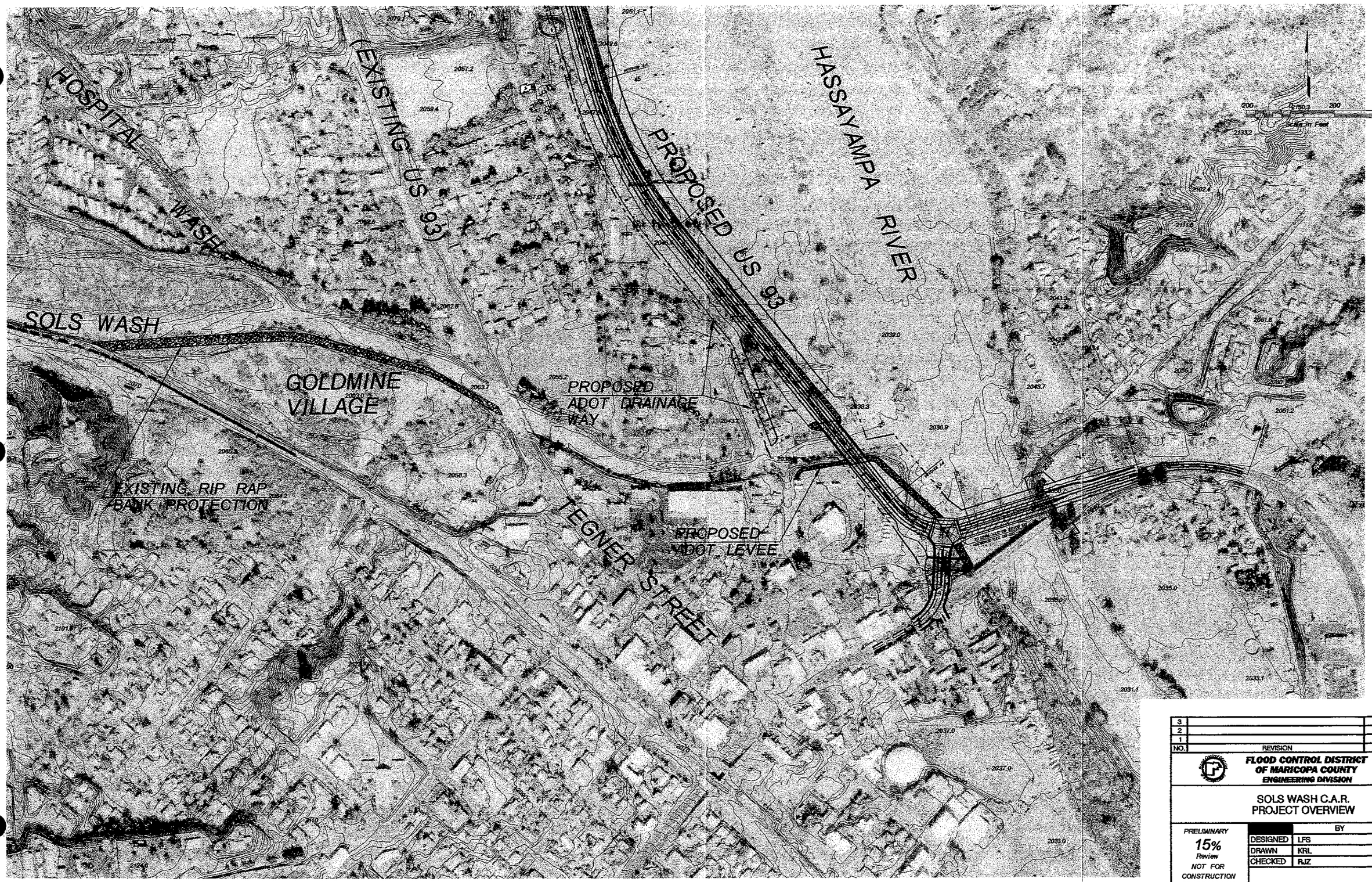


FIGURE 1: PROJECT LOCATION MAP



NO.	REVISION	BY	DATE
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

SOLS WASH C.A.R.
PROJECT OVERVIEW

PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LFS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

DRAWING NO. FIGURE 2 SHEET OF

Plotted By: kleahy at 1:46:04 PM 6/25/2004 R:\PhoenixGrove\Projects\AZ03152\Cadd\Report\3152fig02.dgn

NO.	REVISION	BY	DATE
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

SOLS WASH C.A.R.
EXISTING CONDITIONS
100 - YEAR FLOOD PLAIN

PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LFS	6/04
DRAWN	KRL	6/04
CHECKED	RJZ	6/04

DRAWING NO. FIGURE 3 SHEET OF

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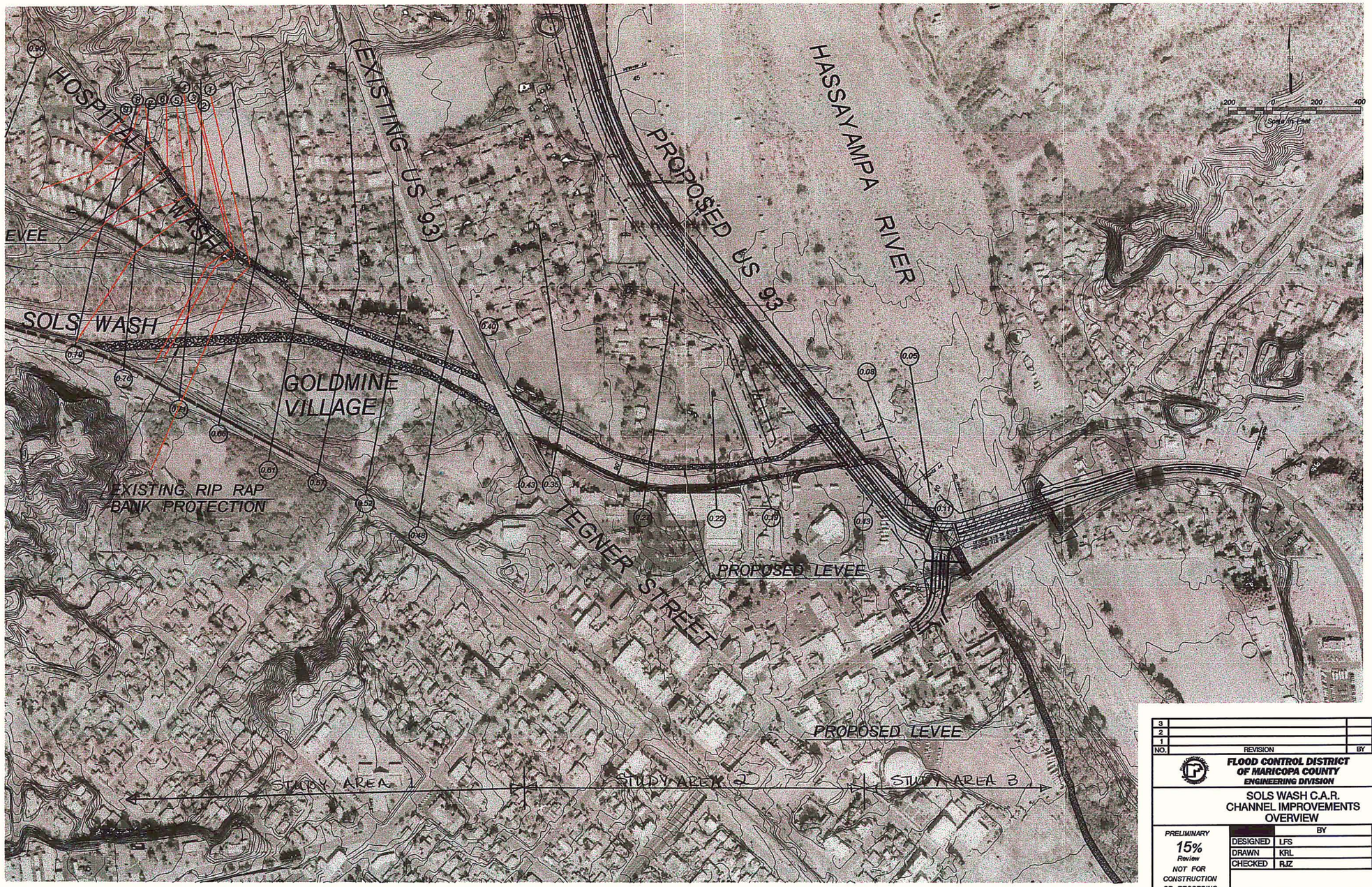

NO.	REVISION	BY	DATE
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

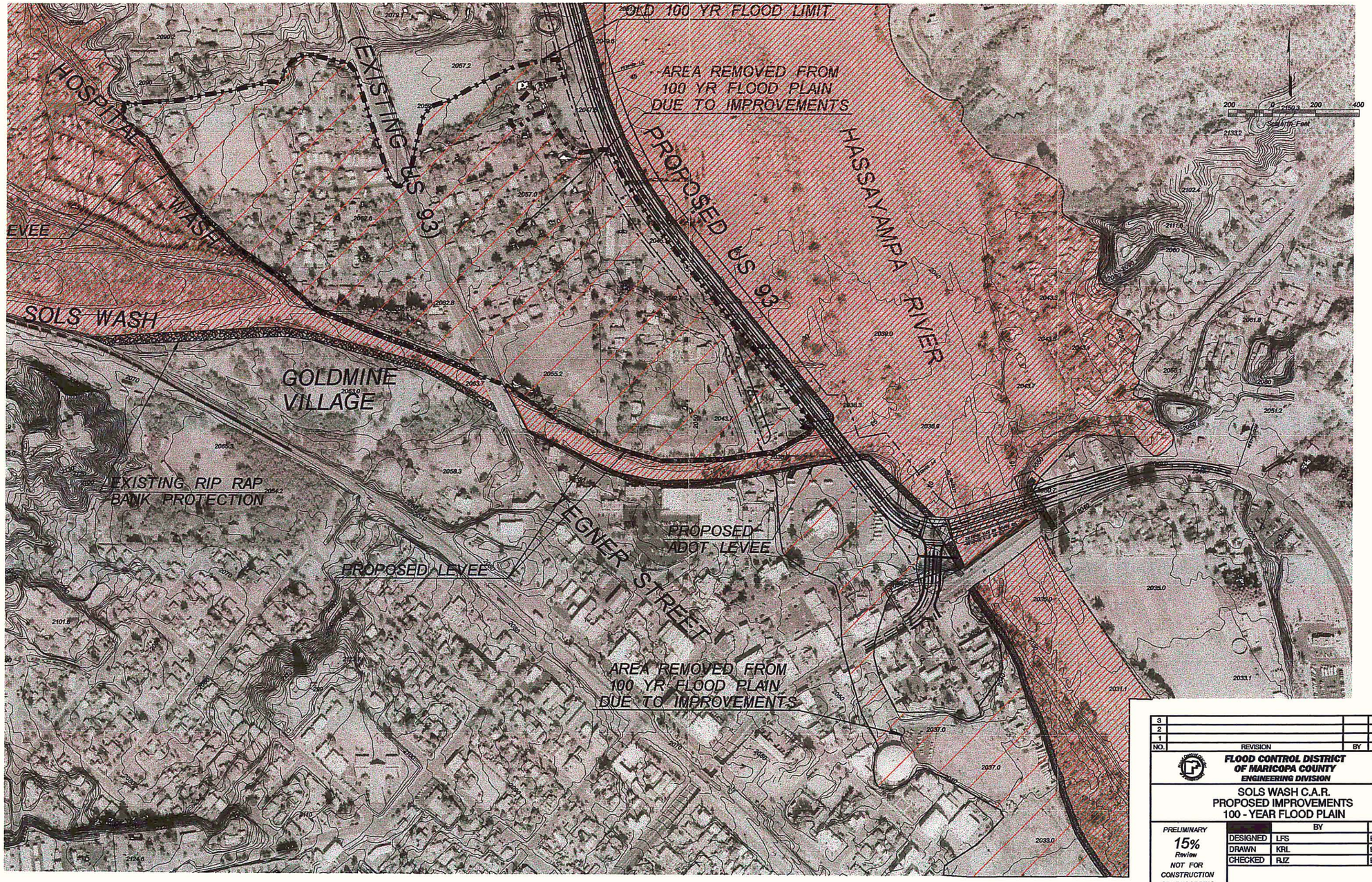
SOLS WASH C.A.R.
CHANNEL IMPROVEMENTS
OVERVIEW

PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LFS	8/04
DRAWN	KRL	8/04
CHECKED	RJZ	8/04

DRAWING NO. FIGURE 4 SHEET OF

Plotted By: kleahy at 1:55:44 PM 6/25/2004 R:\PhoenixGrove\Projects\AZ03152\Cadd\Report\3152Fig04.dgn



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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

SOLS WASH C.A.R.
PROPOSED IMPROVEMENTS
100 - YEAR FLOOD PLAIN

PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LFS	6/04
DRAWN	KRL	6/04
CHECKED	RJZ	6/04

DRAWING NO. FIGURE 5 SHEET OF

Plotted By: kleahy at 1:57:45 PM 6/25/2004 R:\PhoenixGrove\Projects\AZ03152\Cadd\Report\3152Fig05.dgn

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

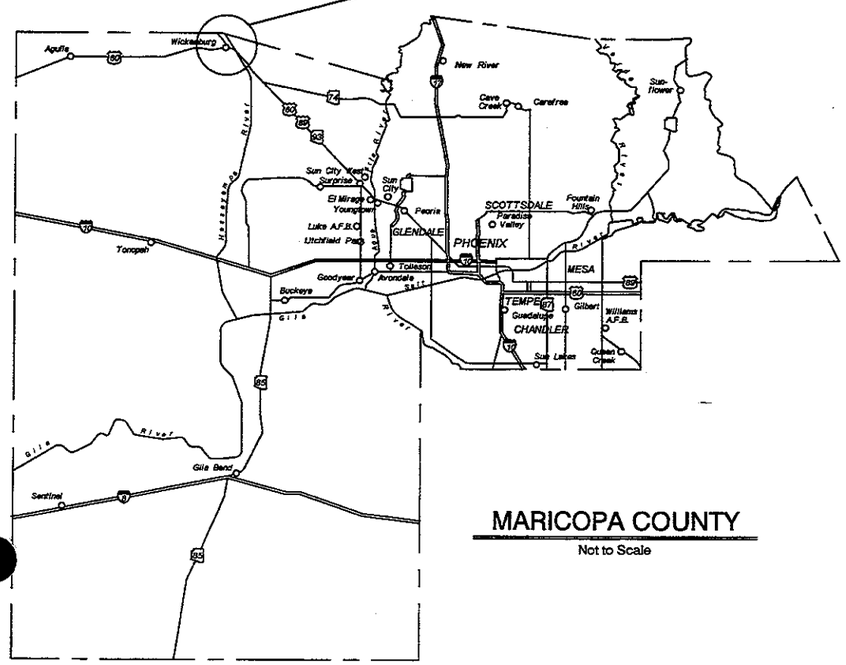
15% CONSTRUCTION PLANS

SOLS WASH C.A.R.

PCN XXX.XX.XX

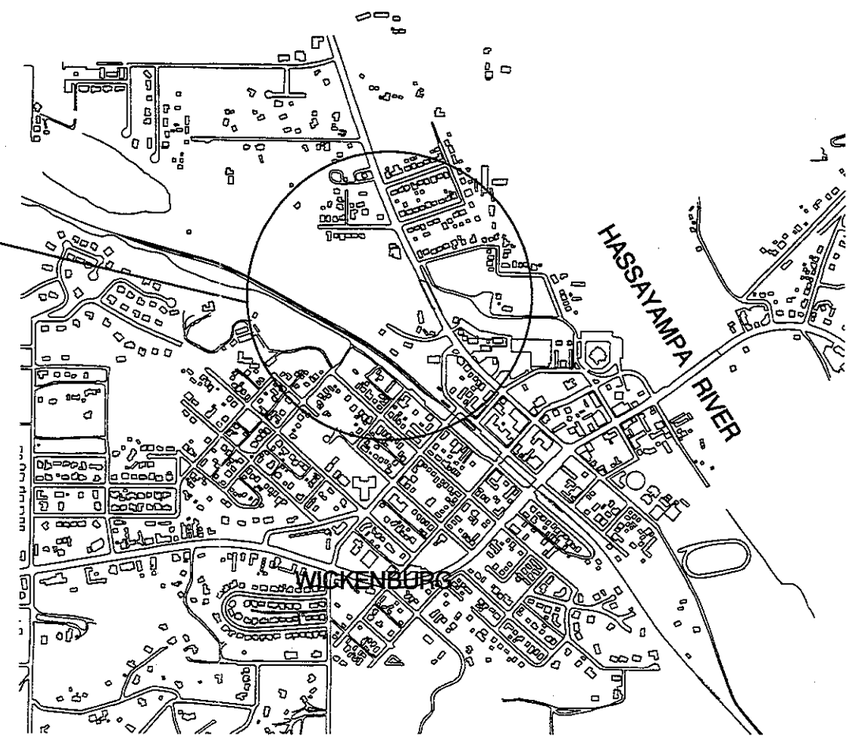
FCD CONTRACT NO. 2002C030

PROJECT LOCATION



MARICOPA COUNTY

Not to Scale



VICINITY MAP

Not to Scale

FIGURE 6

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

ISSUED FOR PUBLIC BIDDING BY:

CHIEF ENGINEER AND GENERAL MANAGER

BOARD OF DIRECTORS OF THE FLOOD CONTROL DISTRICT

ANDY KUNASEK - CHAIRMAN

	FULTON BROCK
DISTRICT 2	DON STAPLEY
DISTRICT 3	ANDY KUNASEK
DISTRICT 4	MAX WILSON
DISTRICT 5	MARY ROSE WILCOX

Plotted By: kleahy at 2:15:45 PM 6/25/2004 R:\PhoenixGrove\Projects\AZ03152\Cadd\Report\3152fig06.dgn

STRUCTURAL NOTES

1. ALL CONSTRUCTION SHALL CONFORM TO MAG STANDARDS DETAILS, SPECIFICATIONS, DATED 1998, INCLUDING ALL REVISIONS THRU 1998
2. DESIGN IS IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, DIVISION 1 15TH EDITION, 1992.
3. REINFORCING STEEL SHALL CONFORM TO ASTM SPECIFICATION A615 GRADE(FILL IN)
4. STRESSES - fs(FILL IN)PSI - GRADE(FILL IN) REINFORCING STEEL.
5. ALL REINFORCING STEEL PLACEMENT DIMENSIONS SHALL BE TO THE CENTER OF BARS UNLESS OTHERWISE NOTED.
6. ALL REINFORCING STEEL SHALL HAVE 2" CLEAR COVER UNLESS OTHERWISE NOTED
7. STRUCTURAL STEEL SHALL CONFORM TO ASTM SPECIFICATION A36.
8. ALL WELDING SHALL CONFORM TO THE REQUIREMENTS OF THE AMERICAN WELDING SOCIETY, STRUCTURAL WELDING CODE, REVISION 1996
9. DIMENSIONS SHALL NOT BE SCALED FROM DRAWING
10. CHAMFER ALL EXPOSED CONRNERS 3/4" UNLESS OTHERWISE NOTED
11. CONCRETE COMPRESSIVE STRENGTH SHALL BE (FILL IN) PSI MAG, UNLESS OTHERWISE NOTED

UTILITY NOTIFICATION

PHONE NO.	COMPANY	CONTACT
XXX	XXX	XXX

GENERAL NOTES

1. ALL CONSTRUCTION TO BE PERFORMED ACCORDING TO APPLICABLE MAG STANDARD DETAILS AND MAG SPECIFICATIONS, DATED 1998 AND THROUGH 2002 AND THE CITY OF (fill in)
2. FACILITIES WHICH ARE NOT SPECIFICALLY LOCATED WITH ACTUAL HORIZONTAL AND VERTICAL CONTROLS ARE APPROXIMATE AND TO THE BEST AVAILABLE INFORMATION.
3. EXISTING UTILITIES AND OTHER FACILITIES HAVE BEEN PLACE ON THE PLANS FROM FIELD SURVEYS, EXISTING MAPS AND OTHER CURRENT PLANS WITHIN THE AREA OF THIS PROJECT. THE CONTRACTOR WILL DETERMINE THE EXACT LOCATION AND/OR ELEVATION OF EXISTING UTILITIES WHICH PERTAIN TO AND AFFECT THE CONSTRUCTION OF THIS PROJECT.
4. TWO (2) WORKING DAYS PRIOR TO EXCAVATING, THE CONTRACTOR SHALL CALL FOR BLUE STAKES AT THE BLUE STAKE CENTER CENTER (PHONE: 1800-STAKEIT)
5. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS PRIOR TO CONSTRUCTION
6. THE FLOOD CONTROL DISTRICT OR CITY OF (fill in) IS NOT RESPONSIBLE FOR LIABILITY ACCRUED DUE TO DELAYS AND/OR DAMAGE TO UTILITIES IN CONJUCTION WITH THIS CONSTRUCTION
7. ANY WORK PERFORMED WITHOUT THE APPROVAL OF THE FLOOD CONTROL DISTRICT AND/OR THE ENGINEER THE ENGINEER AND ALL WORK AND MATERIALS NOT IN CONFORMANCE WITH THE SPECIFICATIONS IS SUBJECT TO REMOVAL AND REPLACEMENT AT THE CONTRACTOR'S EXPENSE
8. THE ENGINEER WILL DETERMINE THE NUMBER AND LOCATION OF THE REQUIRED COMPACTION TESTS FOR STRUCTURAL BACKFILL
9. TRAFFIC CONTROL SHALL BE MAINTAINED IN ACCORDANCE WITH MAG SPECIFICATION 401, PART VI OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (1988 EDITION) INCLUDING REVISION 3 DATED SEPTEMBER 3, 1993)
10. CONTRACTOR SHALL REPLACE PAVEMENT TO THE EXISTING GRADES SHOWN ON THE PLANS
11. EXACT POINT OF MATCHING TERMINATION AND OVERLAY WILL BE DETERMINED IN THE FIELD BY THE ENGINEER
12. NO JOB WILL BE CONSIDERED COMPLETED UNTIL CURBS, PAVEMENT AND SIDEWALKS HAVE BEEN SWEPT CLEAN OF ALL DIRT AND DEBRIS
13. PRIOR TO FINAL APPROVAL AND ACCEPTANCE OF THE WORK, THE CONTRACTOR WILL BE REQUIRED TO CLEAN ADJACENT (OFF-PROJECT) ROADWAYS USED DURING THE COURSE OF CONSTRUCTION
14. CATCH BASIN CONNECTOR PIPES SHALL BE LAID ON A STRAIGHT ALIGNMENT AND SLOPE UNLESS OTHERWISE SPECIFIED. IF BREAKS IN ALIGNMENT AND SLOPE ARE NECESSARY TO MEET FIELD CONDITIONS. THE MAXIMUM DEFLECTION SHALL BE 22.5 DEGREES. CONTRACTOR SHALL PROVIDE A PIPE COLLAR PER MAG DETAIL 505 AT EACH DEFLECTION.
15. CONNECTOR PIPES SHALL CONNECT TO CATCH BASINS WALLS AT AN ANGLE NOT TO EXCEED 22.5 DEGREES FROM PERPENDICULAR

ABBREVIATIONS

CSTR	CONSTRUCTION
DESC	DESCRIPTION
EQ	EQUAL
FOC	FIBRE OPTIC CABLE
OP	OVERHEAD ELECTRIC
PG	PAGE
P/L	PROPERTY LINE
P	PLATE CENTERLINE
PRV	PRIVATE
SPG	SPACING
UGT	UNDERGROUND TELE CABLE
TW	TOP OF WALL
TN	TOP OF NUT

INDEX OF SHEETS

DRAWING NO.	TITLE	SHEET NO.
G1	COVER SHEET & VICINITY MAY	FIGURE 6
G2	GENERAL NOTES & INDEX OF SHEETS	FIGURE 7
D	DETAIL SHEETS	FIGURE 8
C	CIVIL/CONSTRUCTION SHEETS	FIGURES 9-14

SECTION LETTER OR DETAIL NUMBER

SHEET NUMBER TO LOCATE

PROJECT BENCHMARKS

BRASS CAP IN ___
LOCATION
ELEV ___

NO.	REVISION	BY	DATE
3			
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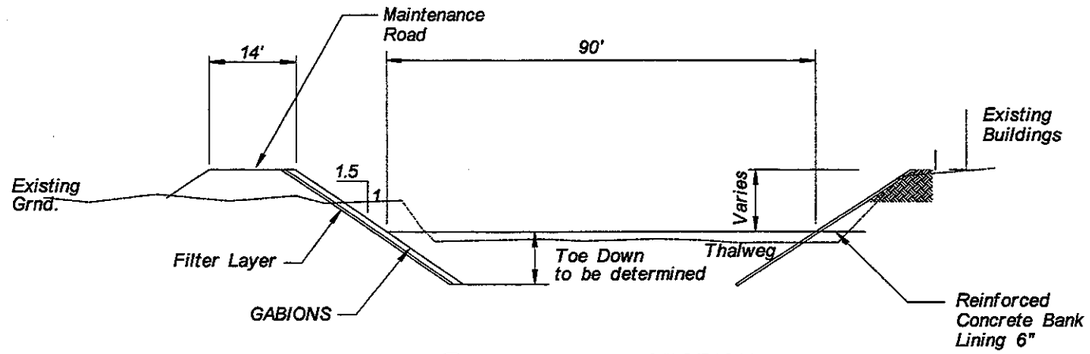
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

SOLS WASH C.A.R.
PROJECT NUMBER FCD 20020030
GENERAL NOTES

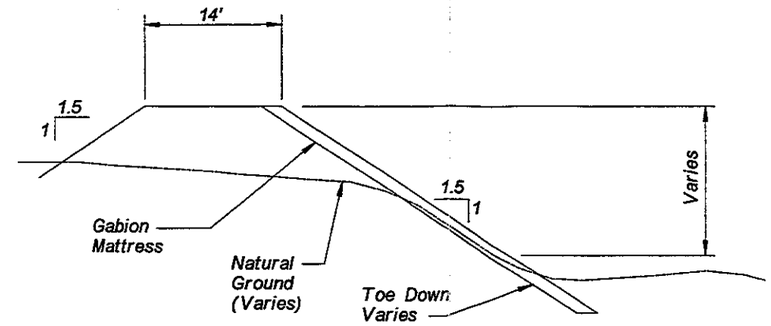
PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LFS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

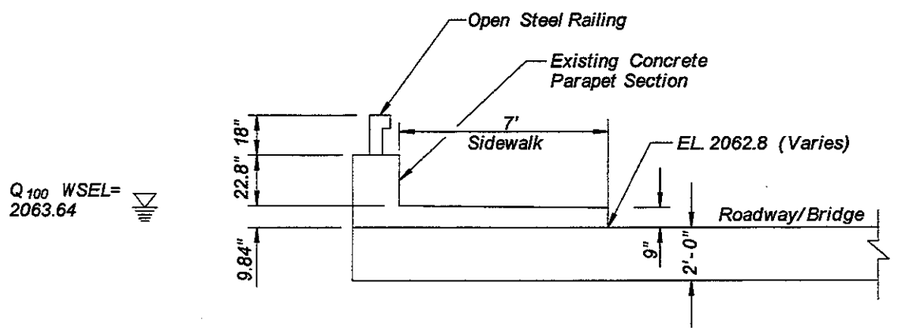
DRAWING NO. FIGURE 7 SHEET OF



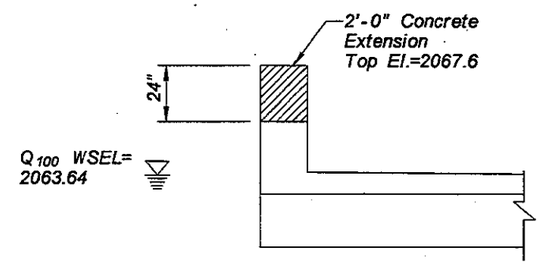
A COMPOSITE SECTION
STA 30+00 TO 45+73
N.T.S.



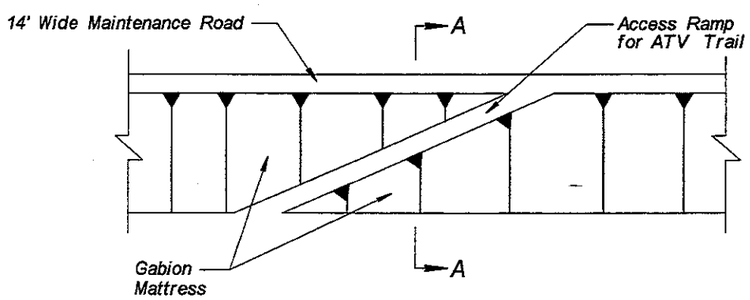
B TYPICAL LEVEE SECTION
STA 10+00 TO 29+74
N.T.S.



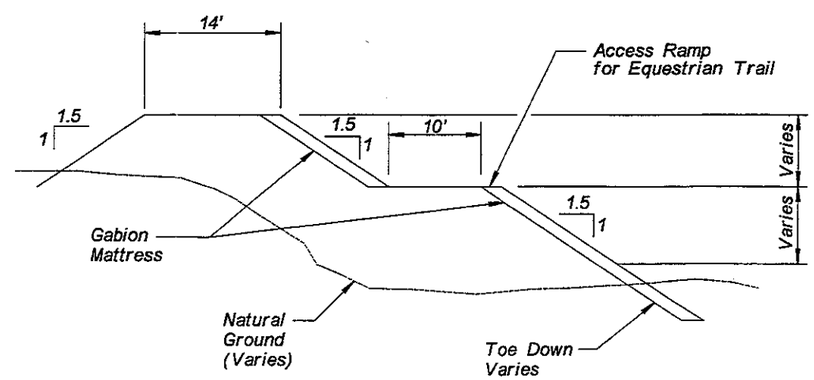
C EXISTING TEGNER BRIDGE CROSS-SECTION
N.T.S.



D PROPOSED IMPROVEMENTS - TEGNER BRIDGE
N.T.S.



E ACCESS RAMP DETAIL, TYPICAL
N.T.S. LOCATION NOT DETERMINED



SECTION A-A
N.T.S.

NO.	REVISION	BY	DATE
3			
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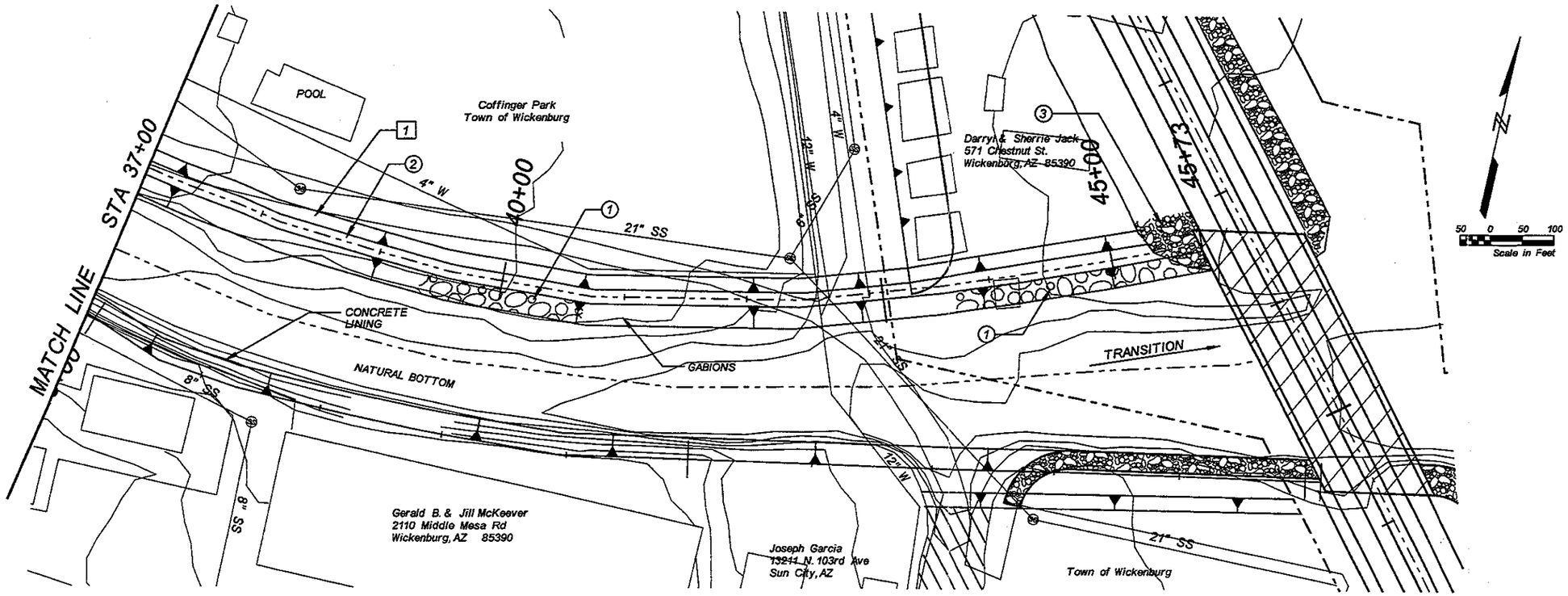
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

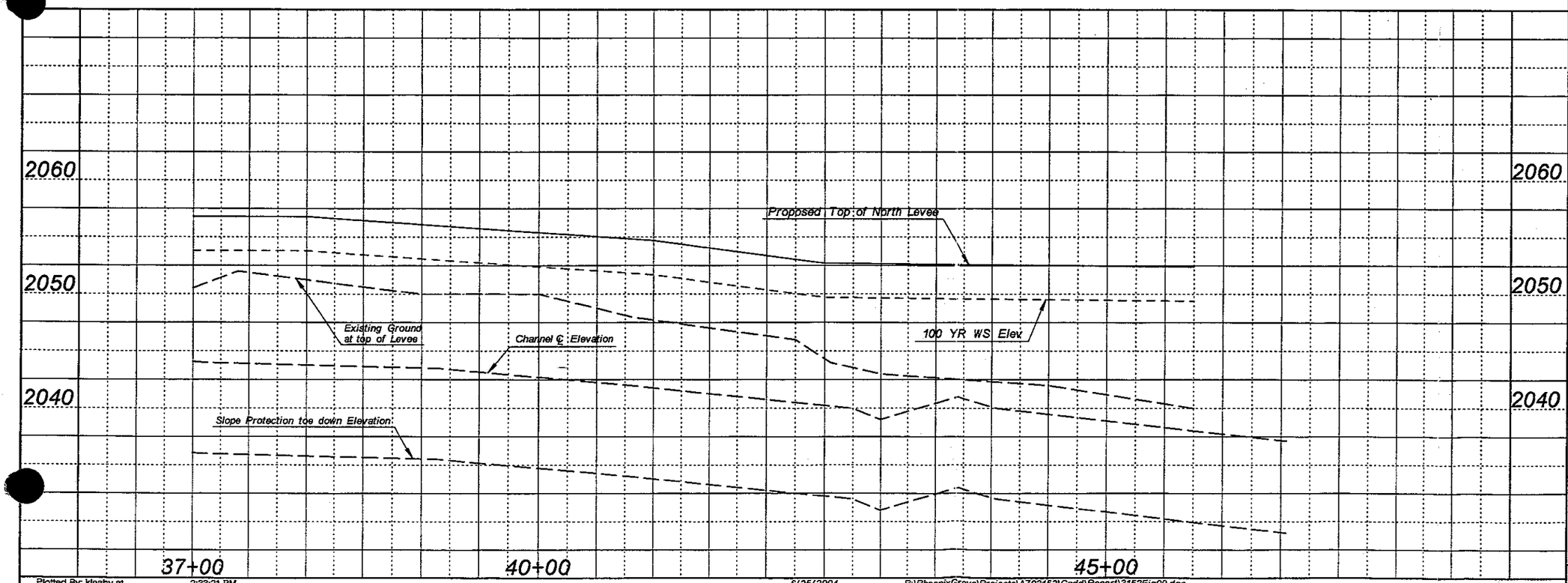
SOLS WASH C.A.R.
PROJECT NUMBER FCD 2002C030
TYPICAL SECTIONS/DETAILS

PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LFS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

DRAWING NO. FIGURE 8 SHEET OF





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☐ REMOVE ☐

1 Remove existing trees as required for levee construction

○ CONSTRUCT ○

1. Construct levee with gabion mattress (Sta 37+00 to tie in with existing protection at bridge, Sta 45+30) per Detail A, Figure 8. — 840 CY
2. Construct 14' maintenance road per Detail E, Figure 8. — 1292 SY
3. Construct proposed levee improvements and connect to existing.

NOTE: REFER TO CAR, Section 4.6 and Figure 15 for additional property ownership information.

NO.	REVISION	BY	DATE
3			
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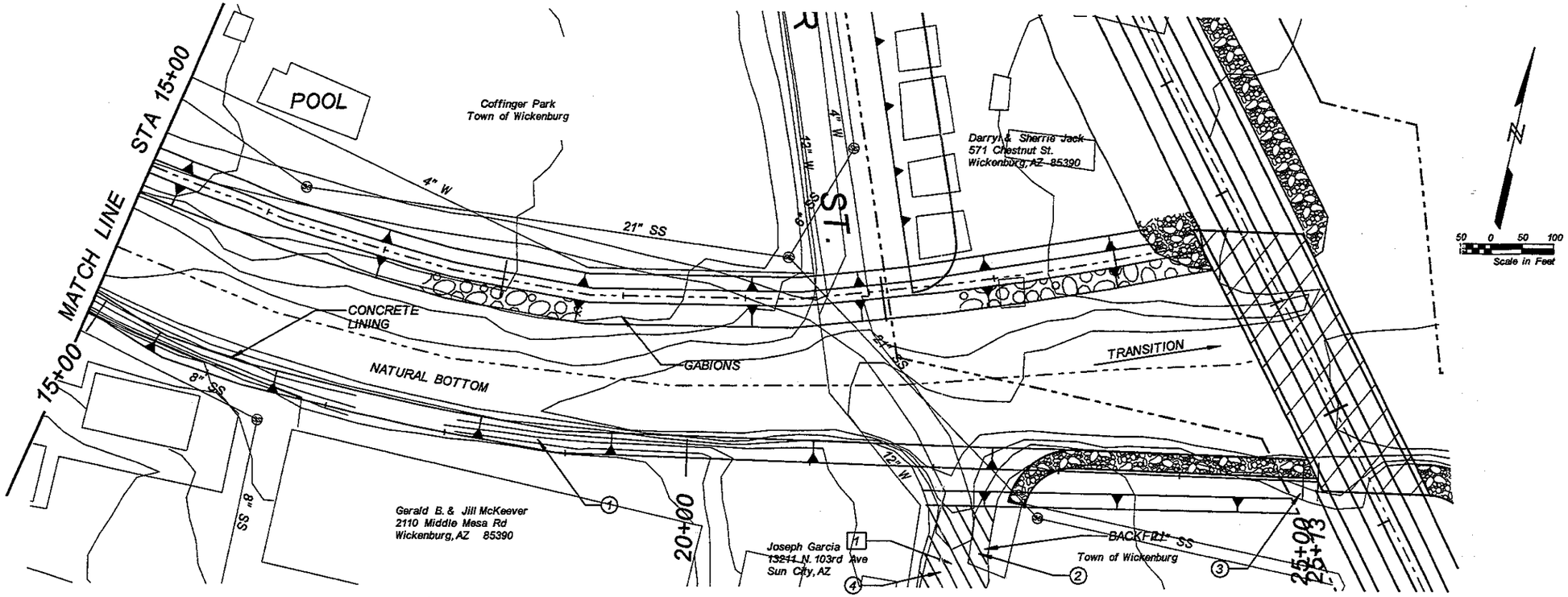
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

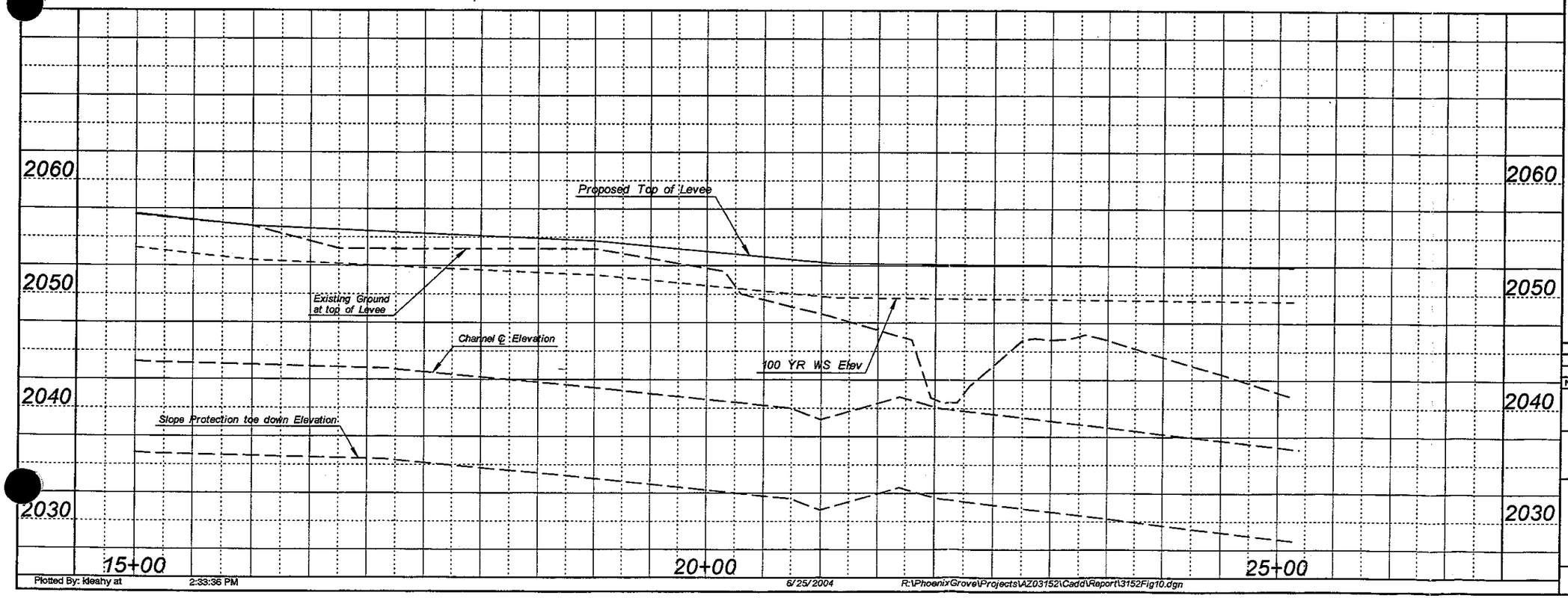
SOLS WASH C.A.R.
PLAN AND PROFILE
NORTH BANK SOLS WASH SECTION 1

PRELIMINARY 15% Review NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LFS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

DRAWING NO. FIGURE 9 SHEET OF





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REMOVE

1 Remove existing section of concrete paving.

CONSTRUCT

1	Construct concrete lining. Do not remove existing bank protection. See Detail A, Figure 8.	815 CY
2	Add Backfill behind proposed concrete bank protection, match grade.	950 CY
3	Connect Proposed levee improvements to existing structure.	1 LS
4	Add appropriate barriers and demarcation for road closure.	1 LS

NOTE: REFER TO CAR, Section 4.6 and Figure 15 for additional property ownership information.

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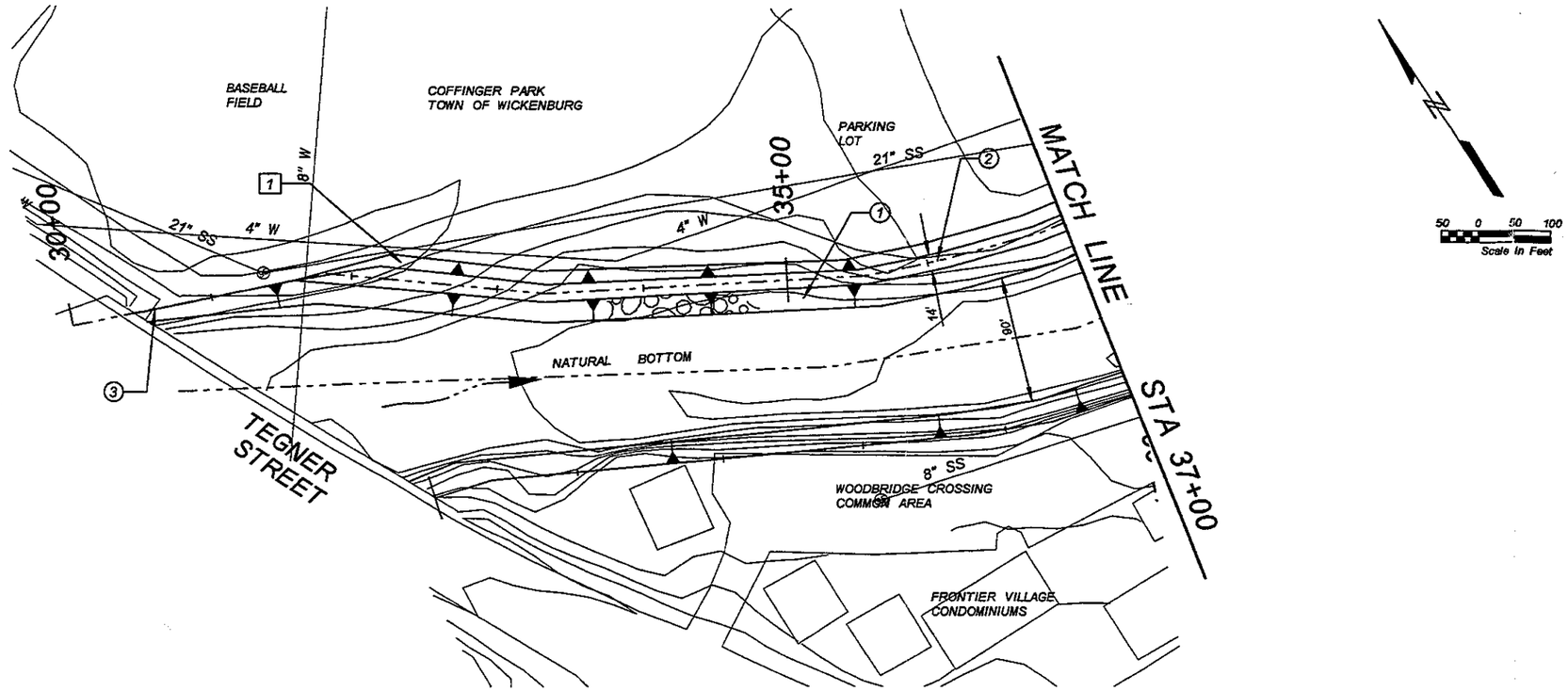
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

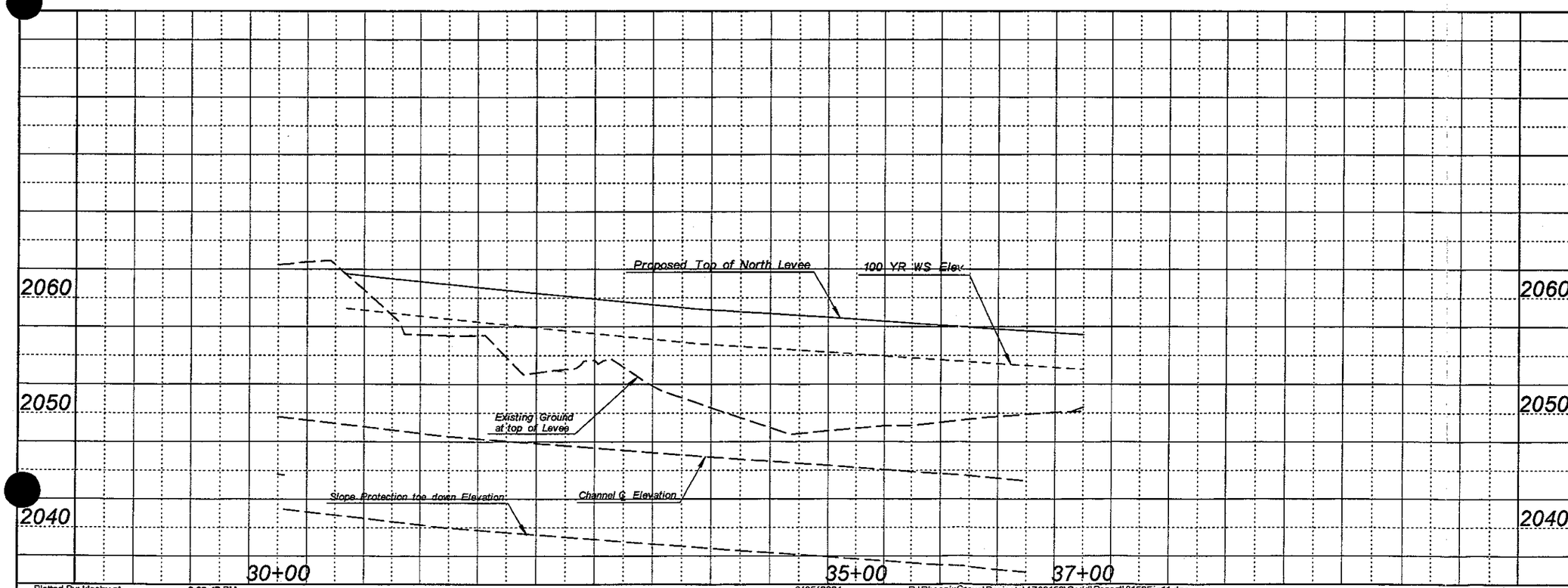
SOLS WASH C.A.R.
PLAN AND PROFILE
SOUTH BANK SOLS WASH SECTION 1

PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LFS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

DRAWING NO. FIGURE 10 SHEET OF





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☐ REMOVE ☐

1 Remove existing trees as required for levee construction

○ CONSTRUCT ○

1. Construct levee with gabion mattress (Sta 30+60 to 37+00)per Detail B, Figutre 8. — 680 CY
2. Construct 14' maintenance road per Detail E, Figure 8. — 1090 SY
3. Connect Proposed levee improvements to existing structure — 1 LS

NOTE: REFER TO CAR, Section 4.6 and Figure 15 for additional property ownership information.

NO.	REVISION	BY	DATE
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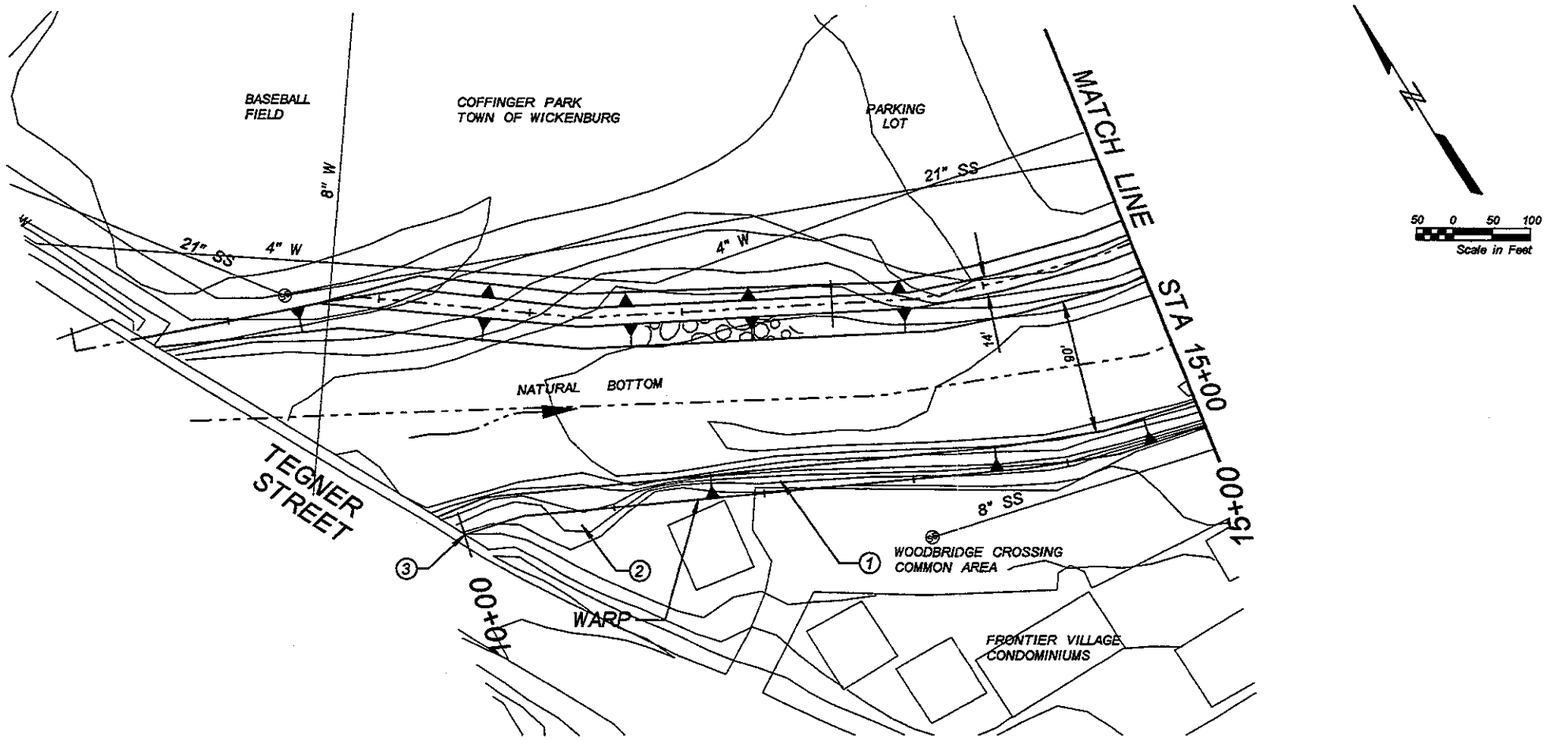
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

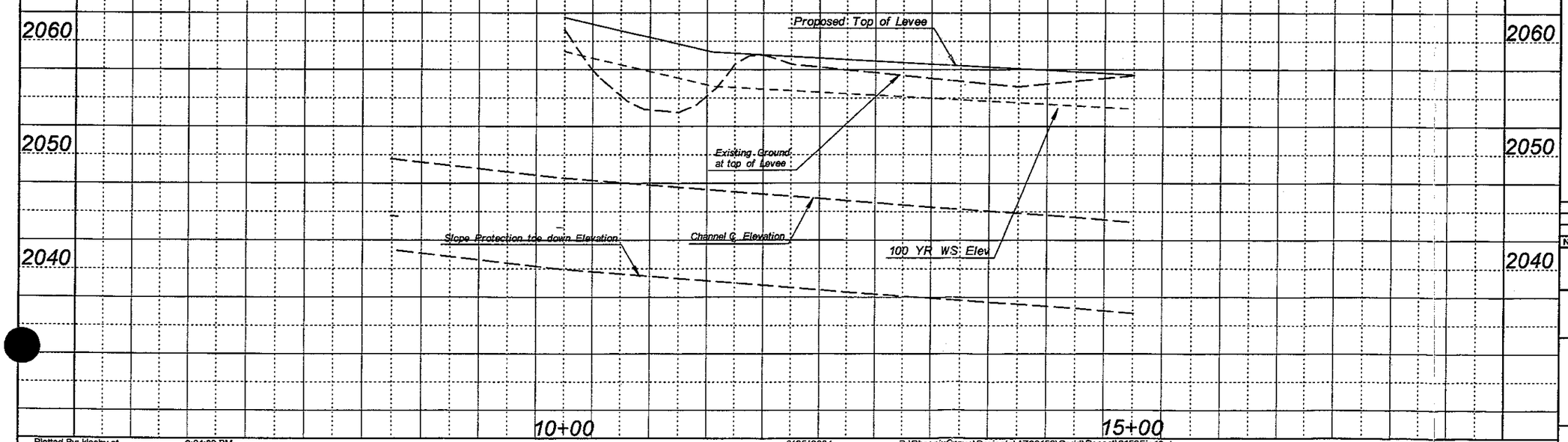
SOLS WASH C.A.R.
PLAN AND PROFILE
NORTH BANK SOLS WASH SECTION 2

PRELIMINARY 15% Review NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LFS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

DRAWING NO. FIGURE 11 SHEET OF





☐ REMOVE ☐

○ CONSTRUCT ○

1	Construct concrete lining. Do not remove existing bank protection. See Detail A, Figure 8.	660 CY
2	Add Backfill behind proposed concrete bank protection, match grade.	300CY
3	Connect Proposed levee improvements to existing structure.	1LS

NOTE: REFER TO CAR, Section 4.6 and Figure 15 for additional property ownership information.

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

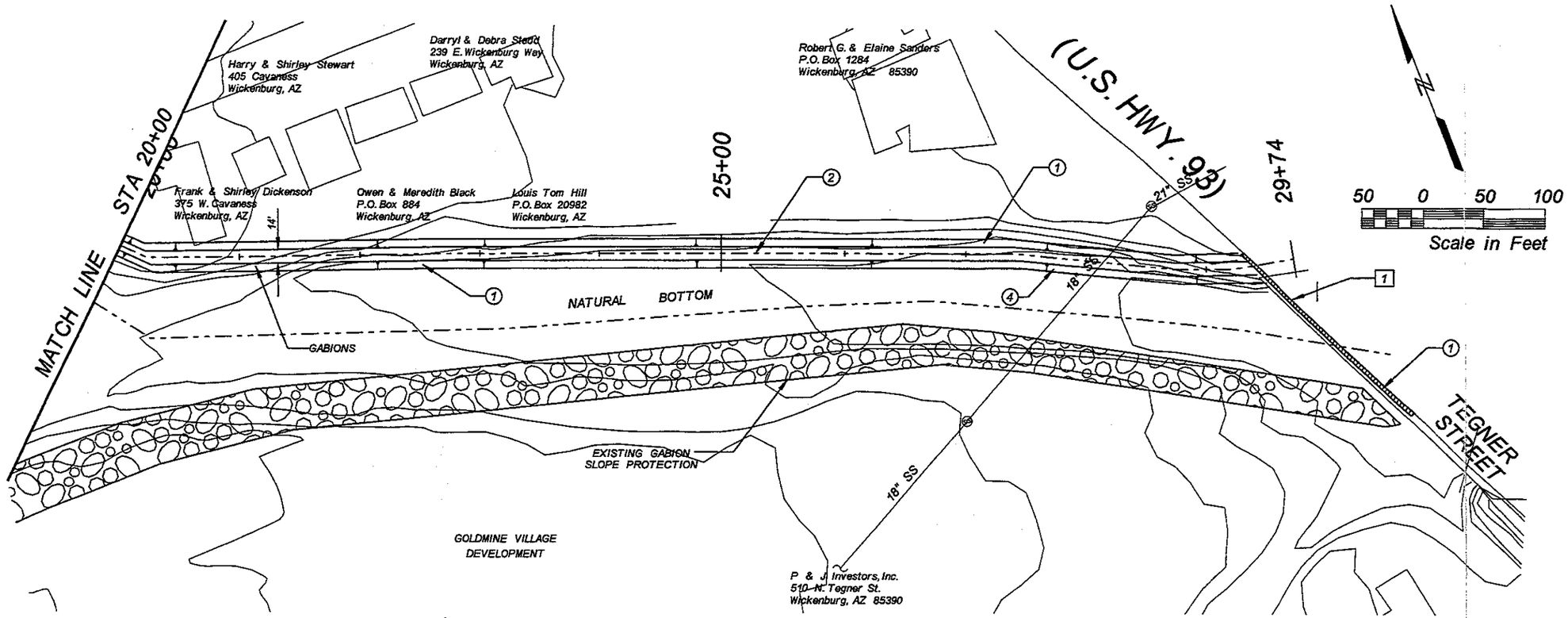
SOLS WASH C.A.R.
PLAN AND PROFILE
SOUTH BANK SOLS WASH SECTION 2

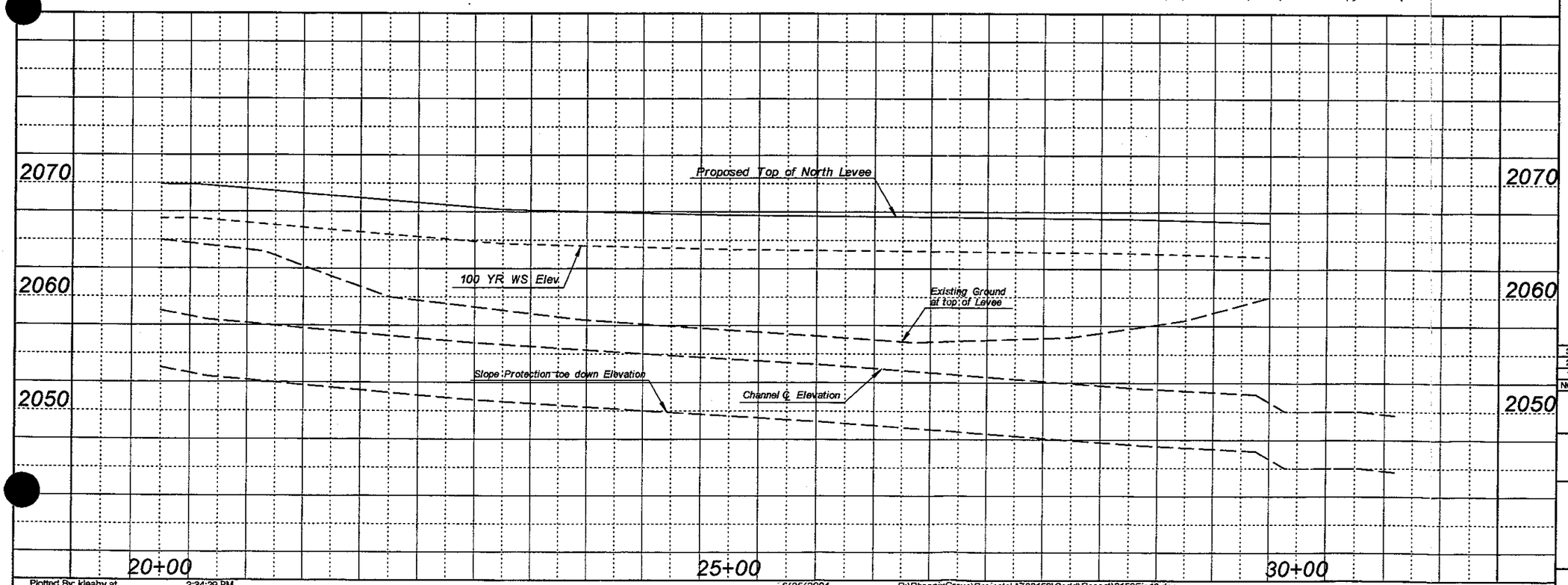
PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LFS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

DRAWING NO. FIGURE 12 SHEET OF

Plotted By: kleahy at 2:34:00 PM 6/25/2004 R:\PhoenixGrove\Projects\AZ03152\Cadd\Report\3152Fig12.dgn





Plotted By: kleahy at 2:34:29 PM 6/25/2004 R:\PhoenixGrove\Projects\AZ03152\Cadd\Report\3152Fig13.dgn

REMOVE

1	Remove Steel hand railing (230 LF) See Detail C, Figure 8.	10 / LF

CONSTRUCT

1	Construct levee with gabion mattress (sta 20+00 to 29+74) per Detail B, Figutre 8.	785 CY
2	Construct 14' maintenance road per Detail E, Figure 8.	1515 SY
3	Construct 2' Concrete extension to concrete Parapet (230 LF) See Detail D, Figure 8.	
4	Slope protection toe down 5' below channel ℄ elevation from Sta. 20+00 to Sta 29+74	974 LF

NOTE: REFER TO CAR, Section 4.6 and Figure 15 for additional property ownership information.

NO.	REVISION	BY	DATE
3			
2			
1			

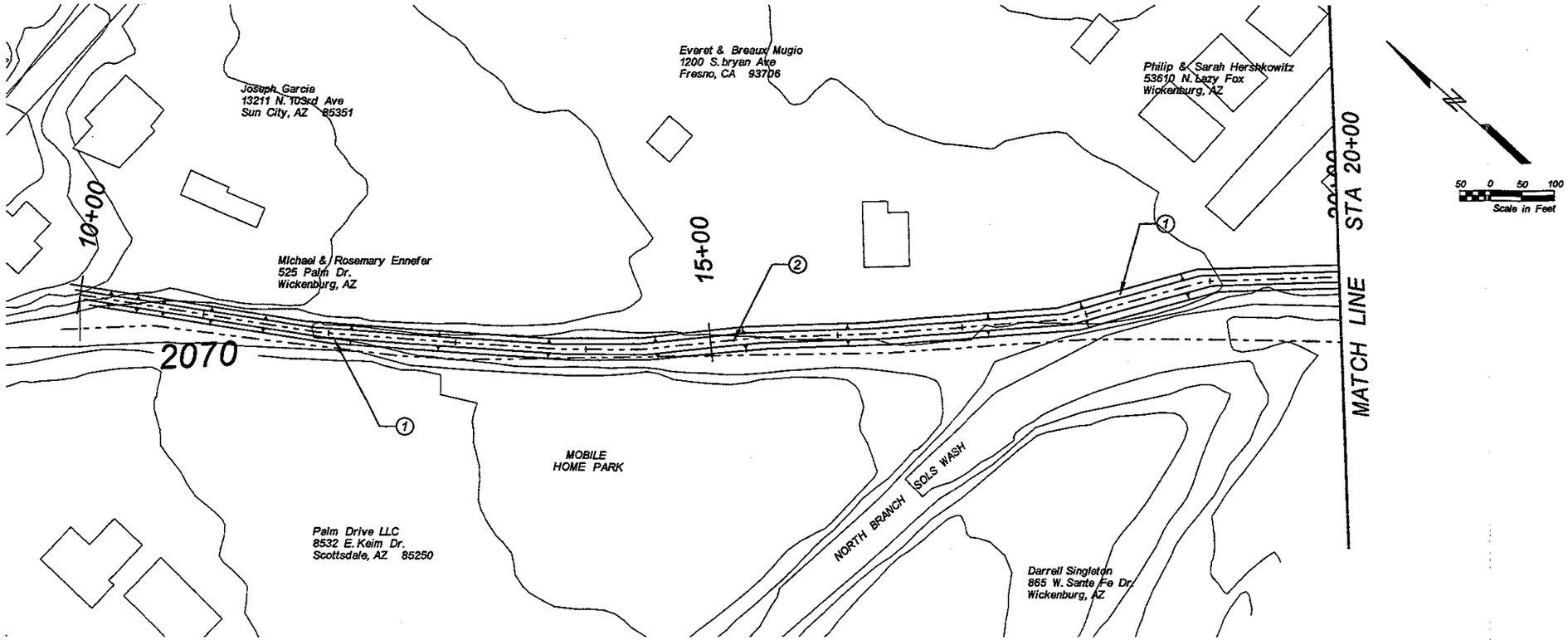
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

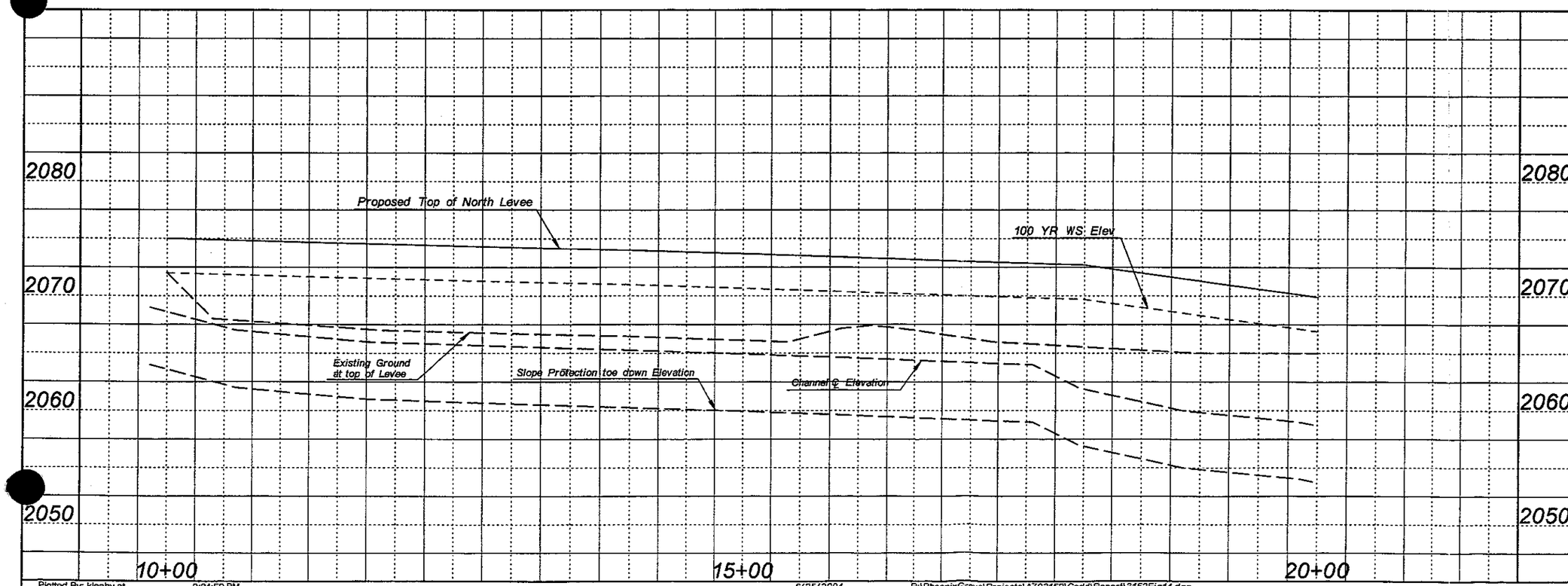
SOLS WASH C.A.R.
PLAN AND PROFILE
NORTH BANK SOLS WASH-SECTION 3

PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LFS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

DRAWING NO. | FIGURE 13 | SHEET OF





☐ REMOVE ☐

○ CONSTRUCT ○

1	Construct levee with gabion mattress (sta 10+00 to 20+00) per Detail B, Figure 8.	311 CY
2	Construct 14' maintenance road per Detail E, Figure 8.	1556 SY

NOTE: REFER TO CAR, Section 4.6 and Figure 15 for additional property ownership information.

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

SOLS WASH C.A.R.
PLAN AND PROFILE
NORTH BANK HOSPITAL WASH

PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LFS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

DRAWING NO. FIGURE 14 SHEET OF

Plotted By: kleahy at 2:34:59 PM 6/25/2004 R:\PhoenixGrove\Projects\AZ03152\Cadd\Report\3152Fig14.dgn

County Parcels

PARCELS
- Parcels

SUBDIVISIONS
- Sub. Boundaries
- Sub Poly

TRANSPORTATION
- Streets (MCDOT)
- Streets (ASSR)

AERIAL PHOTOS
- 2003 Aerial Photos

SCALE 1 : 5,000

500 0 500 1,000 1,500

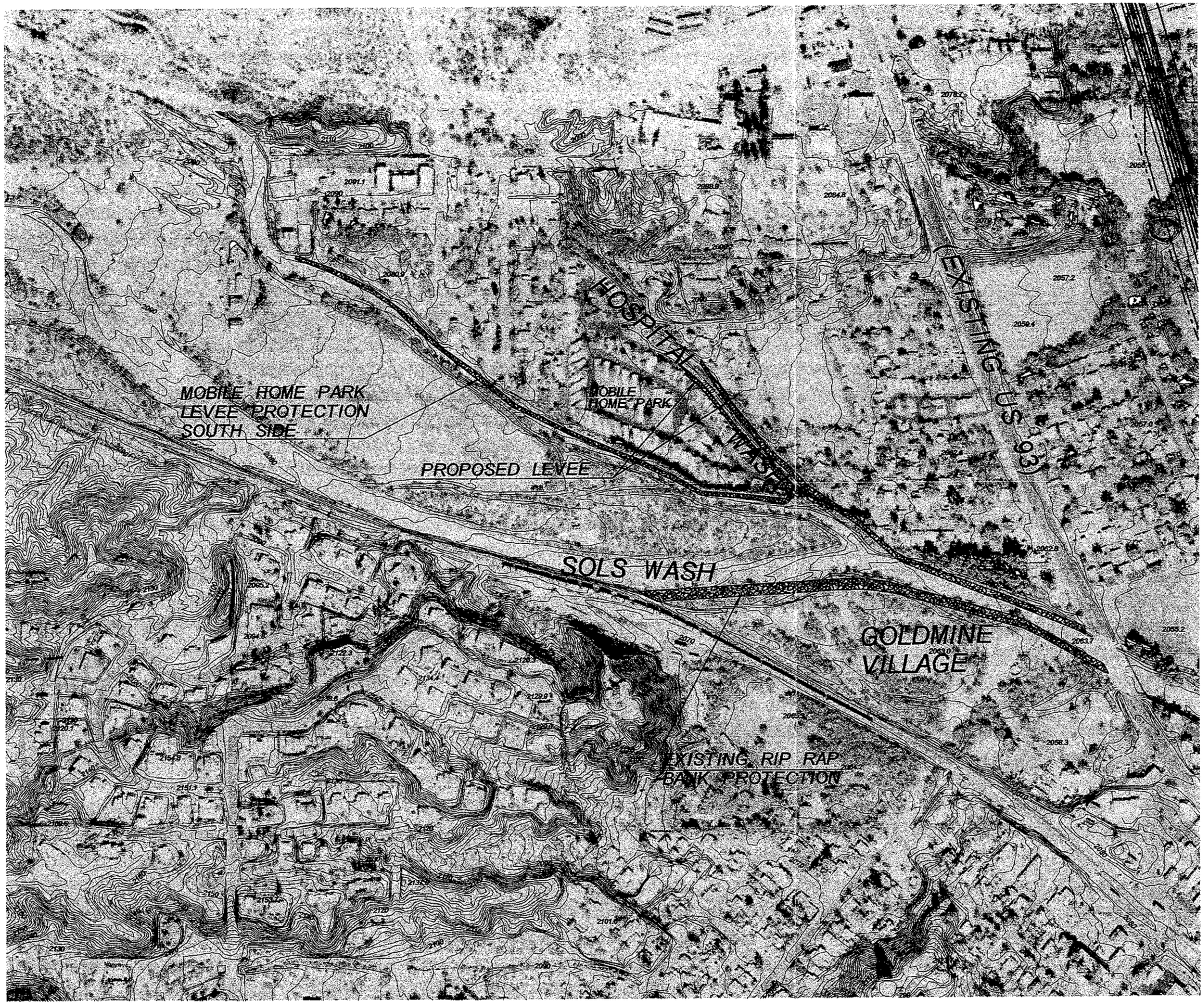
FEET

N

FIGURE 15

http://www.maricopa.gov/assessor/gis/maps/assessor.mwf

Tuesday, May 11, 2004 10:28 AM



N

200 0 200 400

Scale in Feet

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

SOLS WASH C.A.R.
MOBILE HOME PARK
LEVEE IMPROVEMENTS

PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LFS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

DRAWING NO. FIGURE 16 SHEET OF

Plotted By: kleahy at 2:14:15 PM 6/25/2004 R:\Phoenix\Grove\Projects\AZ03152\Cadd\Report\3152Fig16.dgn

APPENDIX

Attachment A: EXISTING CONDITIONS MODEL J.E. FULLER CLOMR DUPLICATE EFFECTIVE FLOOD
Attachment B: REVISED MODEL I – SOLS WASH – BASELINE CONDITIONS
Attachment C: REVISED MODEL II – SOLS WASH LEVEE IMPROVEMENTS WEST OF EXISTING US93
Attachment D: REVISED MODEL III – HOSPITAL WASH – BASELINE CONDITIONS
Attachment E: REVISED MODEL IV – HOSPITAL WASH LEVEE IMPROVEMENTS WEST OF US93
Attachment F: COMPOSITE MODEL – SOLS WASH – COMPOSITE CHANNEL SECTION
Attachment G: SEDIMENT TRANSPORT CALCULATIONS AND LOCAL SCOUR
Attachment H: MOBILE HOME PARK LEVEE IMPROVEMENTS MODEL
Attachment I: COMPARISON OF FIELD SURVEYED SECTIONS TO CORPS FIS SECTIONS
Attachment J: REFERENCE MATERIAL, MEETING MINUTES
Attachment K: HYDRAULIC ANALYSIS USING CORPS OF ENGINEERS DISCHARGE
Attachment L: SENSITIVITY ANALYSIS
Attachment M: HYDRAULIC ANALYSIS WITH 10' DROP
Attachment N: ALTERNATIVE ANALYSIS

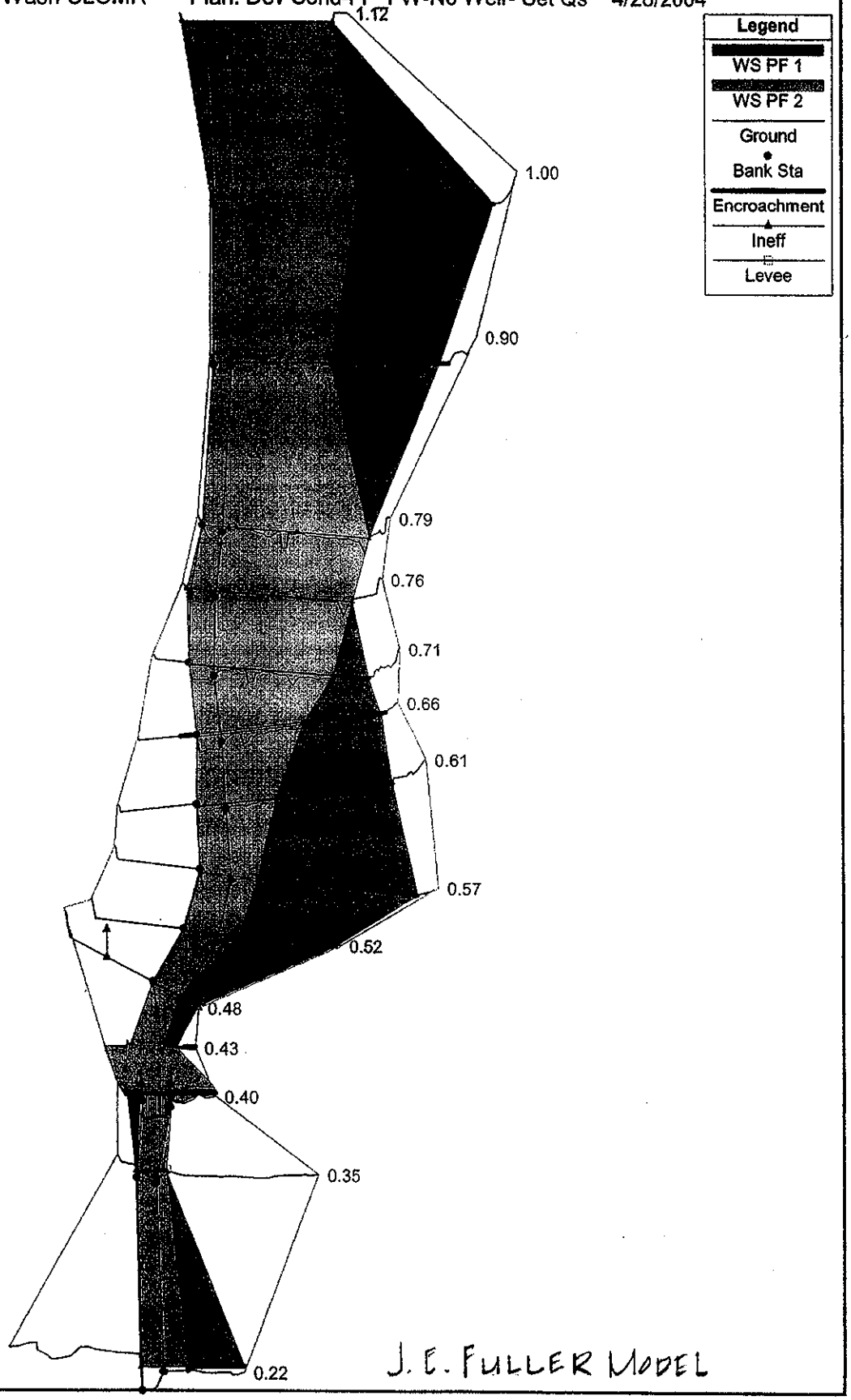
ATTACHMENT A:
EXISTING CONDITIONS MODEL – J.E. FULLER CLOMR – DUPLICATE EFFECTIVE FLOOD

HEC-RAS Plan: Dev_FPFW River: Sols Wash Reach: Reach 1

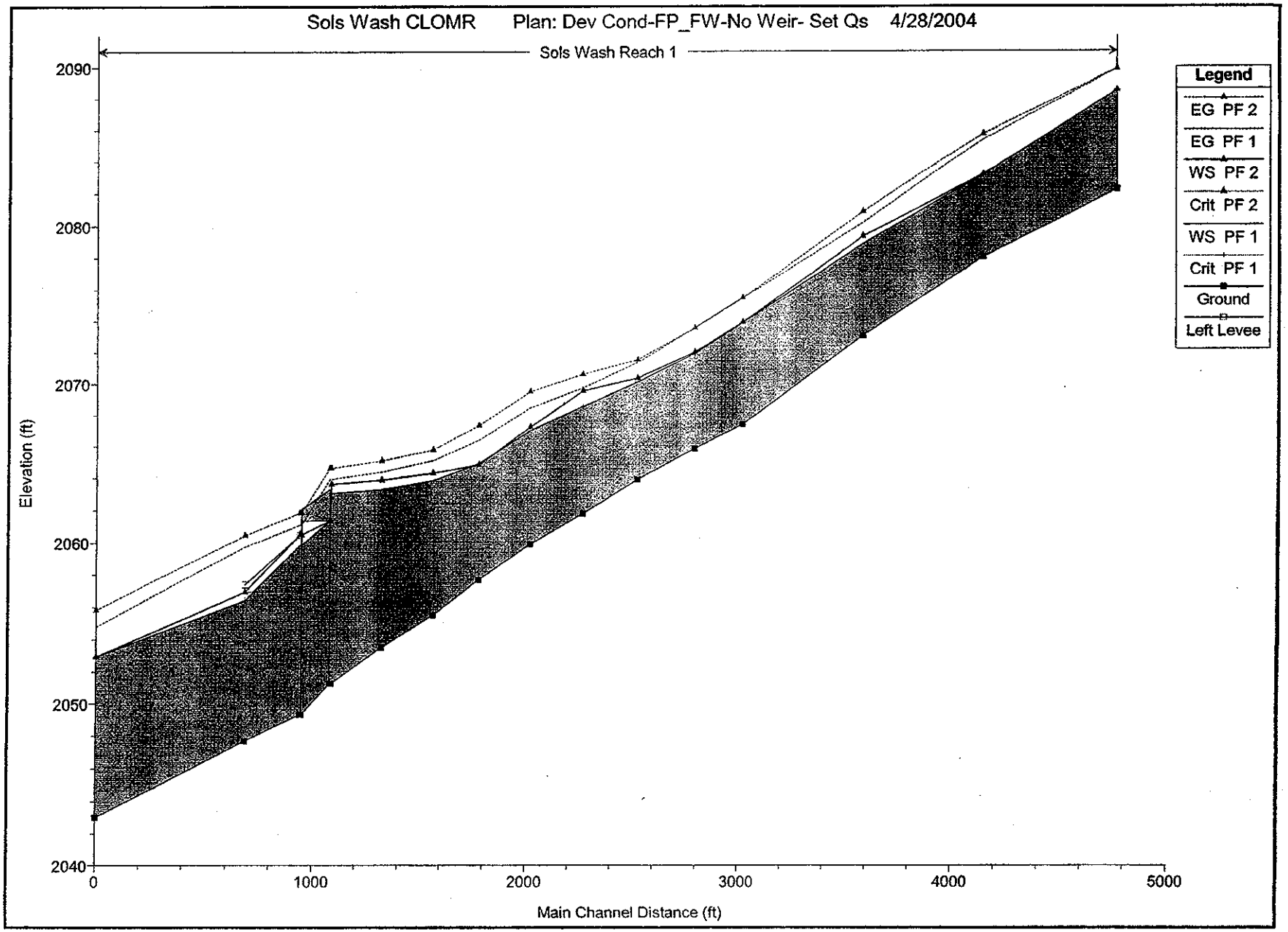
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 1	14413.00	2082.30	2088.53	2088.53	2089.89	0.004302	12.08	2084.25	880.95	0.91
Reach 1	1.12	PF 2	14413.00	2082.30	2088.53	2088.53	2089.89	0.004261	12.06	2088.86	880.00	0.91
Reach 1	1.00	PF 1	14413.00	2078.10	2083.20	2083.20	2085.42	0.008498	15.27	1541.10	1092.53	1.24
Reach 1	1.00	PF 2	14413.00	2078.10	2083.20	2083.20	2085.78	0.008782	15.53	1252.21	585.49	1.27
Reach 1	0.90	PF 1	14413.00	2073.10	2078.92	2078.30	2080.24	0.008038	12.82	2406.01	1338.97	1.00
Reach 1	0.90	PF 2	14413.00	2073.10	2079.38	2079.38	2080.92	0.007230	12.89	1873.35	681.00	0.96
Reach 1	0.79	PF 1	14413.00	2067.42	2073.94	2073.94	2075.50	0.009091	13.19	1921.06	928.30	1.07
Reach 1	0.79	PF 2	14413.00	2067.42	2073.94	2073.94	2075.50	0.009050	13.17	1926.26	928.92	1.07
Reach 1	0.76	PF 1	14413.00	2065.84	2071.96	2071.96	2073.59	0.006661	12.08	1665.95	905.44	0.93
Reach 1	0.76	PF 2	14413.00	2065.84	2072.05	2072.05	2073.60	0.006279	11.86	1745.26	938.11	0.91
Reach 1	0.71	PF 1	14413.00	2063.89	2070.14	2070.14	2071.38	0.004846	10.98	2325.89	1059.51	0.81
Reach 1	0.71	PF 2	14413.00	2063.89	2070.40		2071.56	0.004233	10.54	2273.79	840.64	0.76
Reach 1	0.66	PF 1	14413.00	2061.79	2068.59	2068.59	2069.77	0.004377	10.71	2661.15	1096.87	0.77
Reach 1	0.66	PF 2	14413.00	2061.79	2069.58		2070.63	0.002975	9.70	2409.09	630.00	0.65
Reach 1	0.61	PF 1	14459.00	2059.91	2067.03	2067.03	2068.49	0.004159	10.81	2930.62	1166.17	0.76
Reach 1	0.61	PF 2	14459.00	2059.91	2067.25	2067.25	2069.54	0.005263	12.41	1515.40	466.31	0.86
Reach 1	0.57	PF 1	14459.00	2057.69	2064.91	2064.91	2066.40	0.004155	10.72	2602.18	1291.96	0.76
Reach 1	0.57	PF 2	14459.00	2057.69	2064.83	2064.83	2067.35	0.006053	12.84	1266.62	333.67	0.91
Reach 1	0.52	PF 1	14459.00	2055.50	2063.84		2065.10	0.003029	9.73	2368.36	882.41	0.66
Reach 1	0.52	PF 2	14459.00	2055.50	2064.32		2065.79	0.002956	10.01	1715.02	319.26	0.65
Reach 1	0.48	PF 1	13553.00	2053.51	2063.29		2064.40	0.001694	8.48	1697.99	307.96	0.51
Reach 1	0.48	PF 2	15045.00	2053.51	2063.86		2065.10	0.001703	8.85	1700.28	184.50	0.51
Reach 1	0.43	PF 1	13553.00	2051.27	2063.04	2057.85	2063.93	0.000922	7.58	1787.38	209.22	0.40
Reach 1	0.43	PF 2	15045.00	2051.27	2063.63	2058.29	2064.63	0.000960	8.00	1880.28	185.78	0.41
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 1	13553.00	2049.33	2059.86	2056.46	2061.10	0.001701	8.95	1515.38	229.11	0.51
Reach 1	0.40	PF 2	15045.00	2049.33	2060.51	2056.95	2061.85	0.001679	9.30	1619.82	180.00	0.52
Reach 1	0.35	PF 1	13553.00	2047.68	2056.43	2056.43	2059.75	0.005808	14.89	1030.27	171.64	0.93
Reach 1	0.35	PF 2	15045.00	2047.68	2056.94	2056.94	2060.47	0.005723	15.41	1118.57	172.80	0.93
Reach 1	0.22	PF 1	15045.00	2043.00	2052.93	2052.93	2054.80	0.004064	12.12	2083.07	597.60	0.75
Reach 1	0.22	PF 2	15045.00	2043.00	2052.94	2052.94	2055.84	0.005461	14.06	1282.88	270.61	0.86

J.E. FULLER MODEL - CLOMR

Sols Wash CLOMR Plan: Dev Cond-FP_FW-No Weir- Set Qs 4/28/2004



J. E. FULLER MODEL



J.E. FULLER MODEL

ATTACHMENT B:
REVISED MODEL 1 – SOLS WASH – BASELINE CONDITIONS

Model I - Sols Wash - Baseline Conditions

This Model has been modified slightly since submission in the *Analysis of Preliminary Hydraulic Models.* Model I is considered the Existing conditions for this study since the extents go beyond the J.E. Fuller CLOMR. The intent of this model was to establish AZTEC's standard that would be used as a baseline for Sols Wash. The model uses the CLOMR completed by J.E. Fuller with the addition of five sections downstream provided by ADOT for their proposed improvements. The model includes sections 1.12 at the upstream limits through to section 0.05 located approximately 300 feet downstream of the proposed US 93 Bridge. The downstream section is situated at the tie in with the Hassayampa River. The attached information has been provided to detail AZTEC's Model I for Sols Wash:

EMBCR.

HEC-RAS Plan: Base Model River: Sols Wash Reach: Reach 1 Profile: PF 2

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.53	2088.53	2089.89	0.004281	12.06	2088.86	880.00	0.91
Reach 1	1.00	PF 2	14413.00	2078.10	2083.20	2083.20	2085.78	0.008782	15.53	1252.21	585.49	1.27
Reach 1	0.90	PF 2	14413.00	2073.10	2079.38	2079.38	2080.92	0.007230	12.89	1873.35	681.00	0.96
Reach 1	0.79	PF 2	14413.00	2067.42	2073.94	2073.94	2075.50	0.009050	13.17	1926.28	928.92	1.07
Reach 1	0.76	PF 2	14413.00	2065.84	2072.05	2072.05	2073.60	0.006279	11.86	1745.26	938.11	0.91
Reach 1	0.71	PF 2	14413.00	2063.89	2070.40		2071.56	0.004233	10.54	2273.79	840.64	0.76
Reach 1	0.66	PF 2	14413.00	2061.79	2069.58		2070.63	0.002975	9.70	2409.09	630.00	0.65
Reach 1	0.61	PF 2	14459.00	2059.91	2067.25	2067.25	2069.54	0.005263	12.41	1515.40	466.31	0.86
Reach 1	0.57	PF 2	14459.00	2057.69	2064.83	2064.83	2067.35	0.006053	12.84	1266.62	333.67	0.91
Reach 1	0.52	PF 2	14459.00	2055.50	2064.32		2065.79	0.002948	10.01	1716.89	319.29	0.65
Reach 1	0.48	PF 2	15045.00	2053.51	2063.89		2065.10	0.001699	8.84	1701.50	184.51	0.51
Reach 1	0.43	PF 2	15045.00	2051.27	2063.64	2058.29	2064.63	0.000958	8.00	1881.40	185.79	0.41
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2060.42	2056.95	2061.79	0.001729	9.38	1605.58	169.49	0.52
Reach 1	0.35	PF 2	15045.00	2047.68	2057.01	2057.01	2060.44	0.005525	15.22	1156.99	195.64	0.92
Reach 1	0.27	PF 2	15045.00	2044.00	2055.09		2057.40	0.003488	13.01	1514.95	209.35	0.76
Reach 1	0.22	PF 2	15045.00	2043.00	2052.92	2052.92	2055.78	0.006631	13.85	1278.91	270.60	0.87
Reach 1	0.19	PF 2	15045.00	2040.69	2051.01		2051.60	0.001210	6.54	2871.67	455.52	0.37
Reach 1	.13	PF 2	15045.00	2040.00	2049.40	2047.48	2050.98	0.001908	11.05	1963.05	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2047.00	2047.00	2050.33	0.005024	15.61	1289.45	215.94	1.03
Reach 1	0.08	PF 2	15045.00	2036.99	2044.19		2044.79	0.002918	7.66	3307.51	818.57	0.55
Reach 1	.05	PF 2	15045.00	2038.00	2043.52	2042.40	2044.34	0.002757	9.09	3336.53	1079.12	0.72

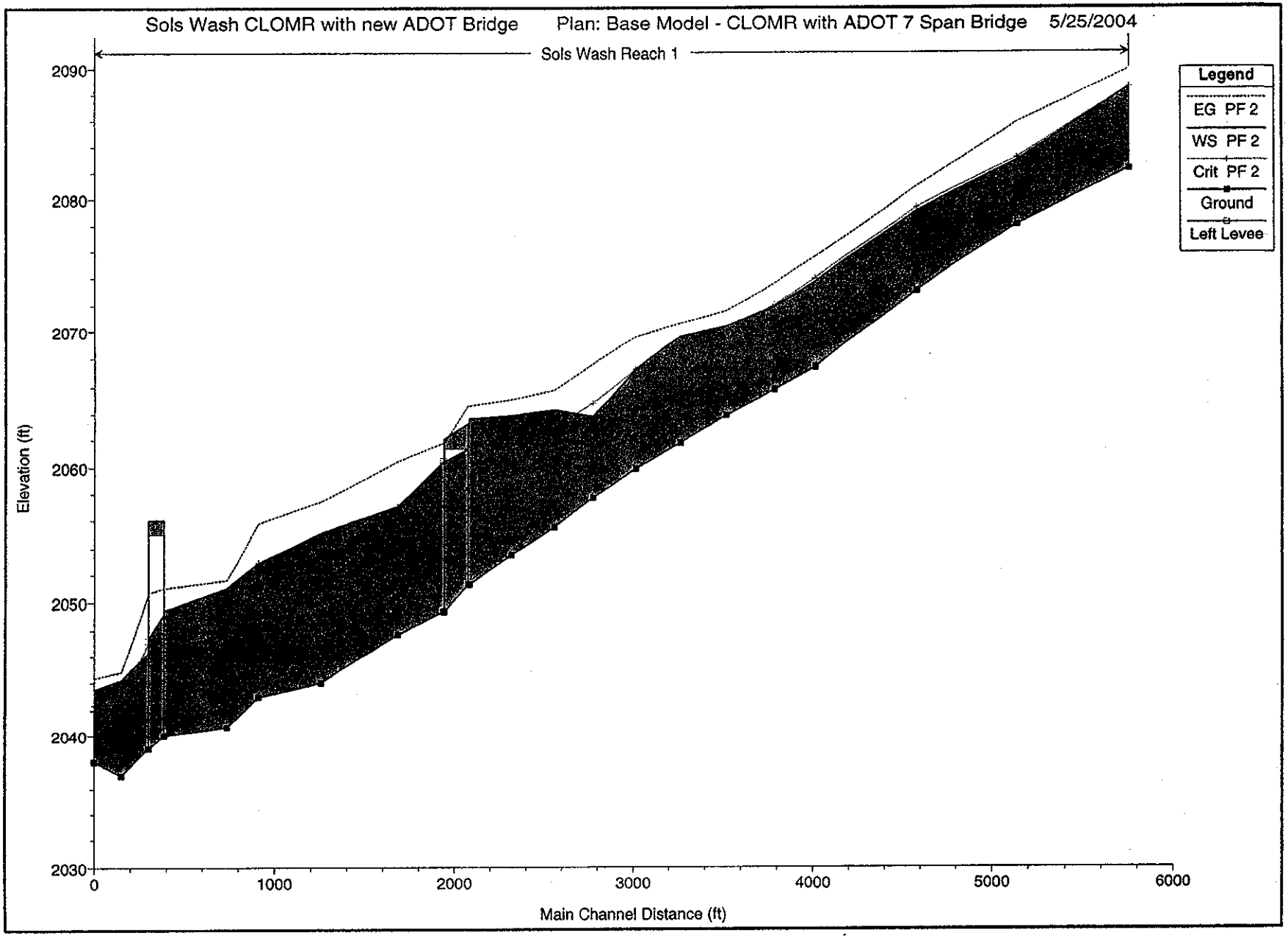
MODEL I CLOMR WITH PROPOSED
7 SPAN BRIDGE ADDED
REV 5/10/04 INCL ENC @ .19 & .27

MIXED

HEC-RAS Plan: Base Model River: Sols Wash Reach: Reach 1 Profile: PF 2

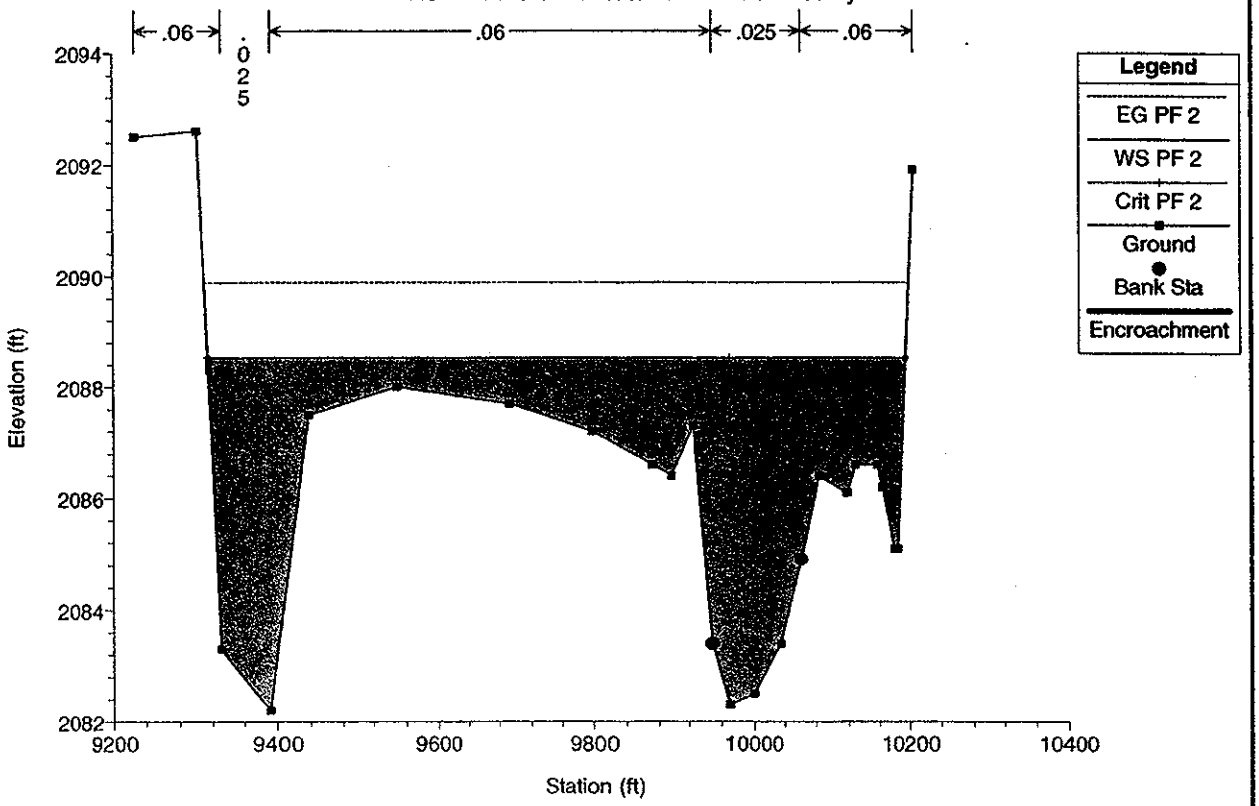
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.53	2088.53	2089.89	0.004281	12.06	2088.86	880.00	0.91
Reach 1	1.00	PF 2	14413.00	2078.10	2082.98	2083.20	2085.85	0.010112	16.14	1155.78	357.33	1.35
Reach 1	0.90	PF 2	14413.00	2073.10	2079.12	2079.38	2080.95	0.008948	13.88	1695.62	681.00	1.06
Reach 1	0.79	PF 2	14413.00	2067.42	2073.72	2073.94	2075.54	0.010771	14.01	1725.06	899.68	1.16
Reach 1	0.76	PF 2	14413.00	2065.84	2071.94	2072.05	2073.59	0.006783	12.16	1643.73	896.38	0.94
Reach 1	0.71	PF 2	14413.00	2063.89	2070.40	2070.08	2071.56	0.004233	10.54	2273.79	840.64	0.76
Reach 1	0.66	PF 2	14413.00	2061.79	2069.58		2070.63	0.002975	9.70	2409.09	630.00	0.65
Reach 1	0.61	PF 2	14459.00	2059.91	2067.25	2067.25	2069.54	0.005263	12.41	1515.40	466.31	0.86
Reach 1	0.57	PF 2	14459.00	2057.69	2063.82	2064.83	2067.60	0.011171	15.61	943.75	261.46	1.21
Reach 1	0.52	PF 2	14459.00	2055.50	2064.32	2062.96	2065.79	0.002948	10.01	1716.89	319.29	0.65
Reach 1	0.48	PF 2	15045.00	2053.51	2063.89		2065.10	0.001699	8.84	1701.50	184.51	0.51
Reach 1	0.43	PF 2	15045.00	2051.27	2063.64	2058.29	2064.63	0.000958	8.00	1881.40	185.79	0.41
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2060.42	2056.95	2061.79	0.001729	9.38	1605.58	169.49	0.52
Reach 1	0.35	PF 2	15045.00	2047.68	2057.01	2057.01	2060.44	0.005525	15.22	1156.99	195.64	0.92
Reach 1	0.27	PF 2	15045.00	2044.00	2055.09	2054.00	2057.40	0.003488	13.01	1514.95	209.35	0.76
Reach 1	0.22	PF 2	15045.00	2043.00	2052.92	2052.92	2055.78	0.006631	13.85	1278.91	270.60	0.87
Reach 1	0.19	PF 2	15045.00	2040.69	2051.01	2046.86	2051.60	0.001210	6.54	2871.67	455.52	0.37
Reach 1	.13	PF 2	15045.00	2040.00	2049.40	2047.48	2050.98	0.001908	11.05	1963.05	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2046.26	2047.00	2050.55	0.007387	17.61	1131.22	214.55	1.22
Reach 1	0.08	PF 2	15045.00	2036.99	2044.19	2042.51	2044.79	0.002917	7.66	3308.01	818.58	0.55
Reach 1	.05	PF 2	15045.00	2038.00	2043.52	2042.40	2044.34	0.002757	9.09	3336.53	1079.12	0.72

MODEL I CWMR WITH
PROPOSED BRIDGE ADDED


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge
5/25/2004
Sols Wash Reach 1
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Left Levee
Elevation (ft)
2090
2080
2070
2060
2050
2040
2030
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)

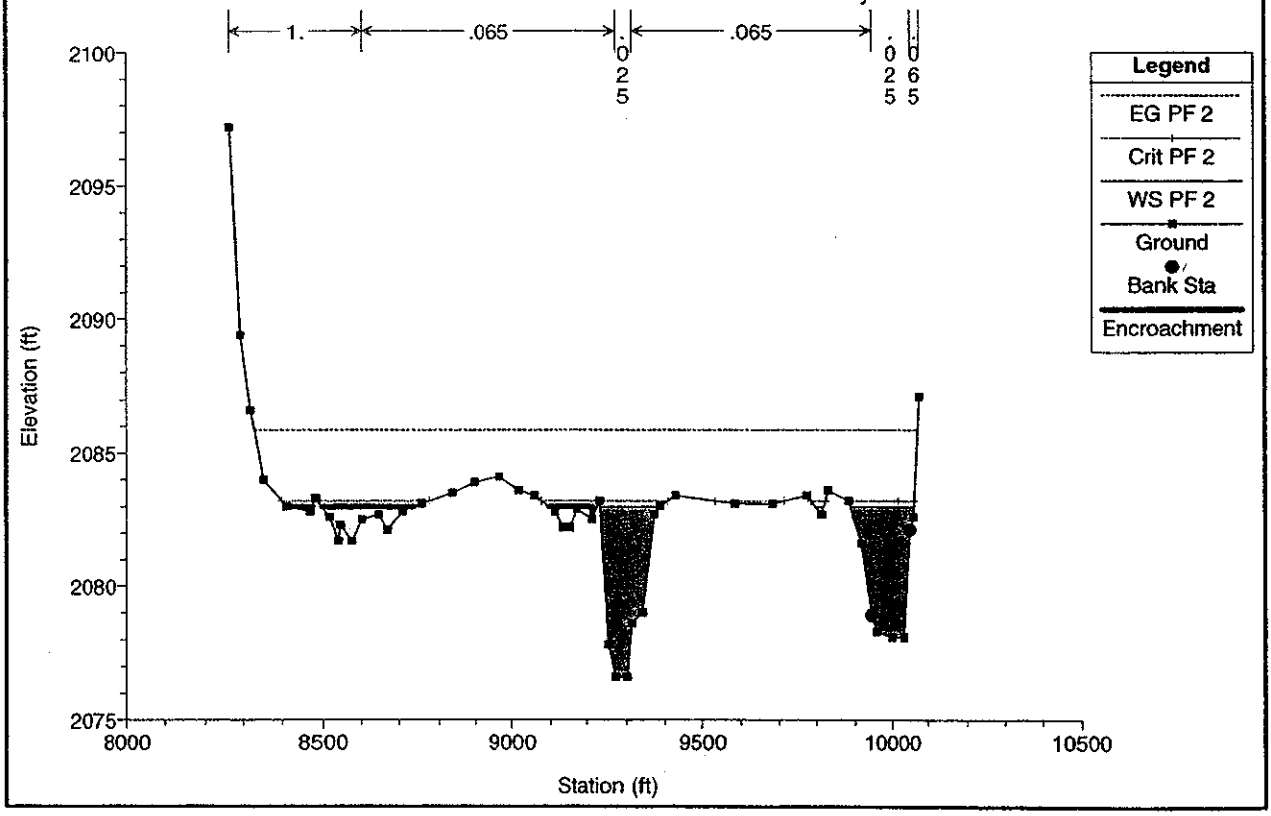
Sols Wash CLOMR with new ADOT Bridge Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004

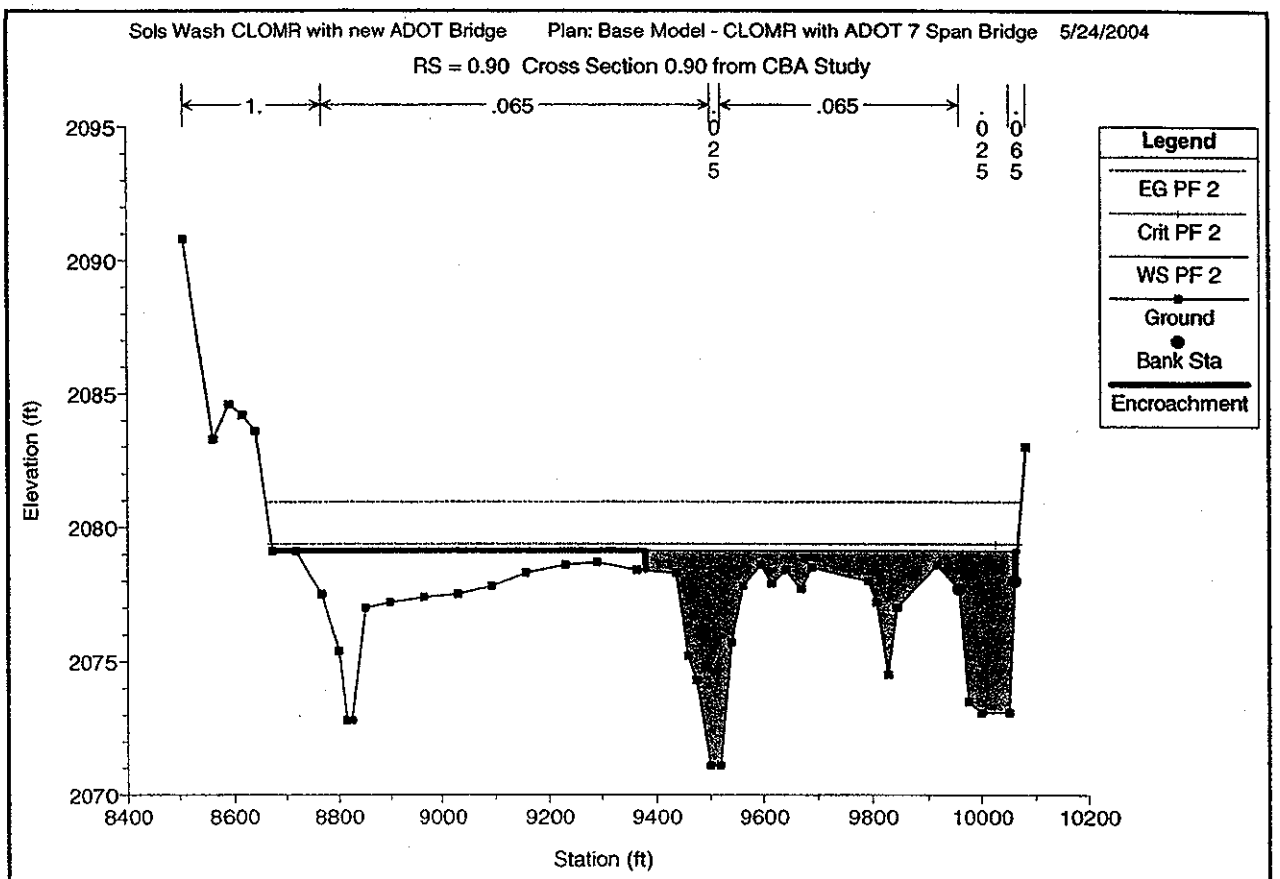
RS = 1.12 Cross Section 1.12 from CBA Study

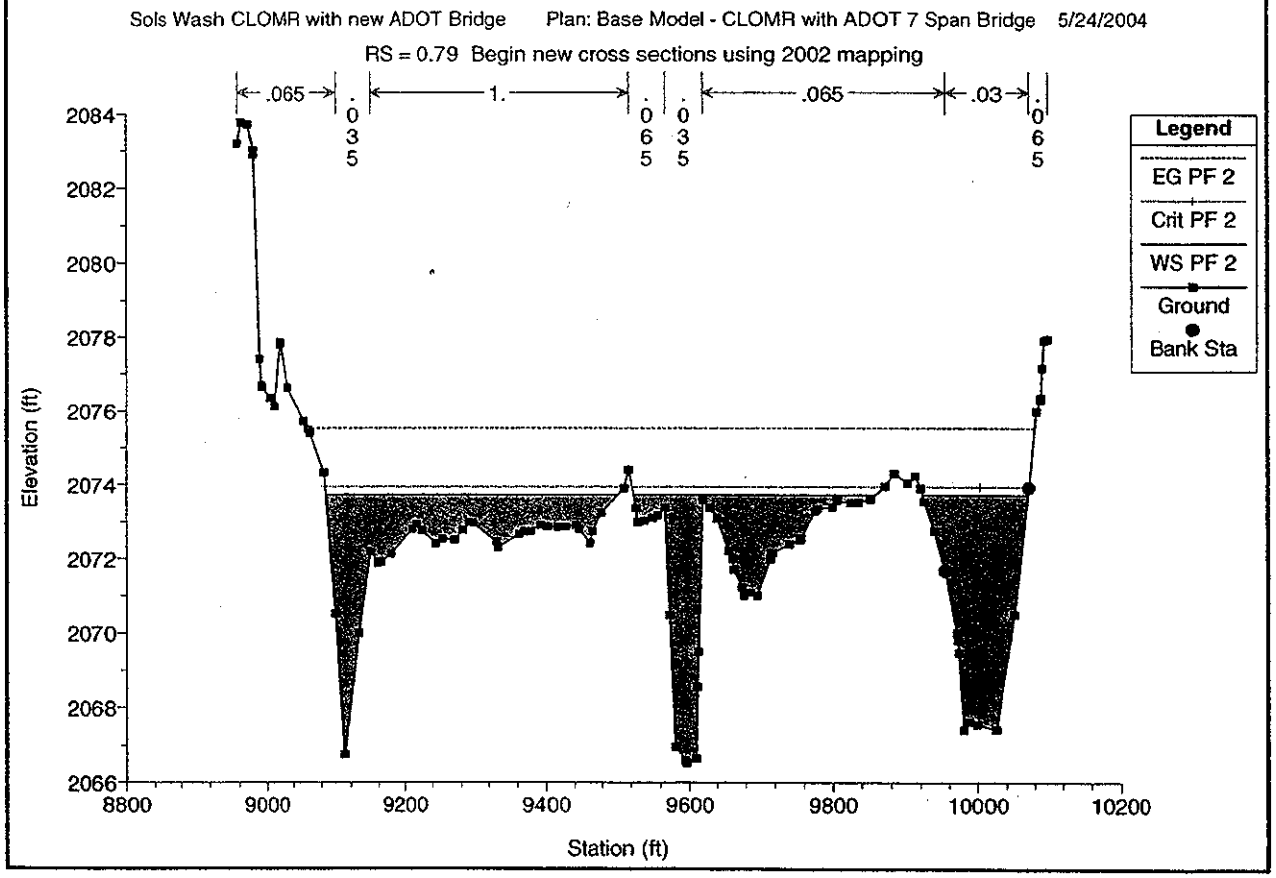


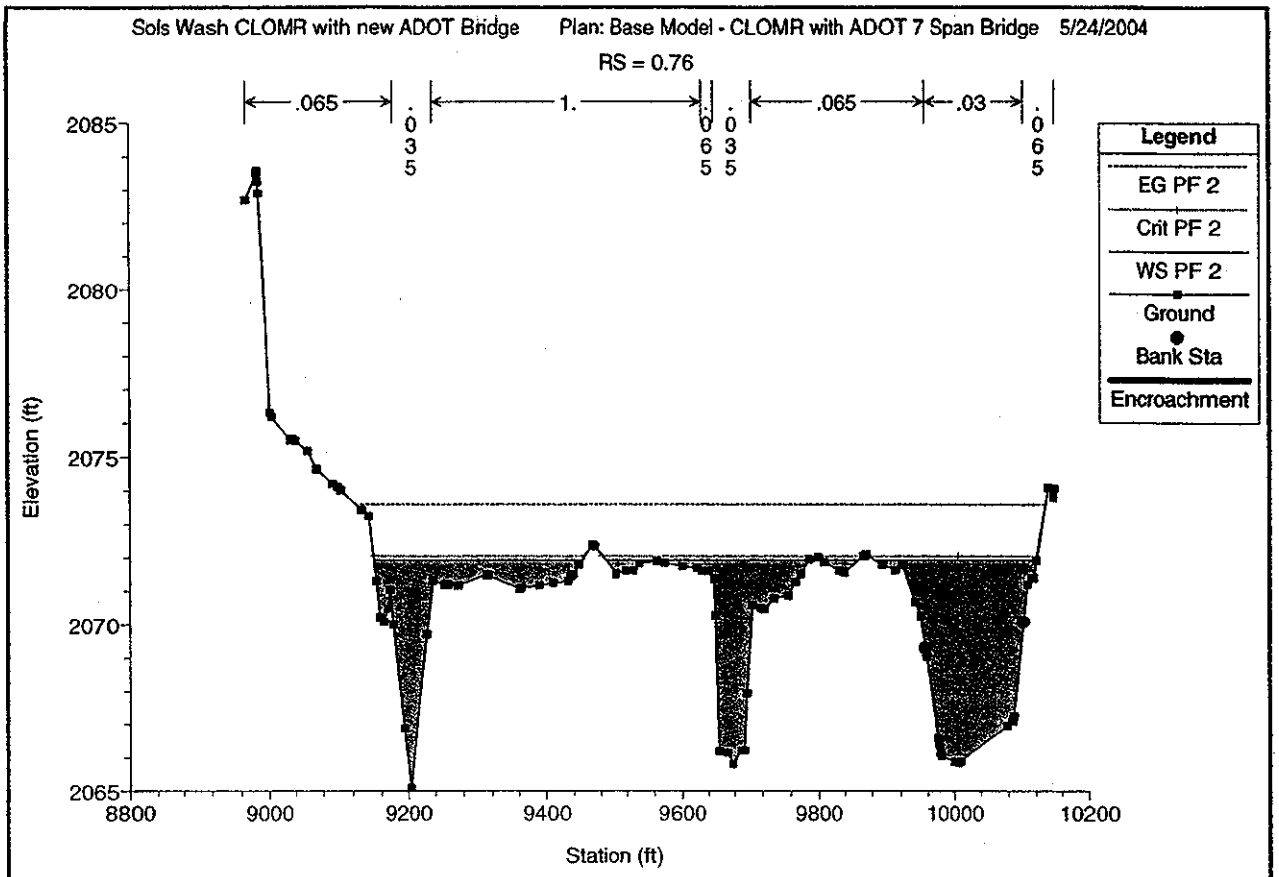
Sols Wash CLOMR with new ADOT Bridge Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004

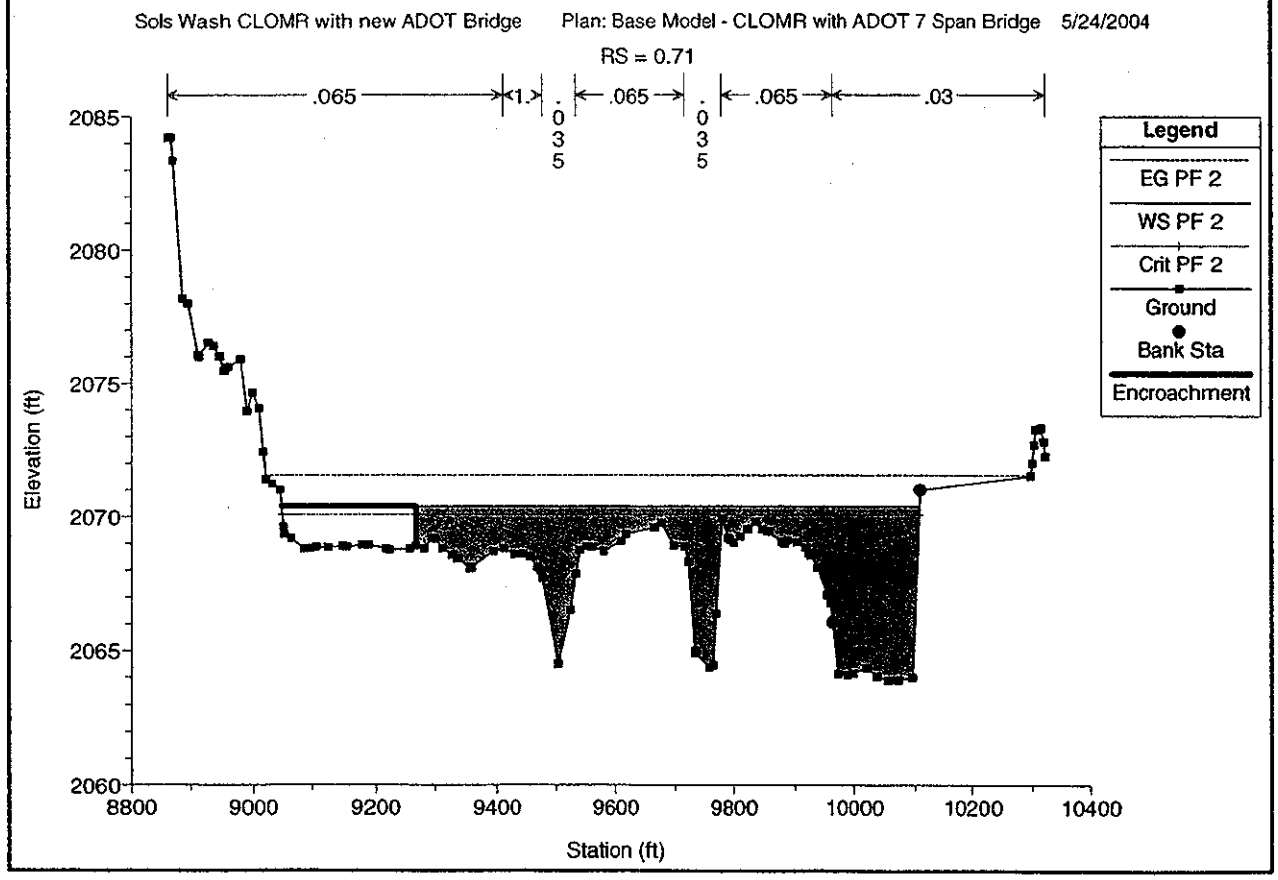
RS = 1.00 Cross Section 1.10 from CBA Study

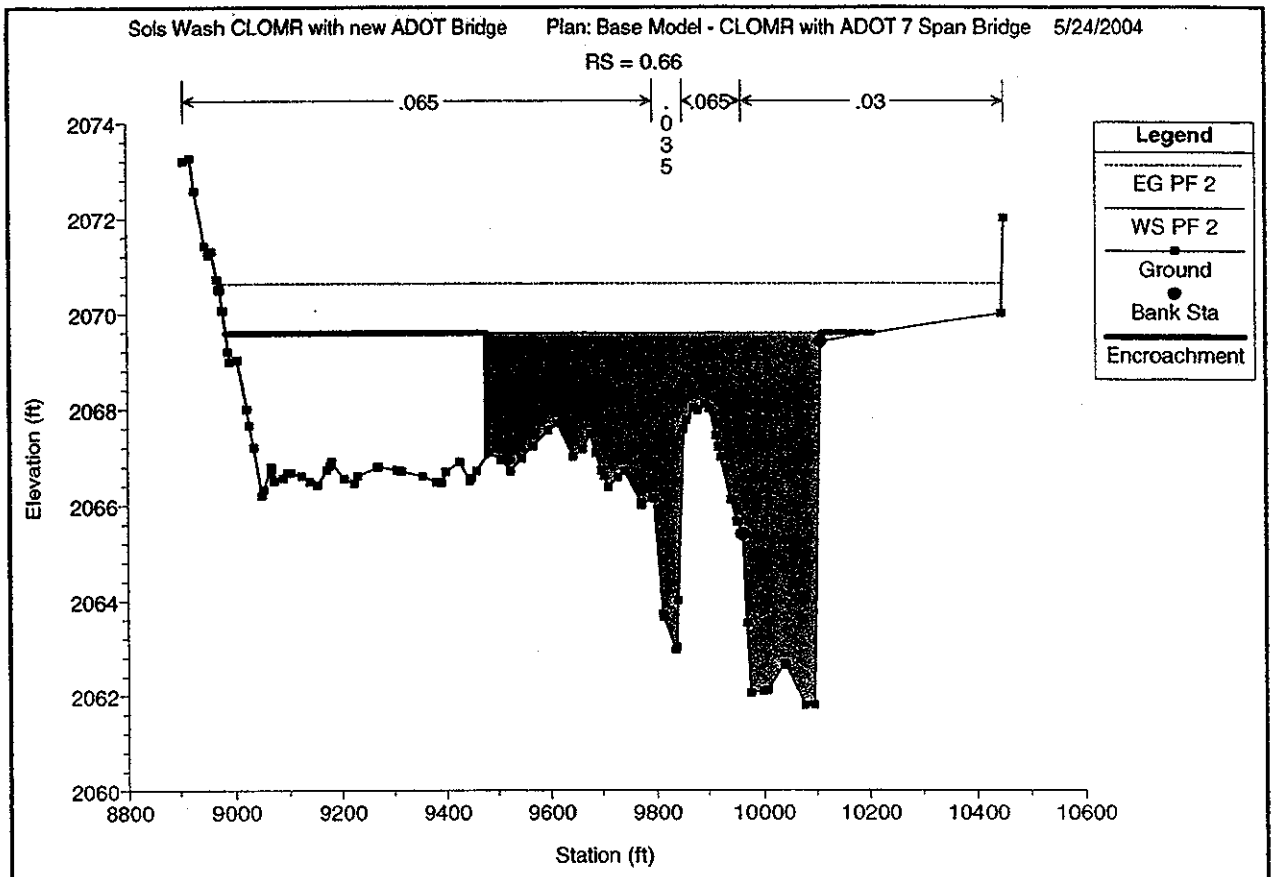


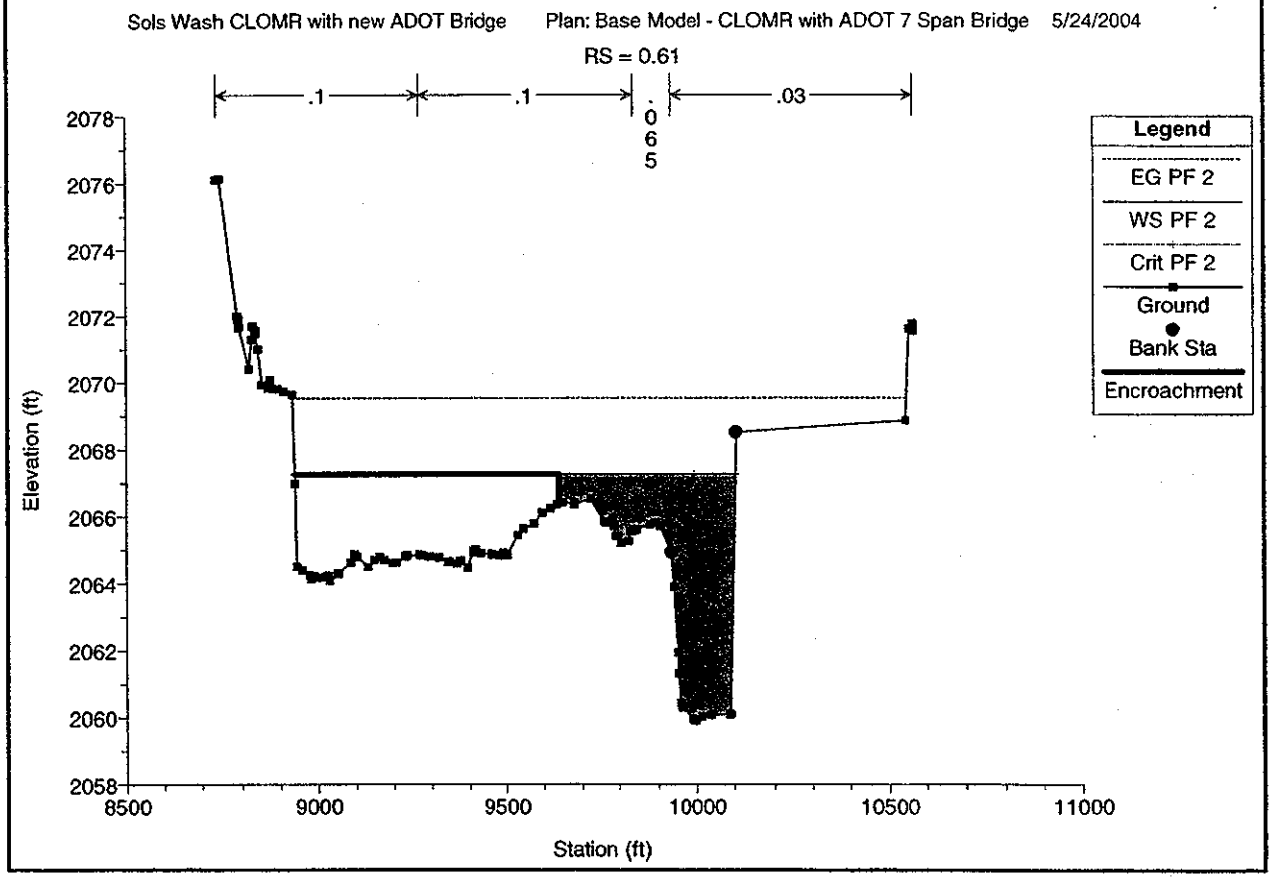

Sols Wash CLOMR with new ADOT Bridge Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.90 Cross Section 0.90 from CBA Study
1.
.065
.025
.065
.065
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

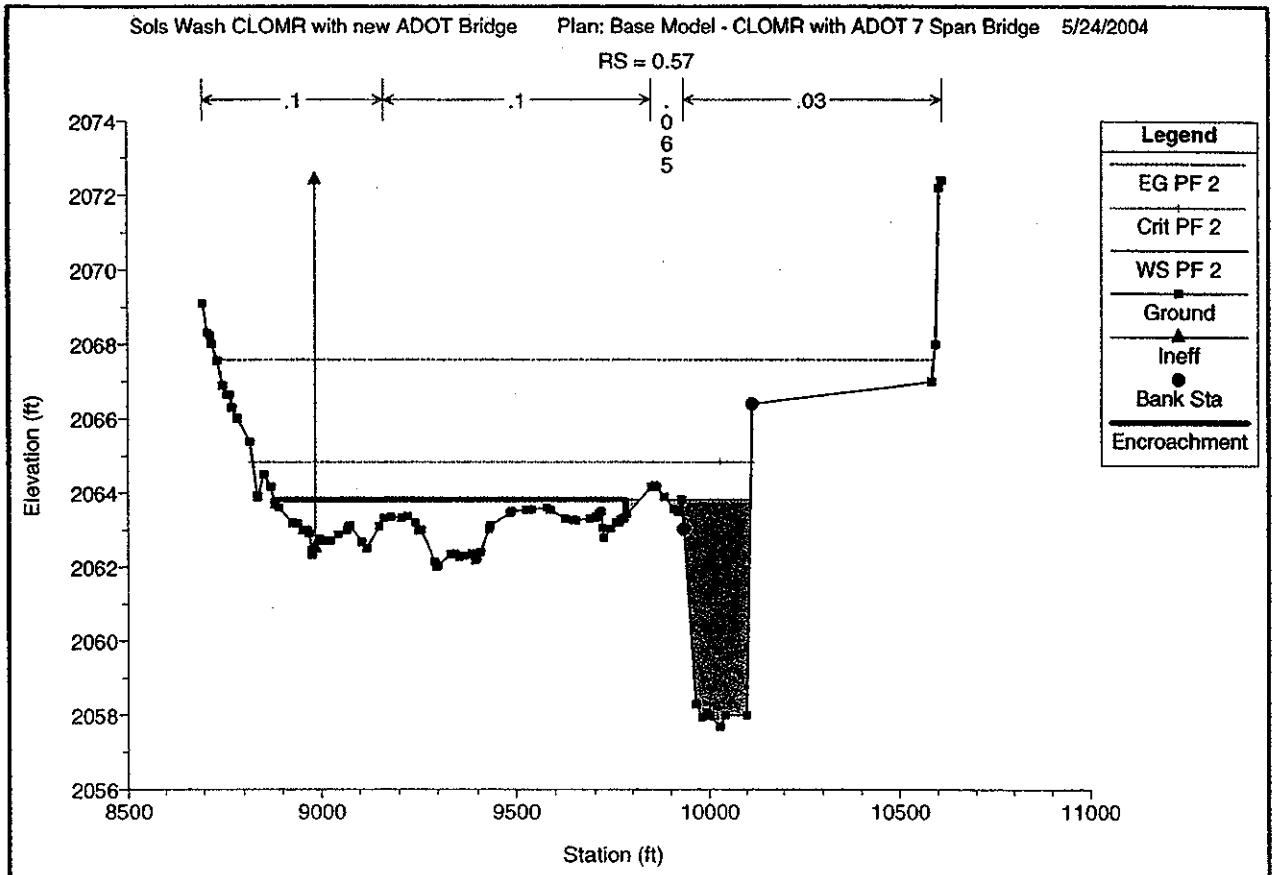

Sols Wash CLOMR with new ADOT Bridge Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.79 Begin new cross sections using 2002 mapping
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

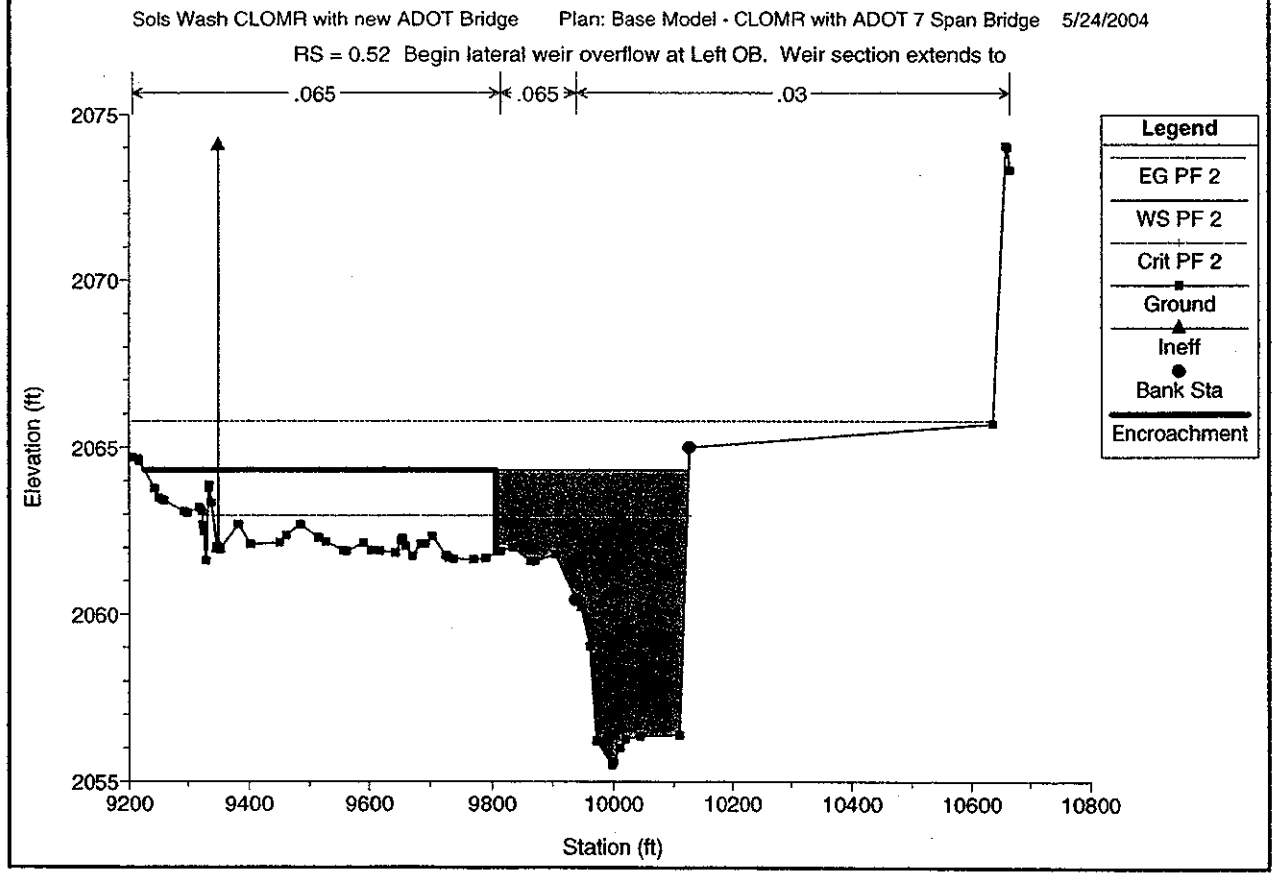

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.76
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2085
2080
2075
2070
2065
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

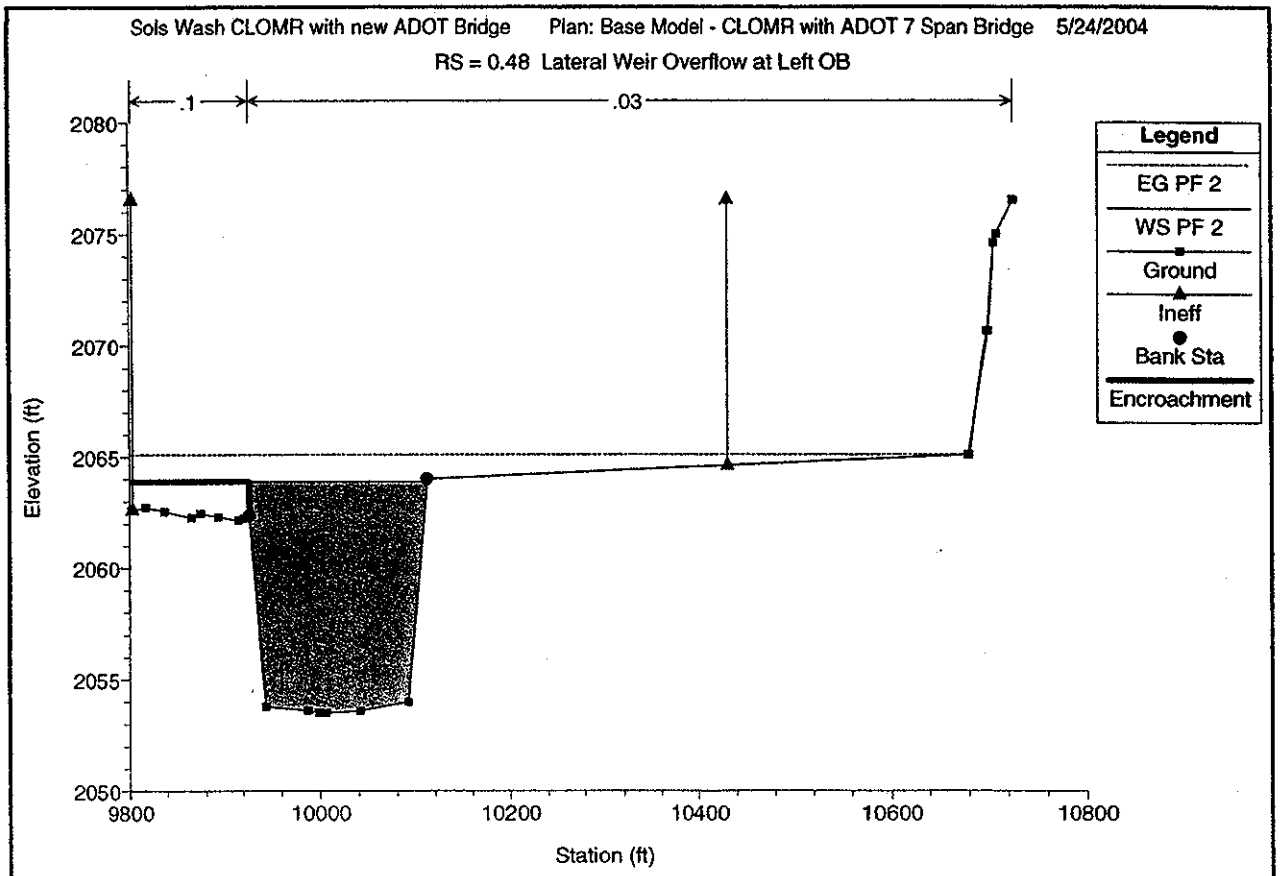

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.71
.065
1.
.035
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2085
2080
2075
2070
2065
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

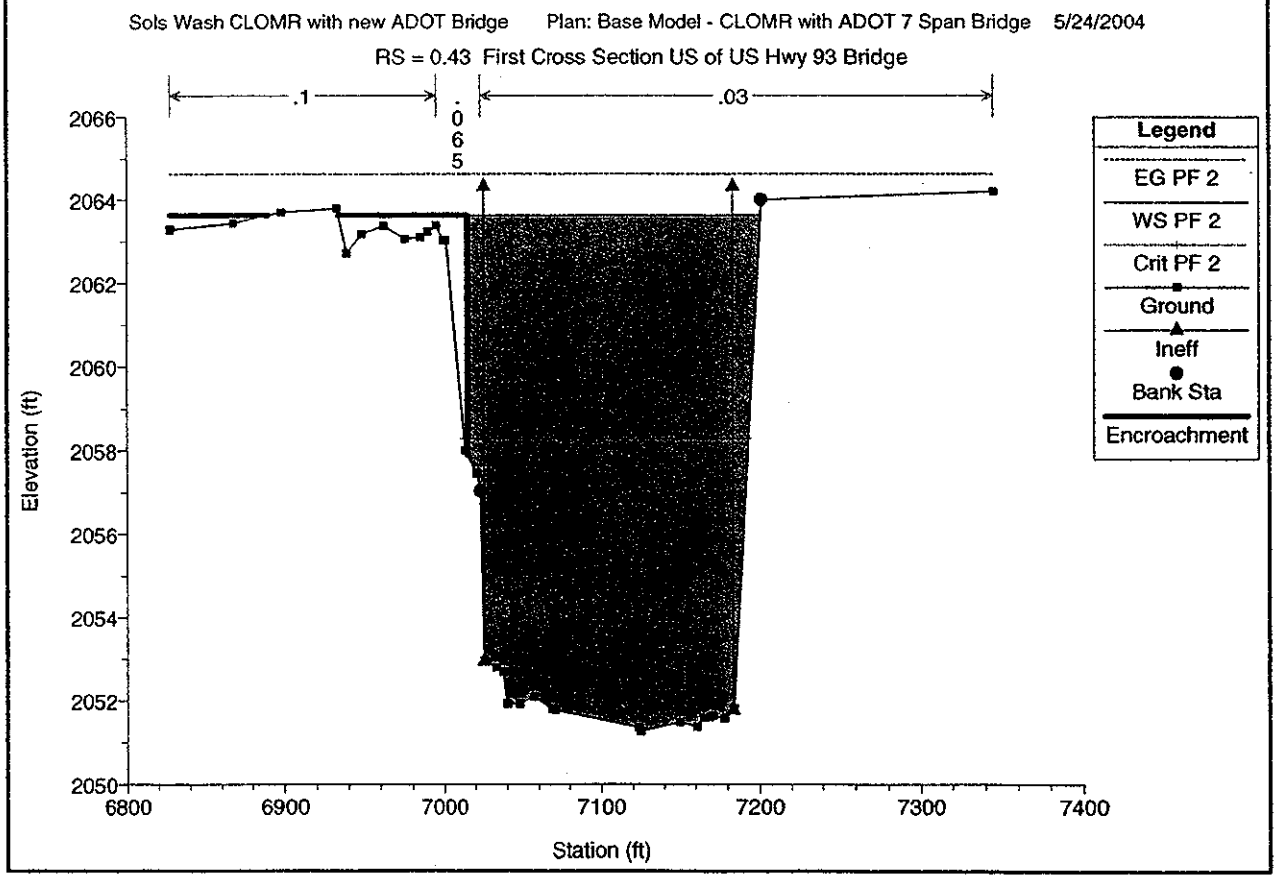

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge
5/24/2004
RS = 0.66
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2074
2072
2070
2068
2066
2064
2062
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
10600
Station (ft)

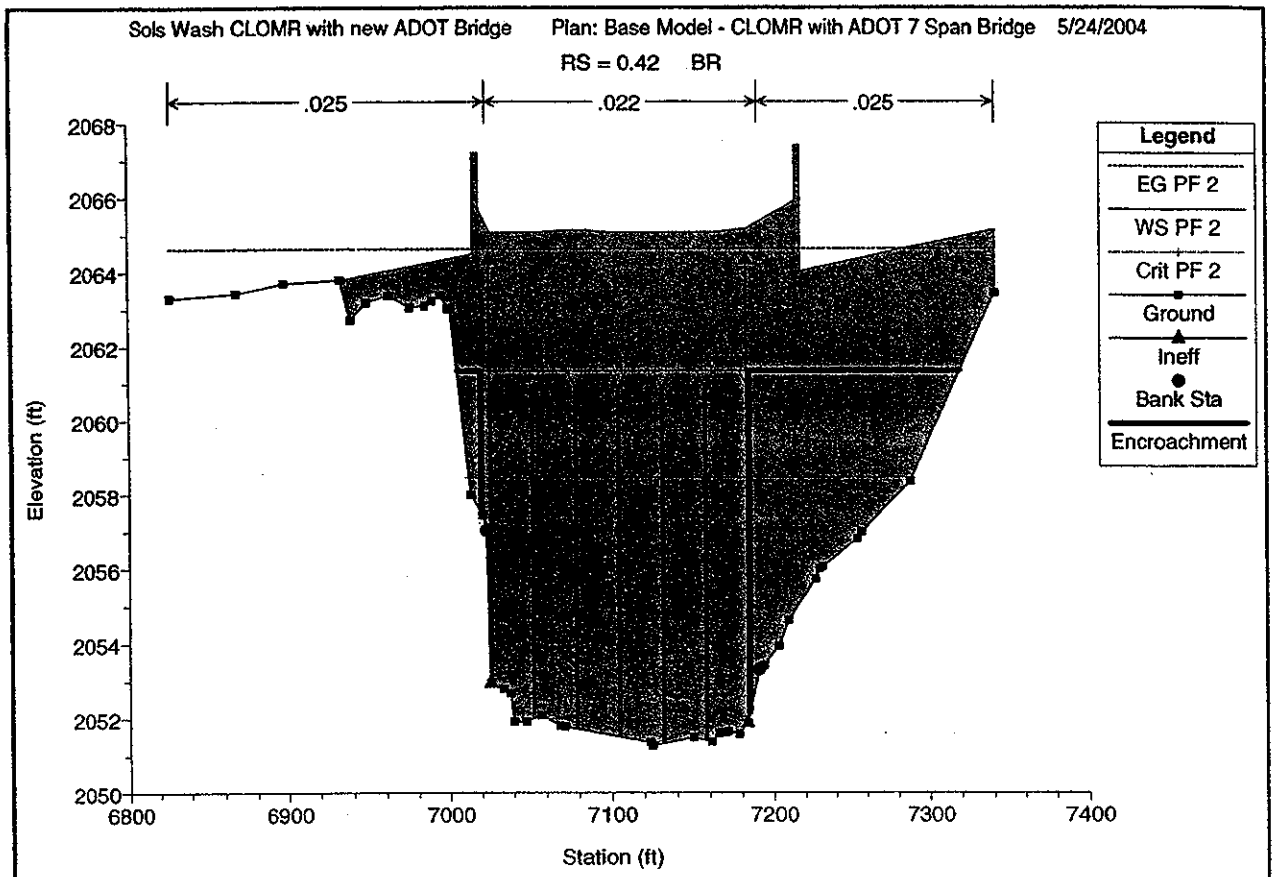

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge
5/24/2004
RS = 0.61
.1
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2078
2076
2074
2072
2070
2068
2066
2064
2062
2060
2058
8500
9000
9500
10000
10500
11000
Station (ft)

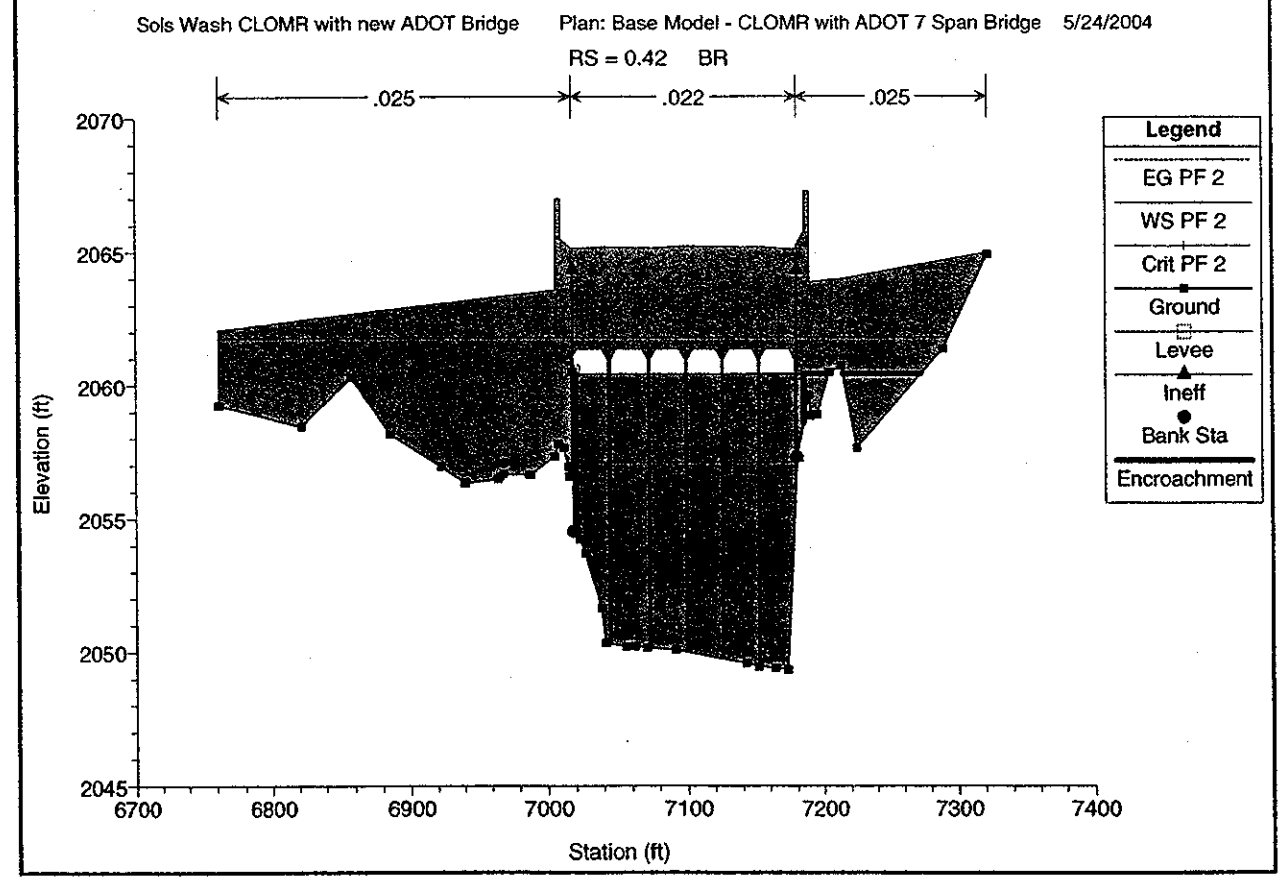

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge
5/24/2004
RS = 0.57
.1
.1
.065
.03
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
2058
2056
8500
9000
9500
10000
10500
11000

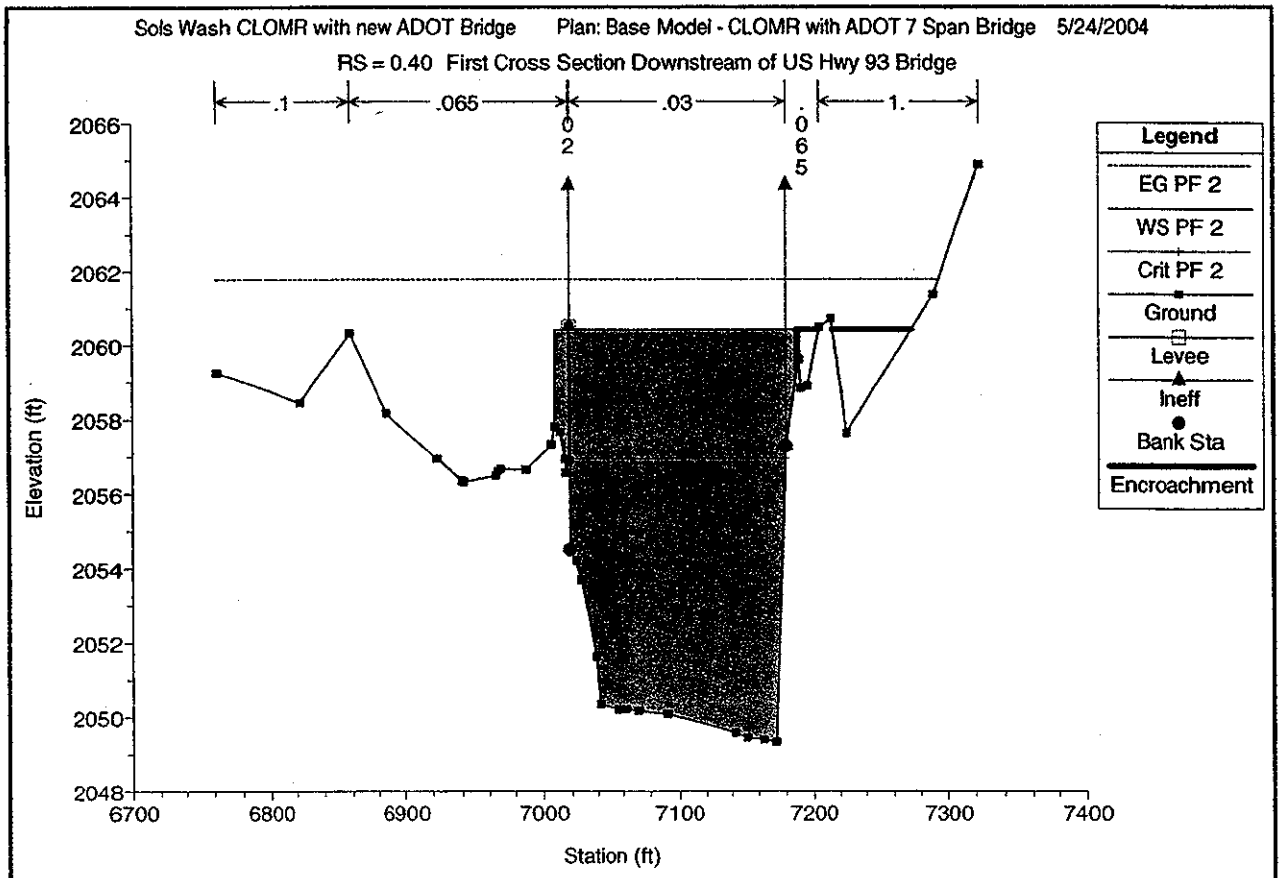

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge
5/24/2004
RS = 0.52 Begin lateral weir overflow at Left OB. Weir section extends to
.065
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
2075
2070
2065
2060
2055
9200
9400
9600
9800
10000
10200
10400
10600
10800

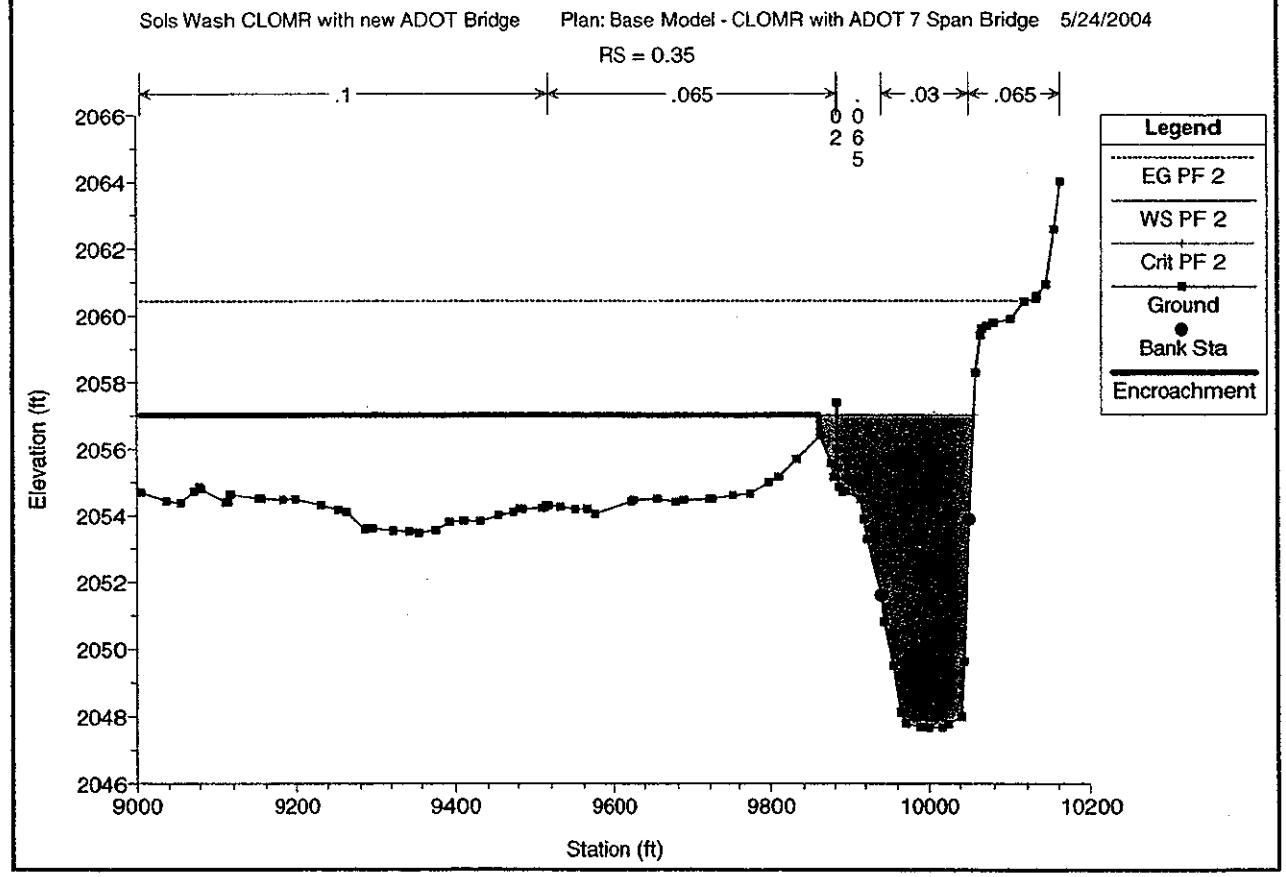

Sols Wash CLOMR with new ADOT Bridge Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.48 Lateral Weir Overflow at Left OB
.1
.03
Legend
EG PF 2
WS PF 2
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
2080
2075
2070
2065
2060
2055
2050
9800
10000
10200
10400
10600
10800
Station (ft)

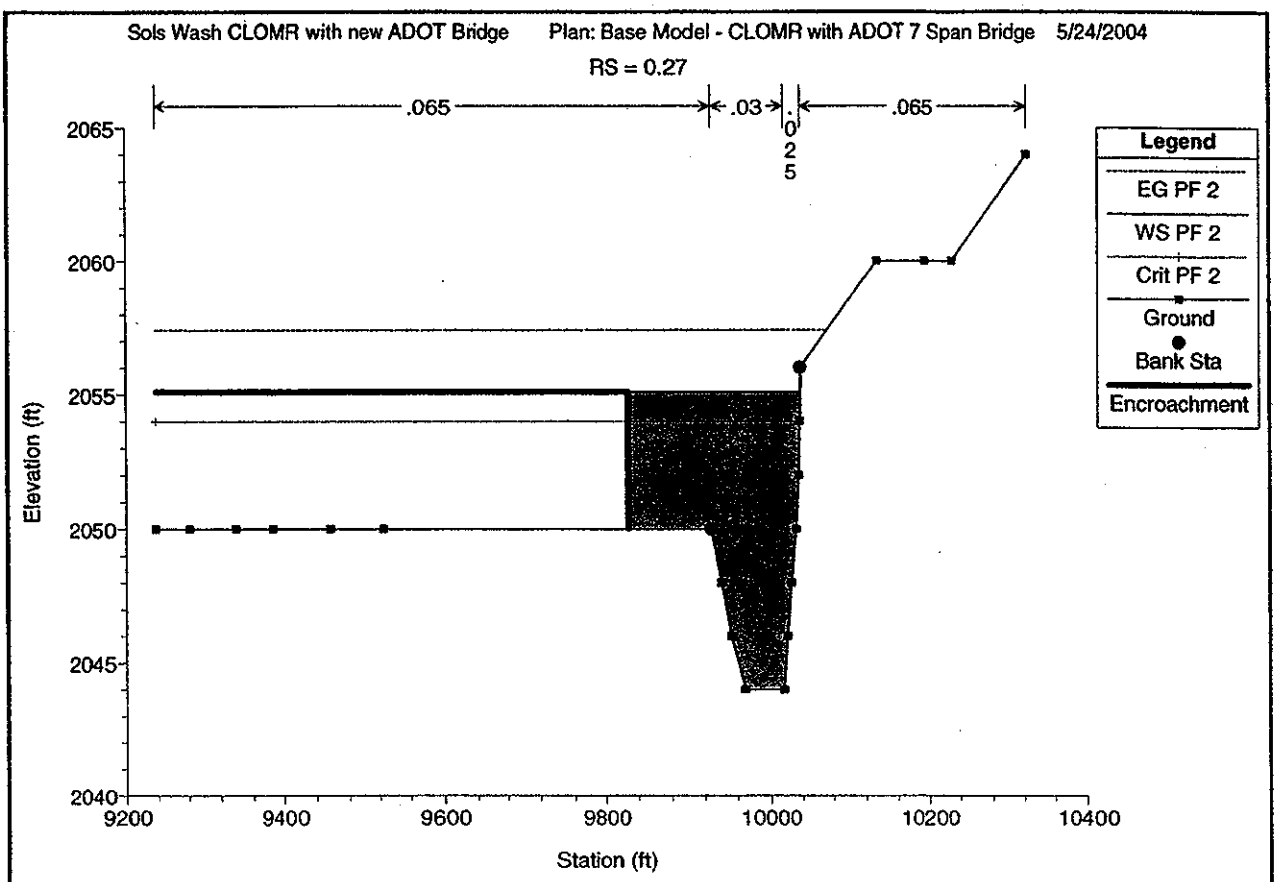

Sols Wash CLOMR with new ADOT Bridge Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.43 First Cross Section US of US Hwy 93 Bridge
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

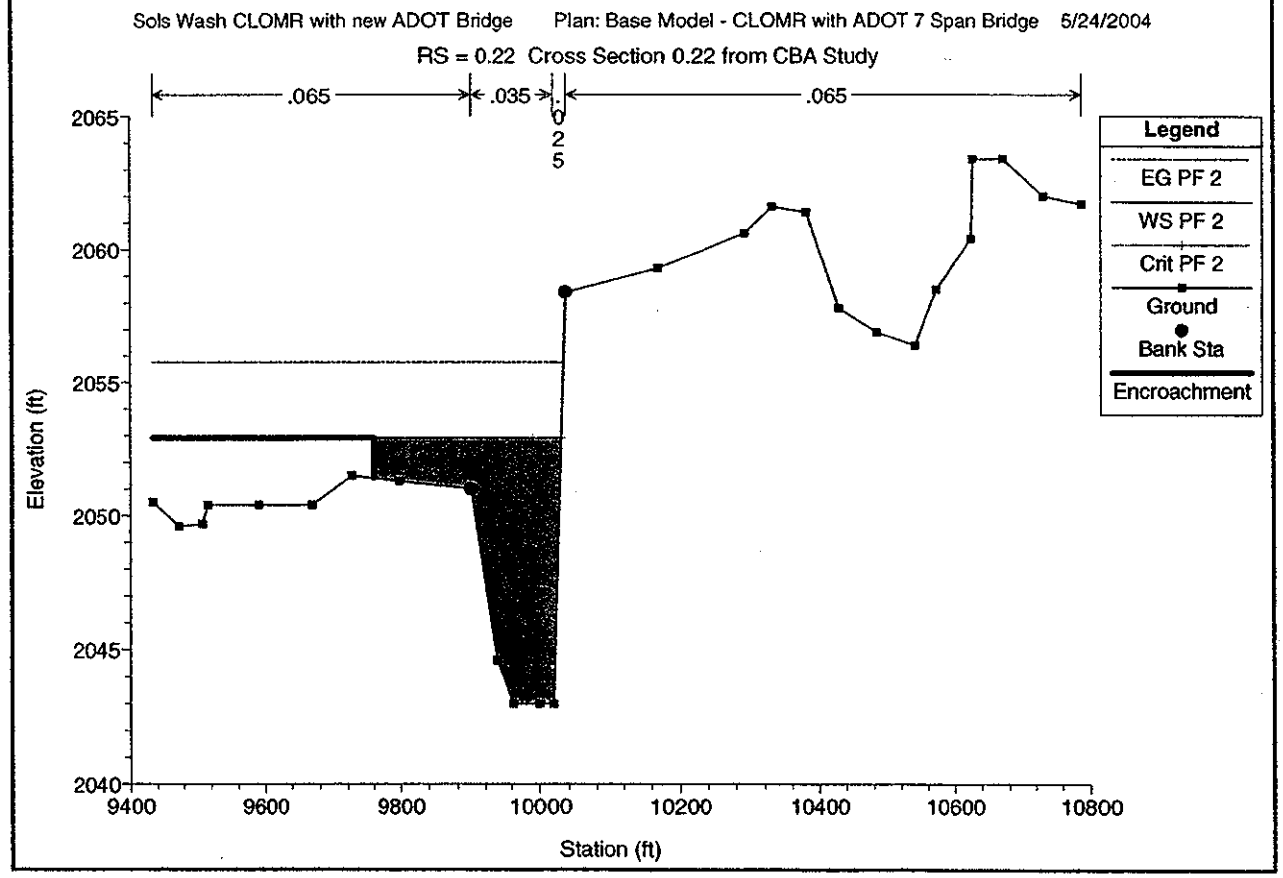

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
2068
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

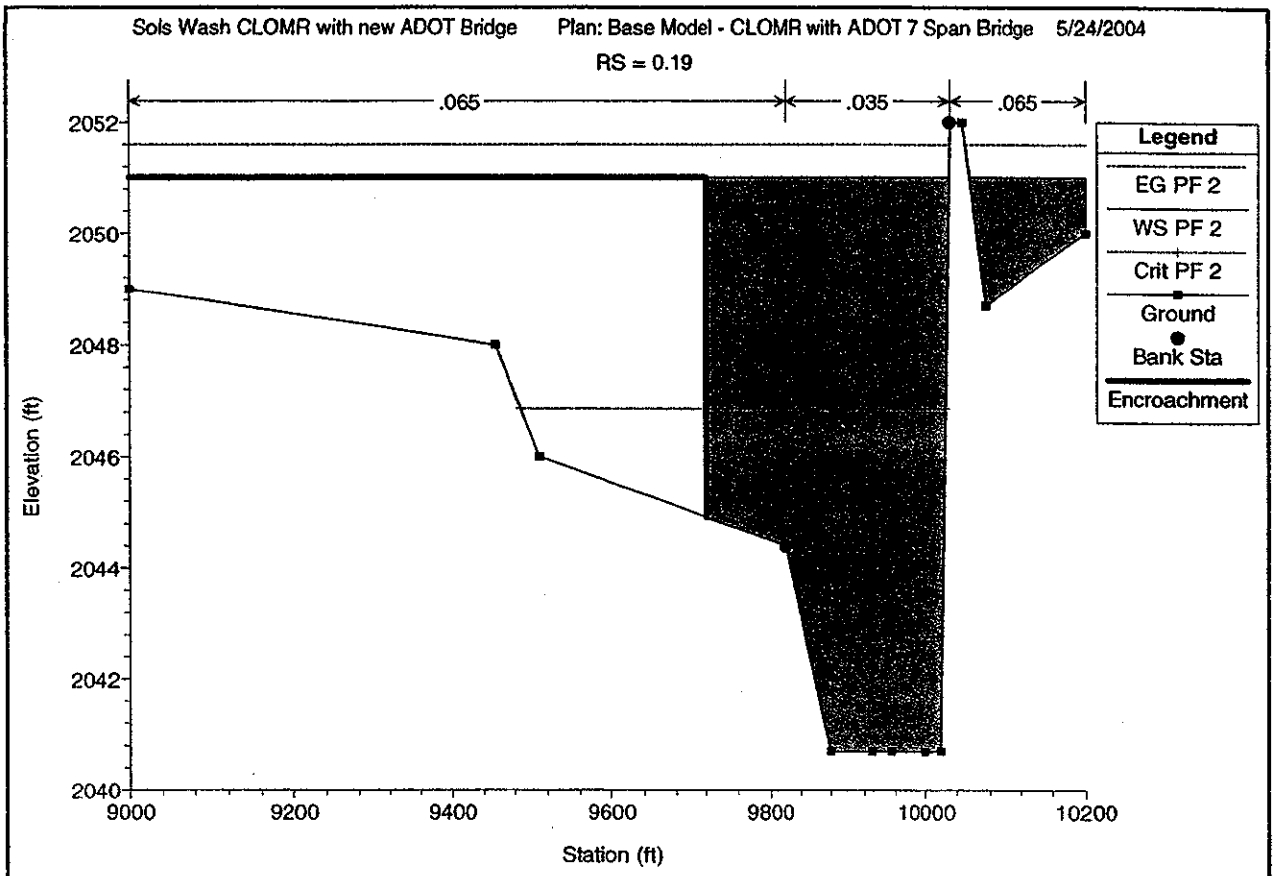

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Encroachment
Elevation (ft)
2070
2065
2060
2055
2050
2045
6700
6800
6900
7000
7100
7200
7300
7400
Station (ft)

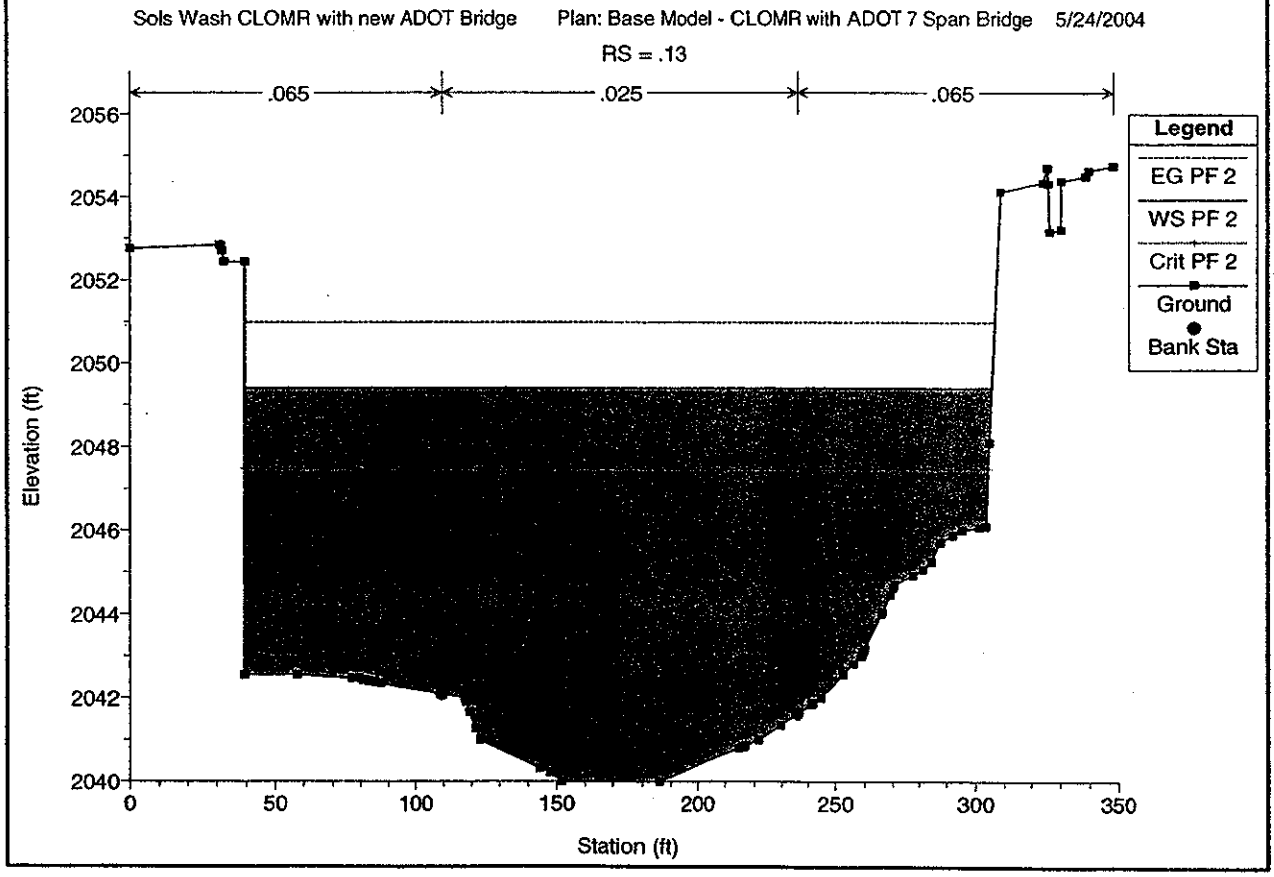

Sols Wash CLOMR with new ADOT Bridge Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.40 First Cross Section Downstream of US Hwy 93 Bridge
.1
.065
.03
.065
1.
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

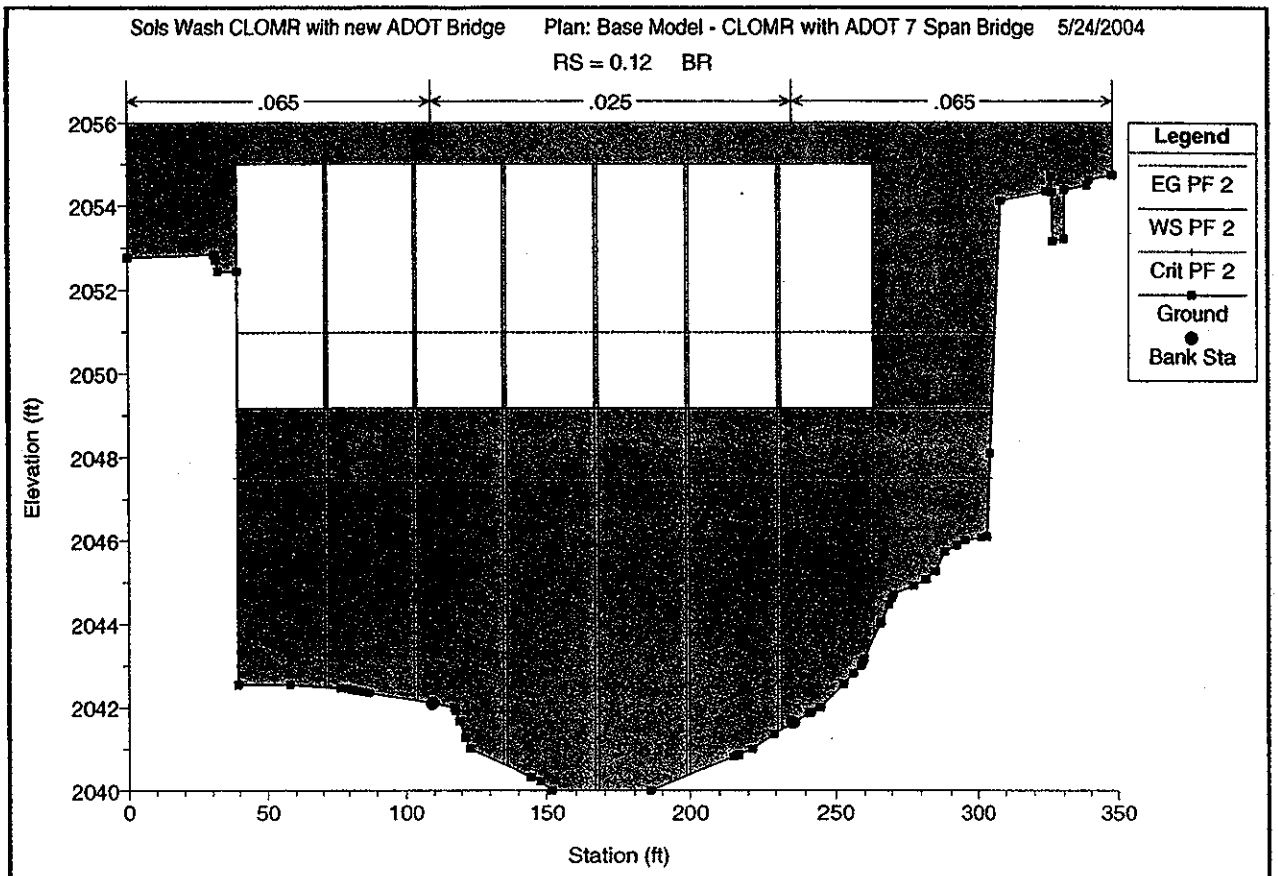

Sols Wash CLOMR with new ADOT Bridge Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.35
.1
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

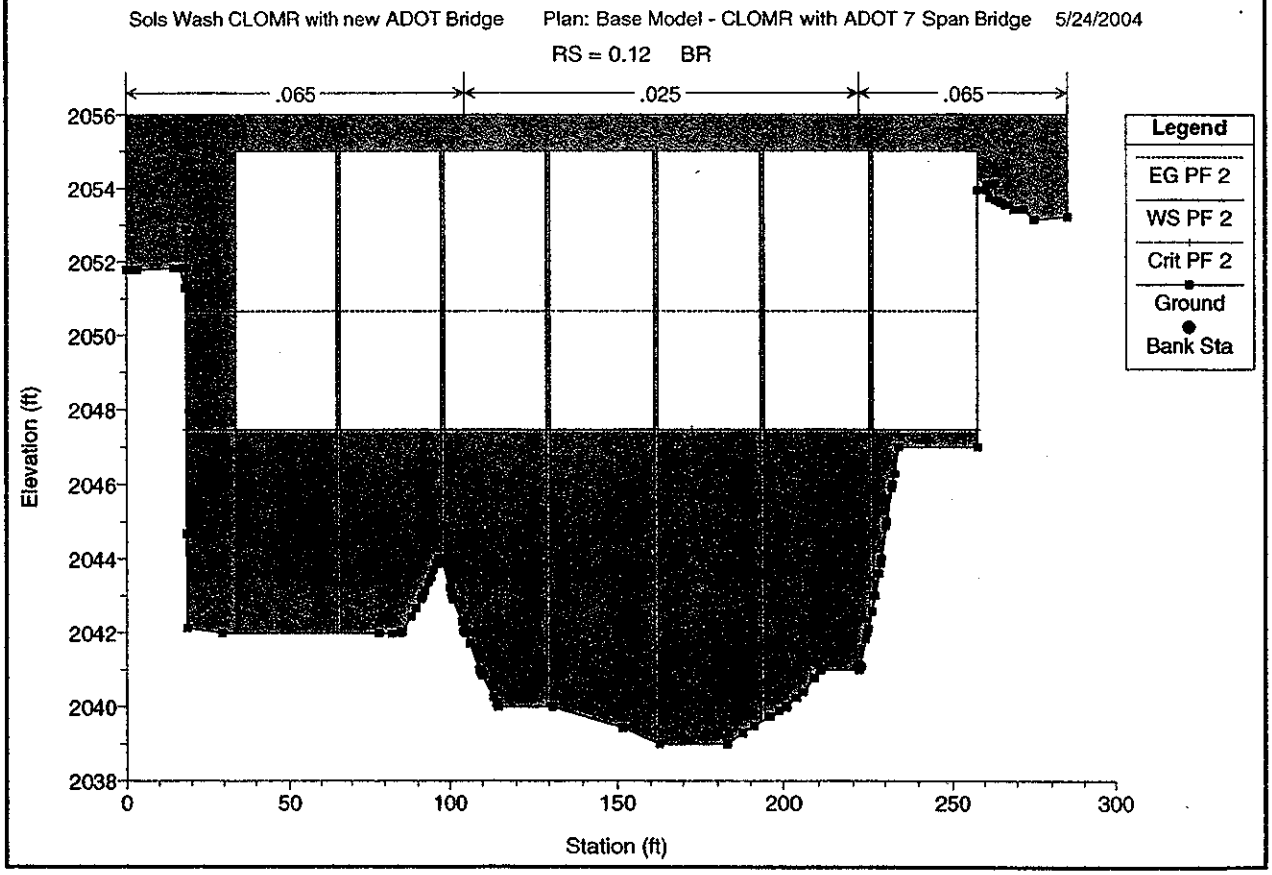

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.27
.065
.03
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2065
2060
2055
2050
2045
2040
9200
9400
9600
9800
10000
10200
10400
Station (ft)

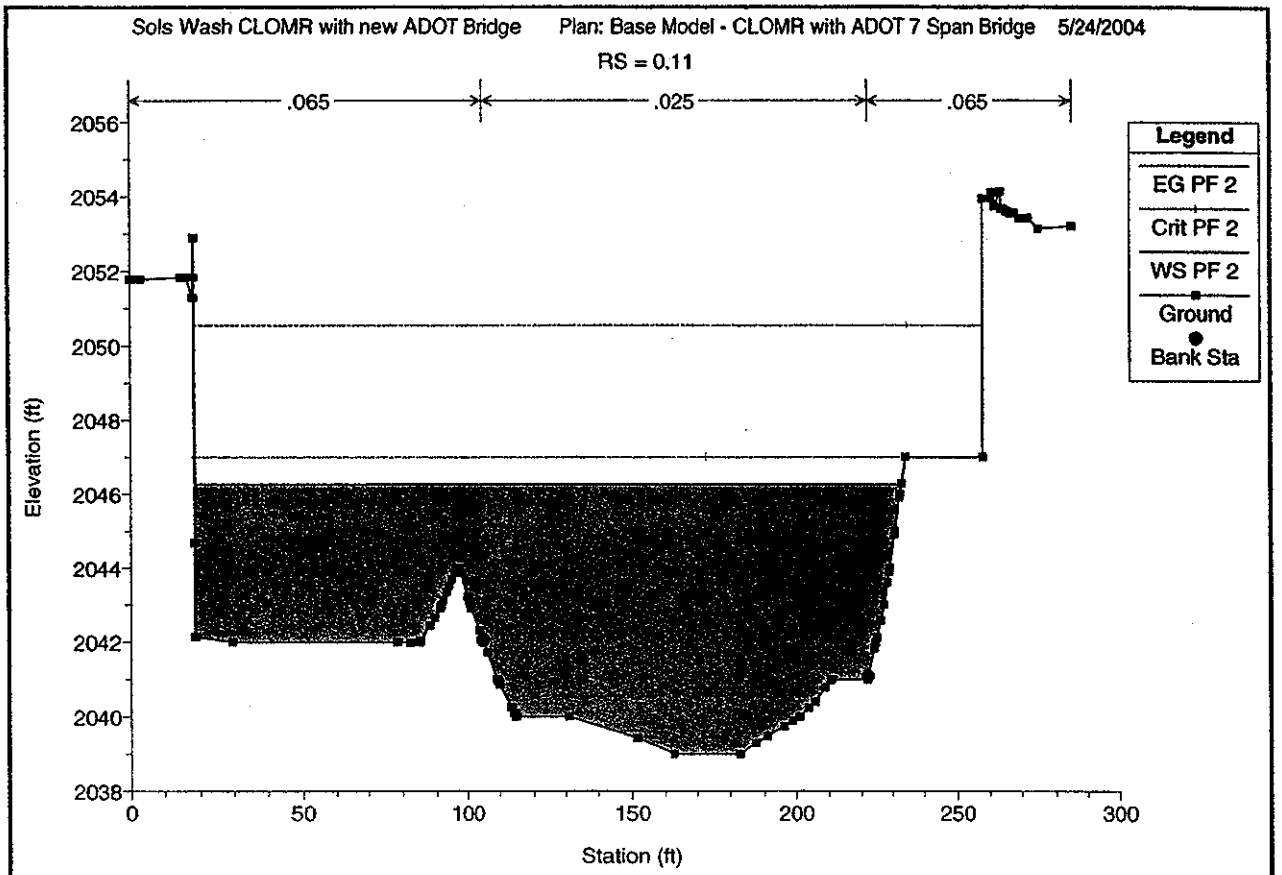

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.22 Cross Section 0.22 from CBA Study
.065
.035
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2065
2060
2055
2050
2045
2040
9400
9600
9800
10000
10200
10400
10600
10800
Station (ft)

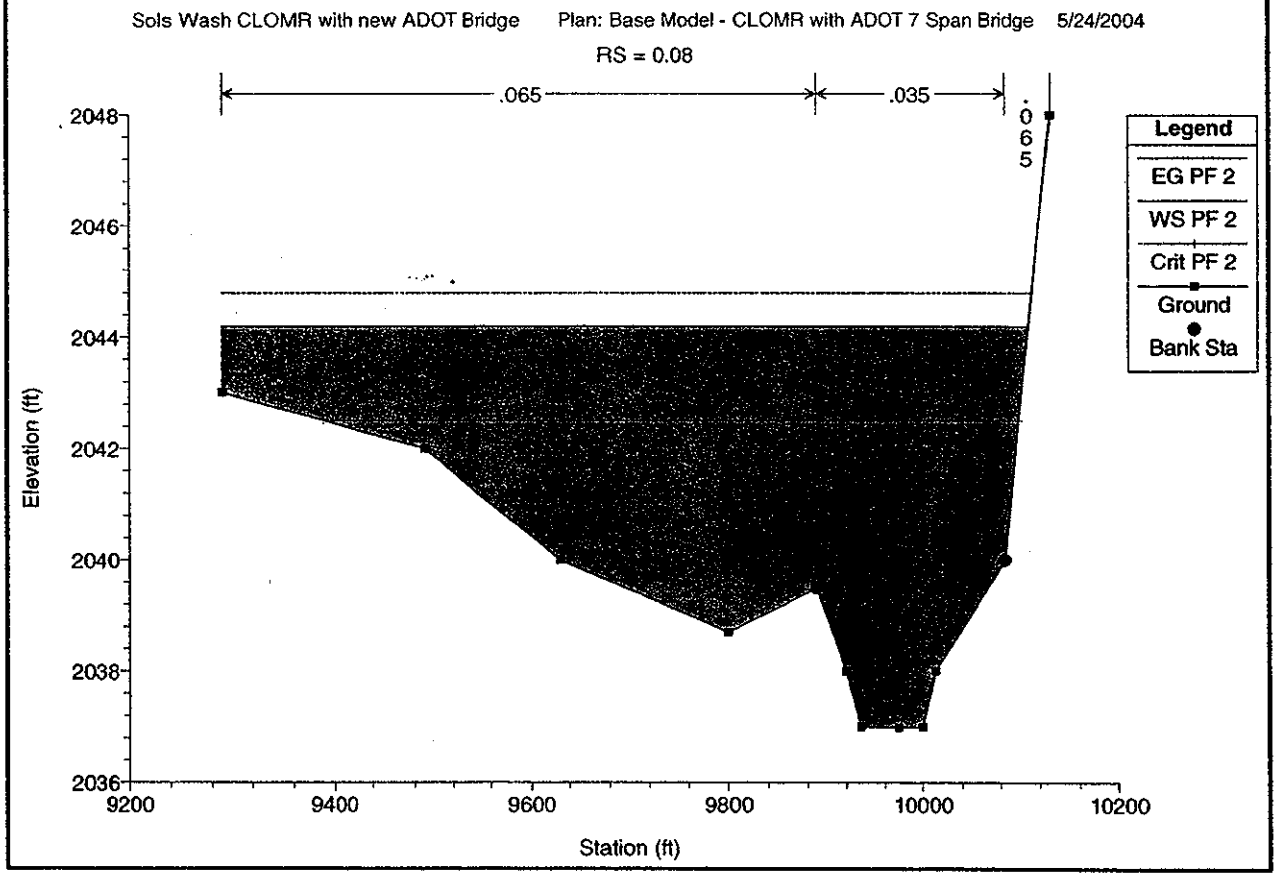

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.19
.065
.035
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2052
2050
2048
2046
2044
2042
2040
9000
9200
9400
9600
9800
10000
10200
Station (ft)

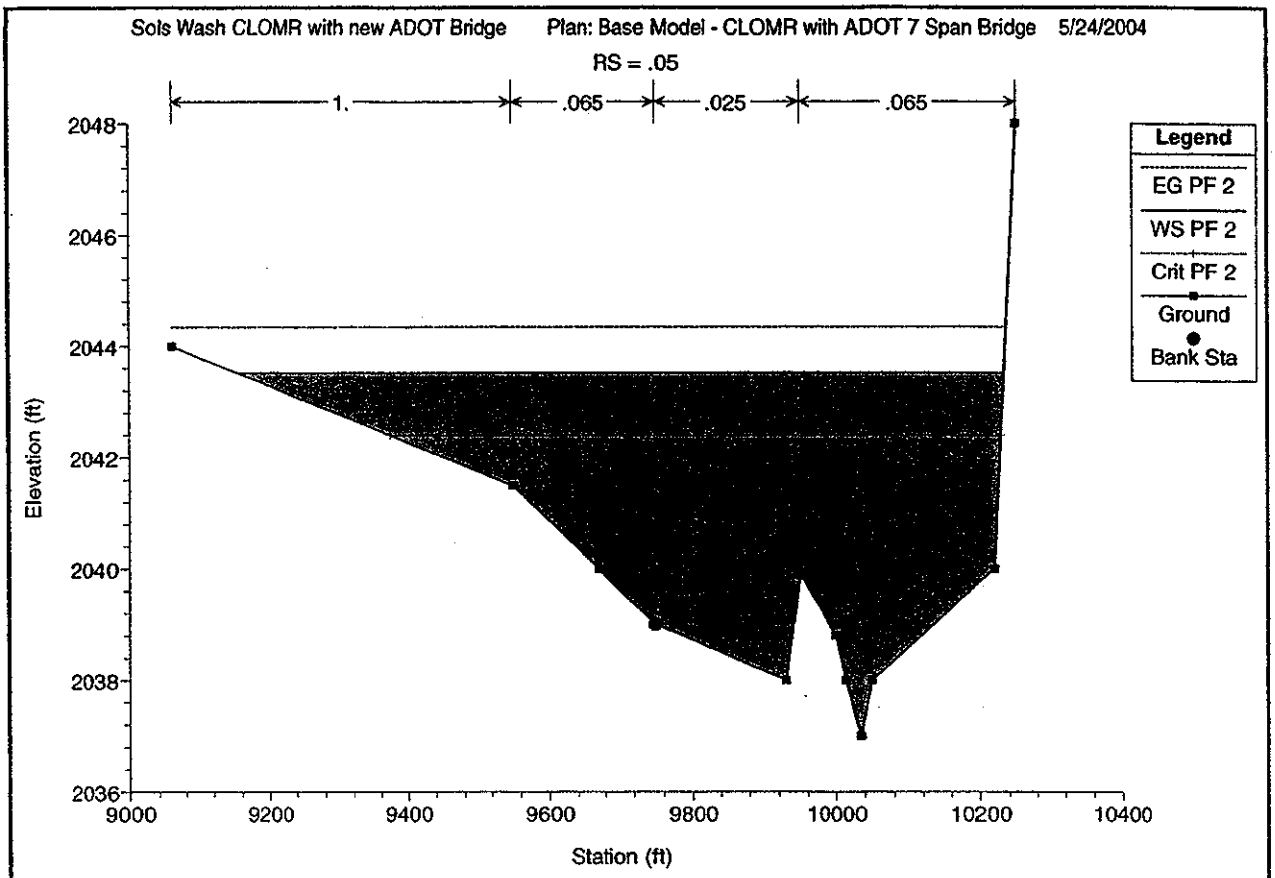

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = .13
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
0
50
100
150
200
250
300
350
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
0
50
100
150
200
250
300
350
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
2038
0
50
100
150
200
250
300
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge
5/24/2004
RS = 0.11
.065
.025
.065
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
2038
0
50
100
150
200
250
300
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge
5/24/2004
RS = 0.08
.065
.035
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9200
9400
9600
9800
10000
10200
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model - CLOMR with ADOT 7 Span Bridge 5/24/2004
RS = .05
1.
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

ATTACHMENT C:
REVISED MODEL II – SOLS WASH LEVEE IMPROVEMENTS WEST OF EXISTING US93

Model II - Sols Wash – Levee Improvements West of Existing US 93

Once AZTEC's base model was established, proposed levee improvements were added to the North bank of Sols Wash, West of the existing US 93 Bridge (Tegner Bridge). The proposed levee begins at section 0.76 and extends eastward along the north bank. The model represents the proposed condition, which eliminates flows from breaking out to the north and flowing across properties and Tegner Road. These levee improvements are effective in containing the flow within the Sols Wash channel for this section of the reach. In addition, the channel flow is kept below the proposed rip rap embankment developed in the CLOMR for the Goldmine Village Development. The attached information has been provided to detail the proposed levee improvements in Sols Wash west of the Tegner Bridge.

SUBCR

HEC-RAS Plan: MODEL II River: Sols Wash Reach: Reach 1 Profile: PF 2

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(fps)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.53	2088.53	2089.89	0.004281	12.06	2088.86	880.00	0.91
Reach 1	1.00	PF 2	14413.00	2078.10	2084.07	2084.07	2085.60	0.004798	12.86	1957.76	850.22	0.96
Reach 1	0.90	PF 2	14413.00	2073.10	2079.38	2079.38	2080.92	0.007230	12.89	1873.35	681.00	0.96
Reach 1	0.79	PF 2	14413.00	2067.42	2073.90	2073.90	2075.50	0.009363	13.32	1886.69	924.15	1.09
Reach 1	0.76	PF 2	14413.00	2065.84	2071.97	2071.97	2073.62	0.006700	12.13	1639.60	885.21	0.94
Reach 1	0.71	PF 2	14413.00	2063.89	2071.02	2070.12	2071.96	0.002965	9.37	2351.77	664.94	0.64
Reach 1	0.66	PF 2	14413.00	2061.79	2069.70	2068.75	2071.10	0.003460	10.59	1815.94	534.05	0.70
Reach 1	0.61	PF 2	14459.00	2059.91	2066.89	2066.89	2069.77	0.006845	13.67	1097.00	200.63	0.97
Reach 1	0.57	PF 2	14459.00	2057.69	2064.67	2064.53	2067.46	0.006811	13.40	1085.58	185.76	0.96
Reach 1	0.52	PF 2	14459.00	2055.50	2064.21	2062.80	2065.92	0.003361	10.59	1443.39	220.49	0.70
Reach 1	0.48	PF 2	15045.00	2053.51	2063.89	2060.38	2065.11	0.001696	8.84	1702.45	184.52	0.51
Reach 1	0.43	PF 2	15045.00	2051.27	2063.64	2058.29	2064.64	0.000956	7.99	1882.29	201.37	0.41
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2060.43	2056.95	2061.79	0.001723	9.37	1607.31	244.44	0.52
Reach 1	0.35	PF 2	15045.00	2047.68	2056.99	2056.99	2060.44	0.005575	15.27	1152.83	195.59	0.92
Reach 1	0.27	PF 2	15045.00	2044.00	2055.12		2057.41	0.003445	12.96	1521.64	209.37	0.75
Reach 1	0.22	PF 2	15045.00	2043.00	2052.87	2052.87	2055.78	0.006807	13.97	1264.05	270.53	0.88
Reach 1	0.19	PF 2	15045.00	2040.69	2050.82		2051.73	0.002020	8.26	2433.57	432.33	0.47
Reach 1	0.13	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2047.25	2047.25	2050.36	0.004473	15.08	1349.67	239.45	0.98
Reach 1	0.05	PF 2	15045.00	2036.99	2044.19		2044.79	0.002923	7.67	3305.61	818.56	0.55
Reach 1	.05	PF 2	15045.00	2038.00	2043.52	2042.38	2044.34	0.002757	9.09	3336.53	1079.12	0.72

MODEL II SOLS WASH WITH LEVEE IMPROVEMENTS WEST OF U.S. 93. PROPOSED 1 SPAN ADOT BRIDGE INCLUDED

HEC-RAS Plan: MODEL II River: Sols Wash Reach: Reach 1 Profile: PF 2

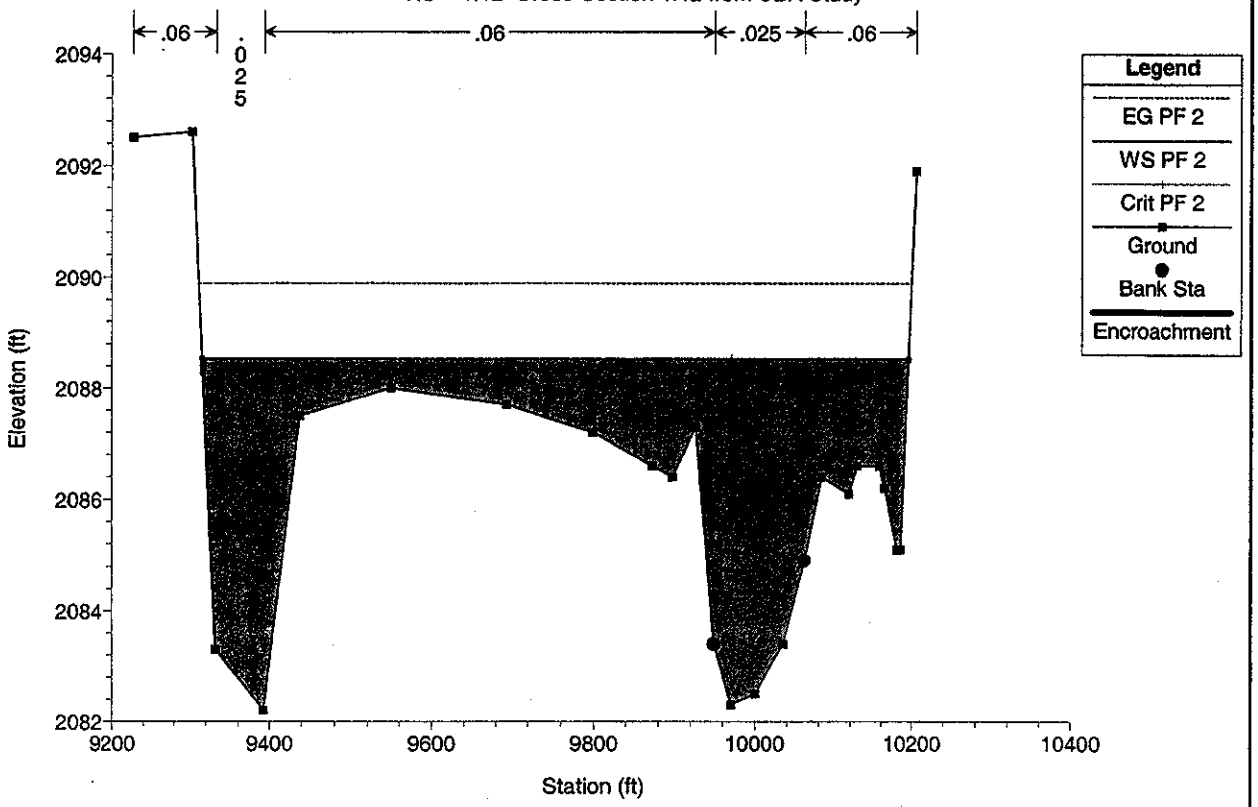
MIXED

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.92	PF 2	14413.00	2082.30	2088.53	2088.53	2089.89	0.004281	12.06	2088.86	880.00	0.91
Reach 1	0.00	PF 2	14413.00	2078.10	2082.98	2084.07	2085.85	0.010136	16.15	1154.56	356.71	1.35
Reach 1	0.90	PF 2	14413.00	2073.10	2079.12	2079.38	2080.95	0.008989	13.90	1691.96	681.00	1.07
Reach 1	0.79	PF 2	14413.00	2067.42	2073.74	2073.90	2075.53	0.010654	13.96	1737.37	901.57	1.15
Reach 1	0.76	PF 2	14413.00	2065.84	2071.97	2071.97	2073.62	0.006700	12.13	1639.60	885.21	0.94
Reach 1	0.71	PF 2	14413.00	2063.89	2071.02	2070.12	2071.96	0.002965	9.37	2351.77	664.94	0.64
Reach 1	0.66	PF 2	14413.00	2061.79	2069.70	2068.75	2071.10	0.003460	10.59	1815.94	534.05	0.70
Reach 1	0.61	PF 2	14459.00	2059.91	2066.89	2066.89	2069.77	0.006845	13.67	1097.00	200.63	0.97
Reach 1	0.57	PF 2	14459.00	2057.69	2063.82	2064.53	2067.60	0.011173	15.61	928.21	184.03	1.21
Reach 1	0.52	PF 2	14459.00	2055.50	2064.21	2062.80	2065.92	0.003361	10.59	1443.39	220.49	0.70
Reach 1	0.48	PF 2	15045.00	2053.51	2063.89	2060.38	2065.11	0.001696	8.84	1702.45	184.52	0.51
Reach 1	0.43	PF 2	15045.00	2051.27	2063.64	2058.29	2064.64	0.000956	7.99	1882.29	201.37	0.41
Reach 1	0.42	PF 2	Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2060.43	2056.95	2061.79	0.001723	9.37	1607.31	244.44	0.52
Reach 1	0.35	PF 2	15045.00	2047.68	2056.99	2056.99	2060.44	0.005575	15.27	1152.83	195.59	0.92
Reach 1	0.27	PF 2	15045.00	2044.00	2055.12	2053.96	2057.41	0.003445	12.96	1521.64	209.37	0.75
Reach 1	0.22	PF 2	15045.00	2043.00	2052.87	2052.87	2055.78	0.006807	13.97	1264.05	270.53	0.88
Reach 1	0.19	PF 2	15045.00	2040.69	2050.82	2047.60	2051.73	0.002022	8.26	2432.83	432.30	0.47
Reach 1	.33	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.12	PF 2	Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2046.27	2047.25	2050.55	0.007350	17.58	1133.13	214.56	1.22
Reach 1	0.08	PF 2	15045.00	2036.99	2044.19	2042.48	2044.79	0.002917	7.66	3307.91	818.58	0.55
Reach 1	.05	PF 2	15045.00	2038.00	2043.52	2042.39	2044.34	0.002757	9.09	3336.53	1079.12	0.72

MODEL II SOLS WASH WITH LEVEE IMPROVEMENTS WEST OF U.S. 93. PROPOSED 1 SPAN NOT BRIDGE INCLUDED

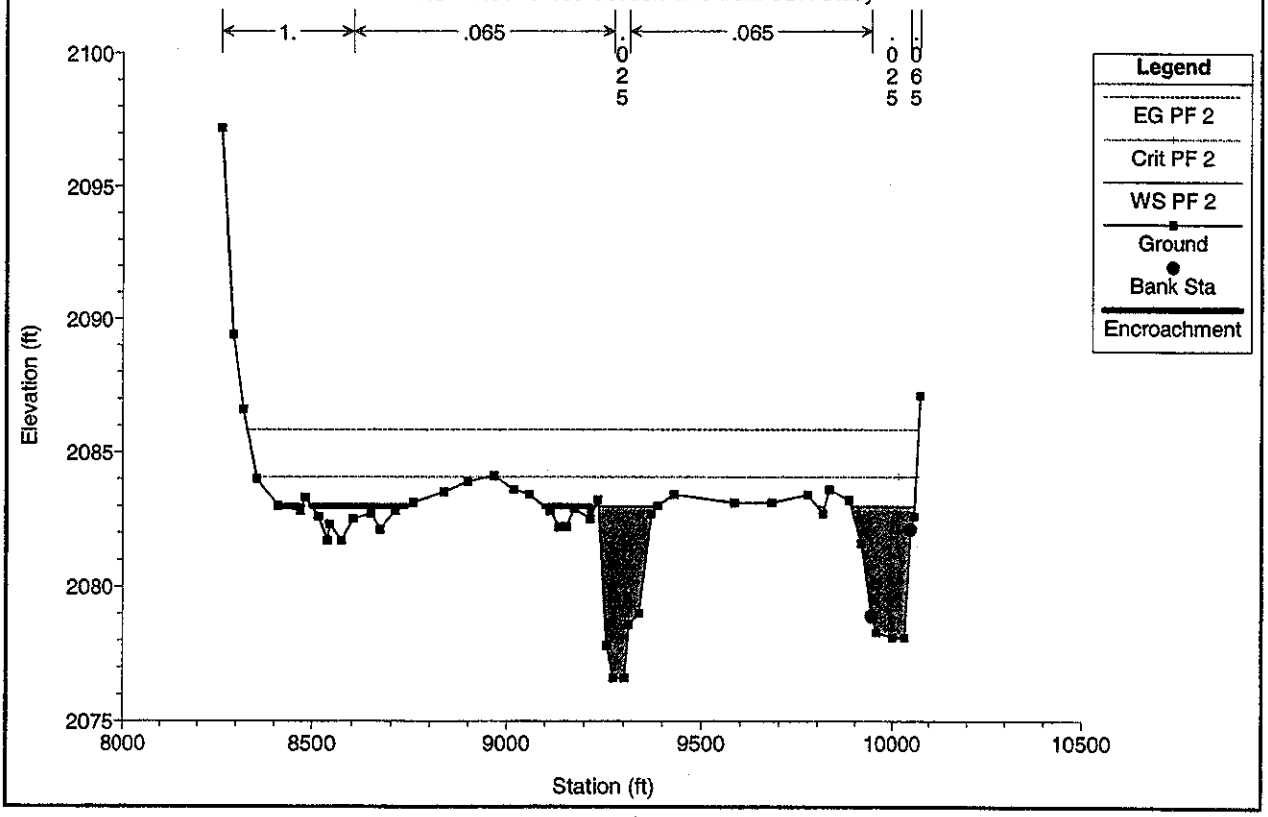
Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004

RS = 1.12 Cross Section 1.12 from CBA Study



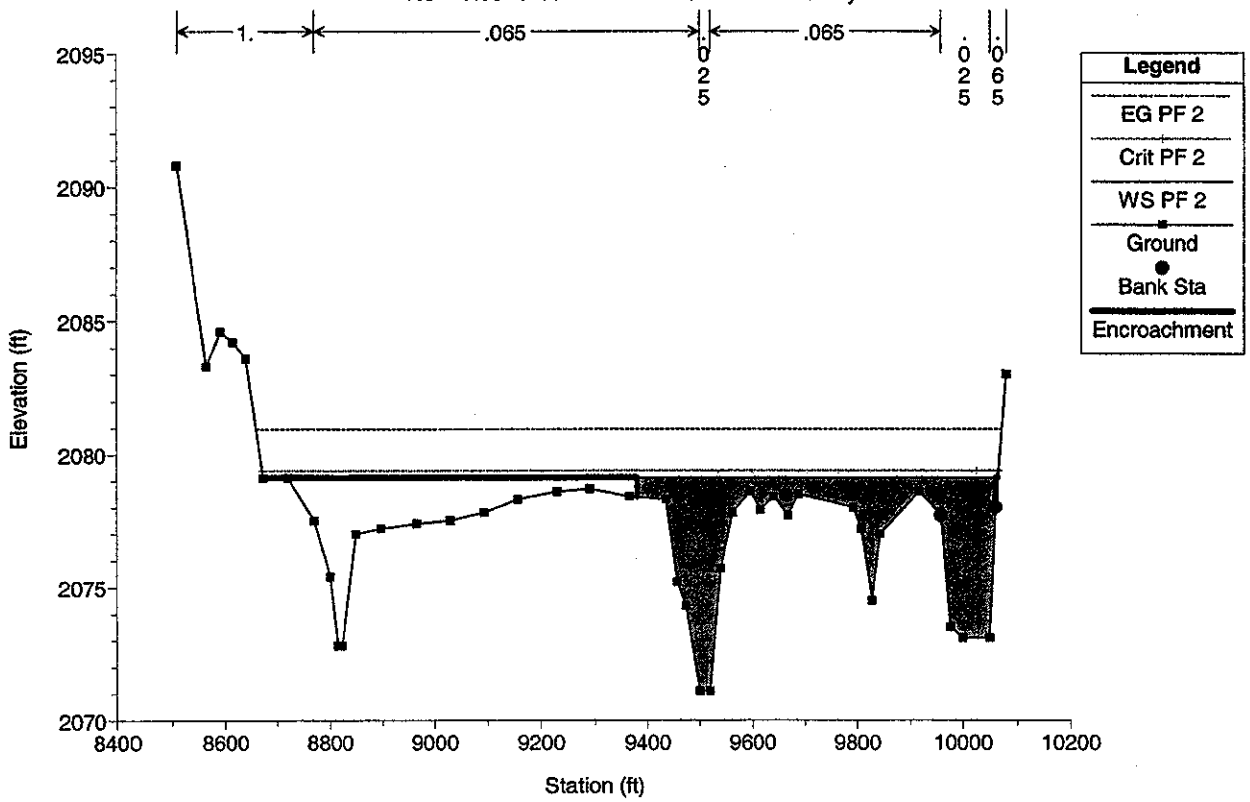
Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004

RS = 1.00 Cross Section 1.10 from CBA Study



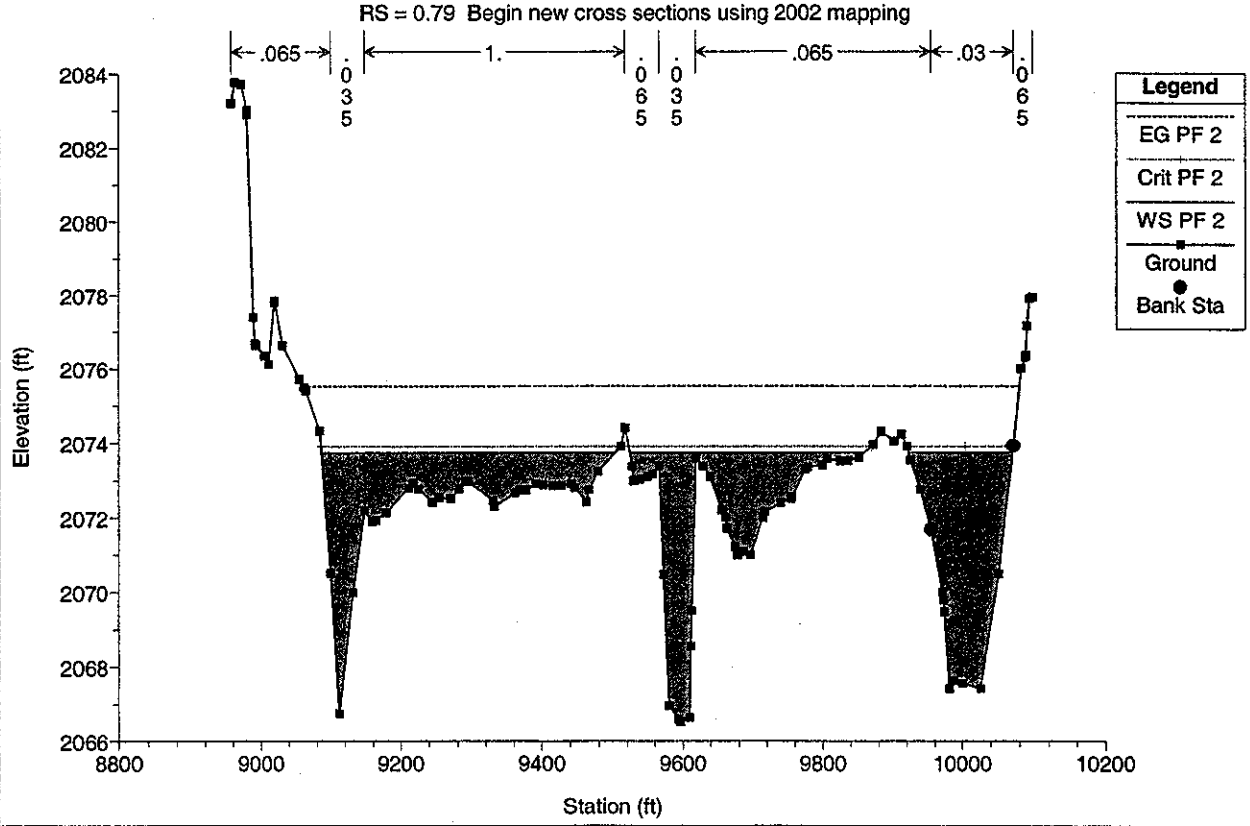
Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004

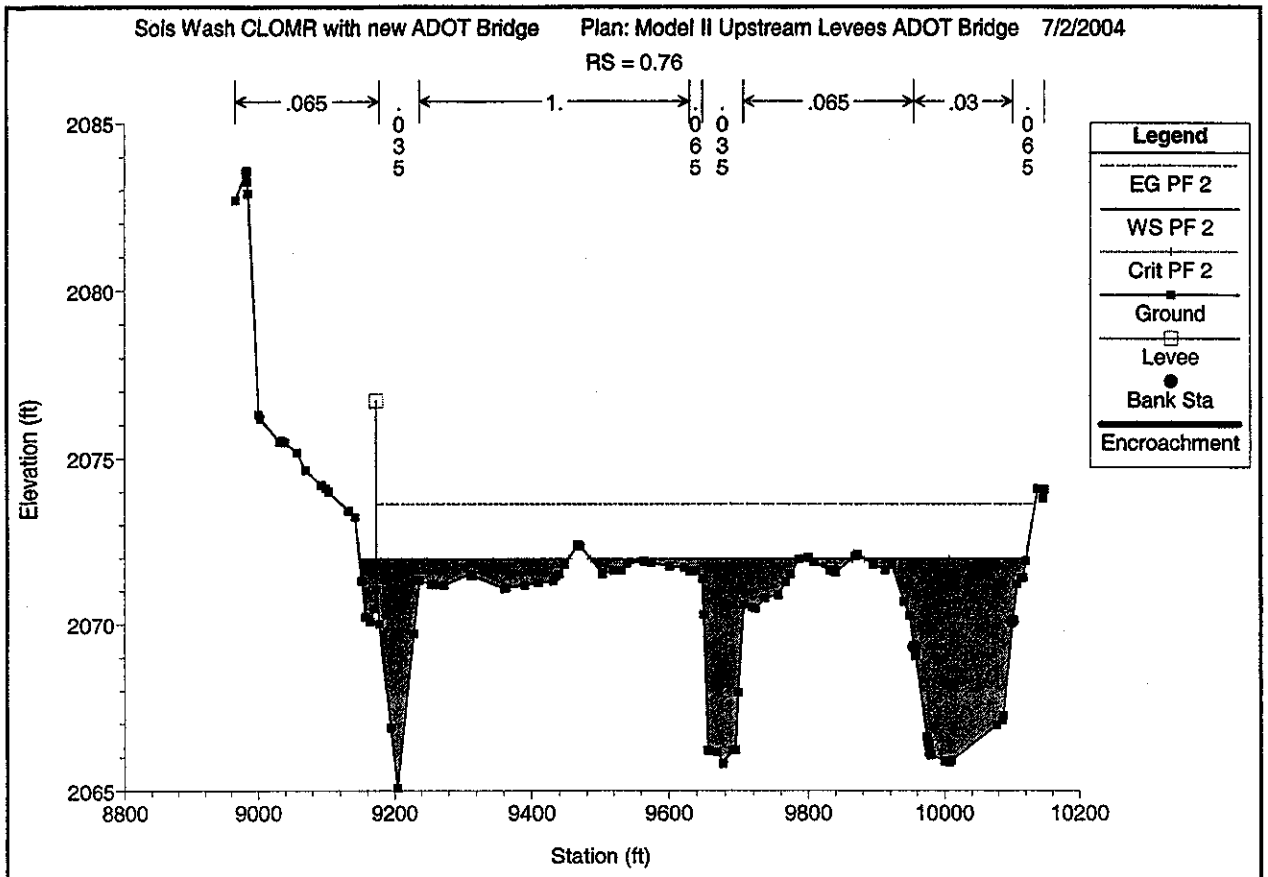
RS = 0.90 Cross Section 0.90 from CBA Study

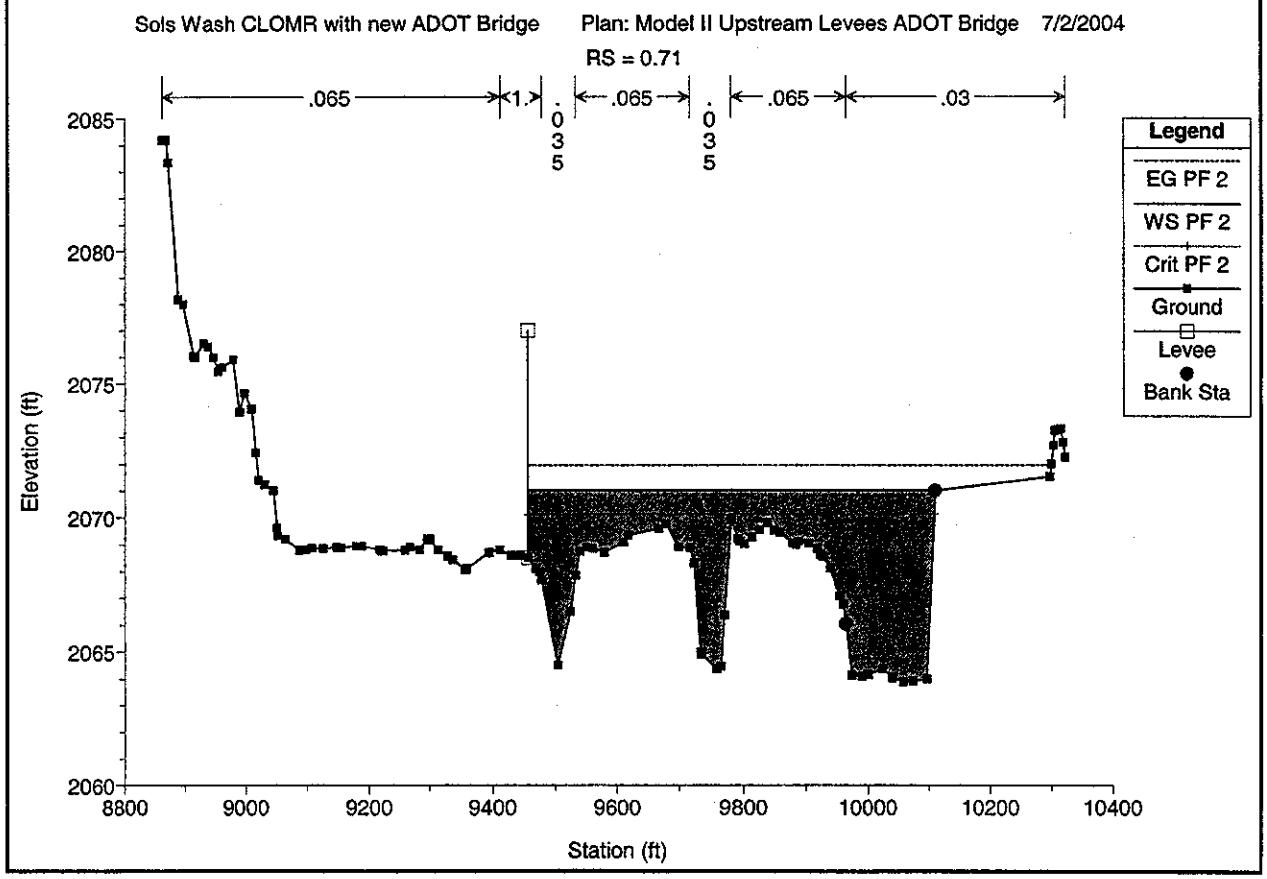


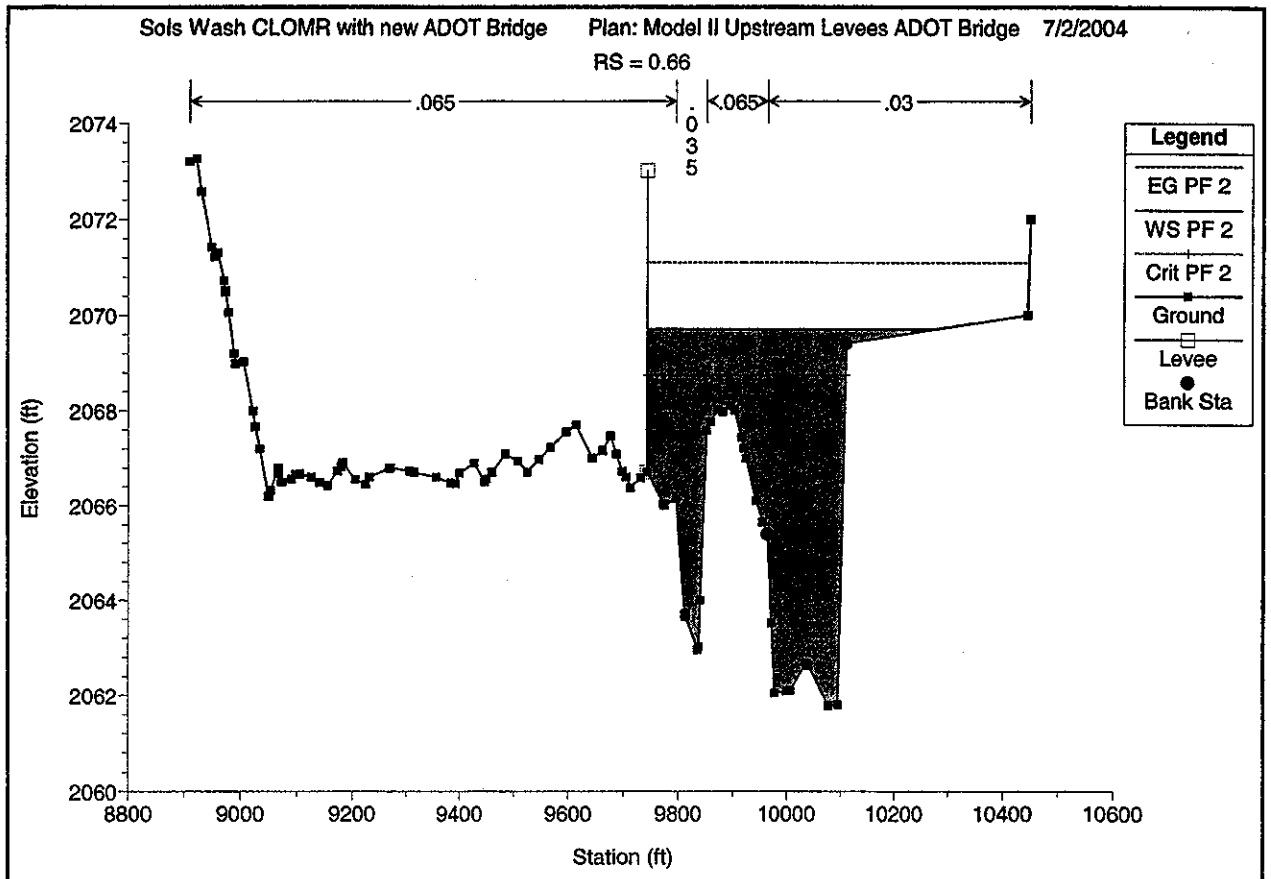
Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004

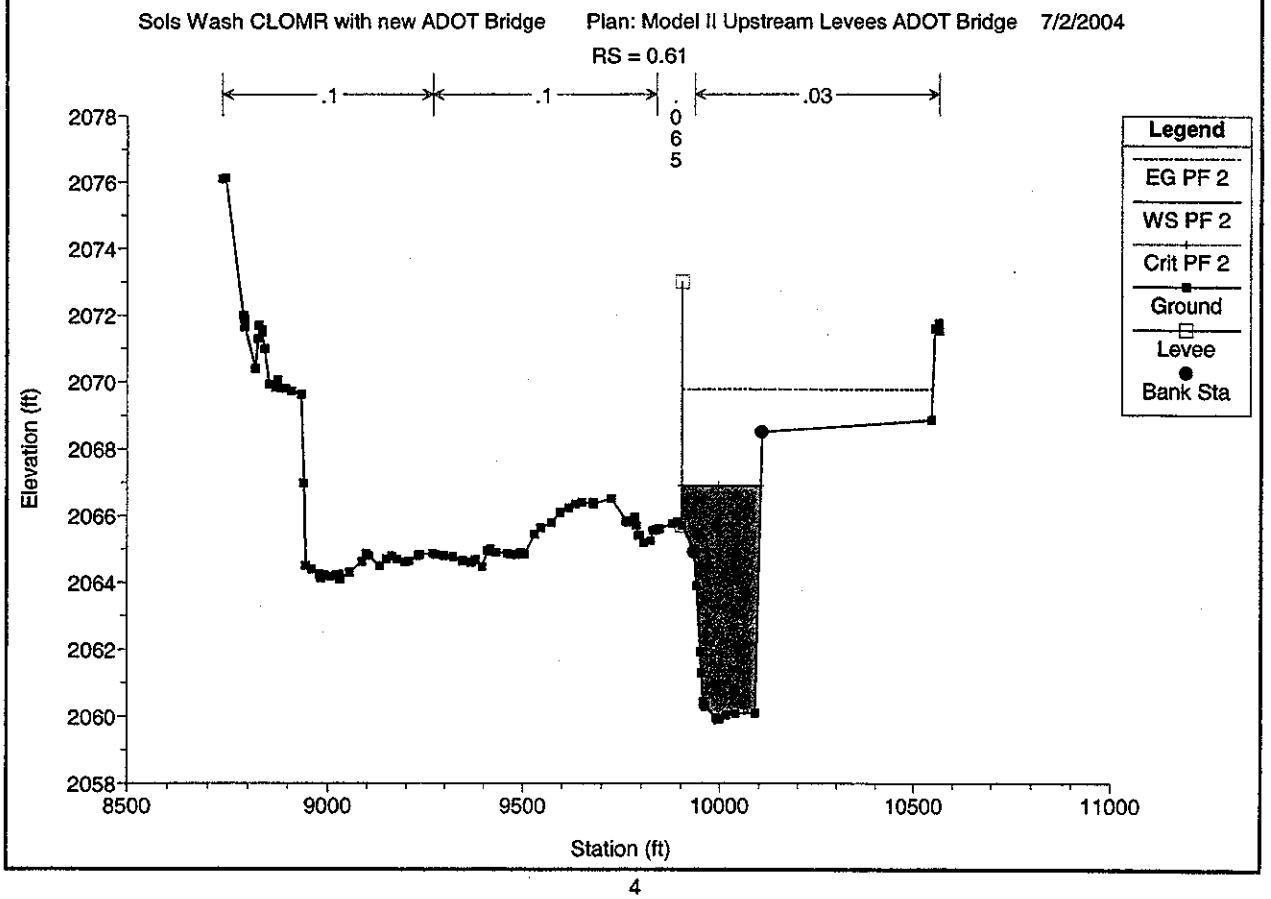
RS = 0.79 Begin new cross sections using 2002 mapping

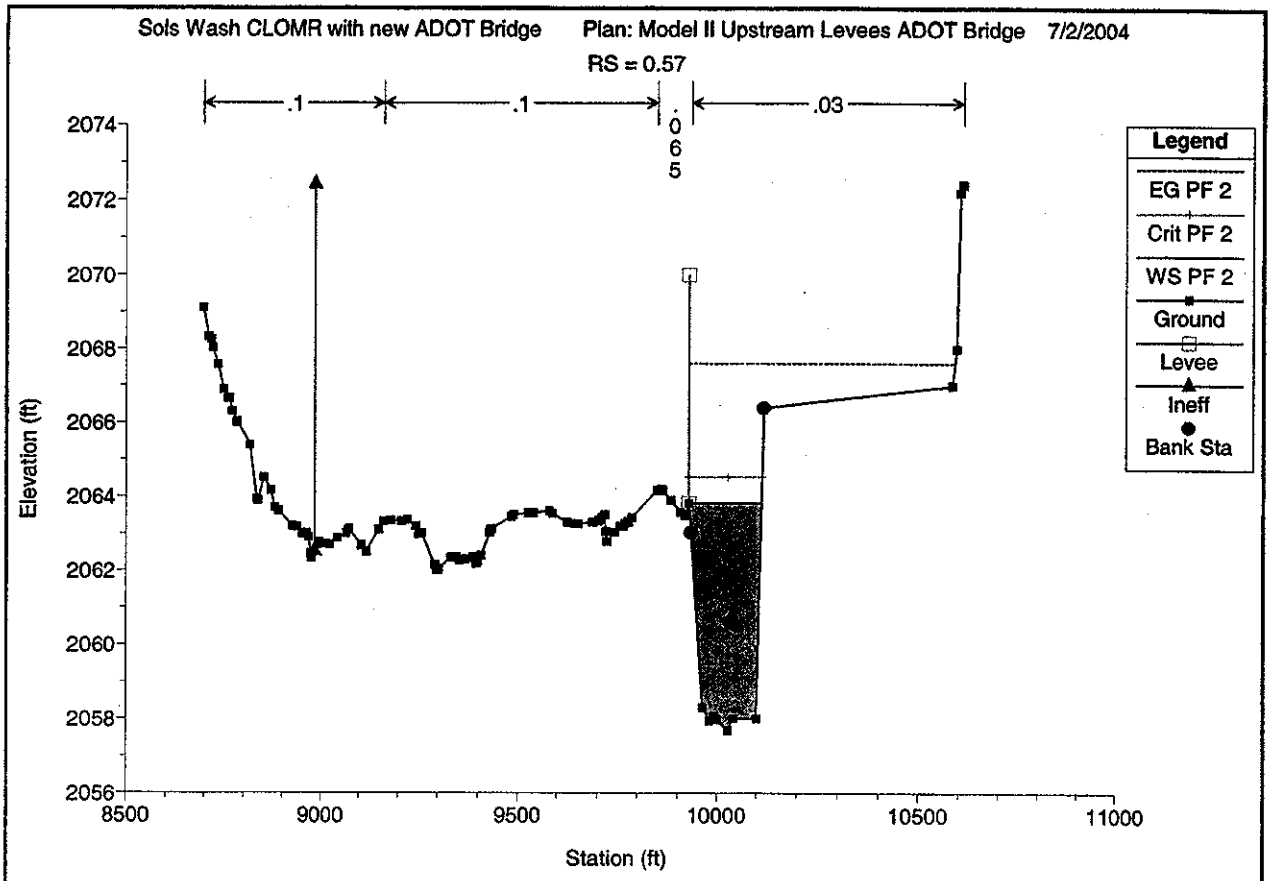


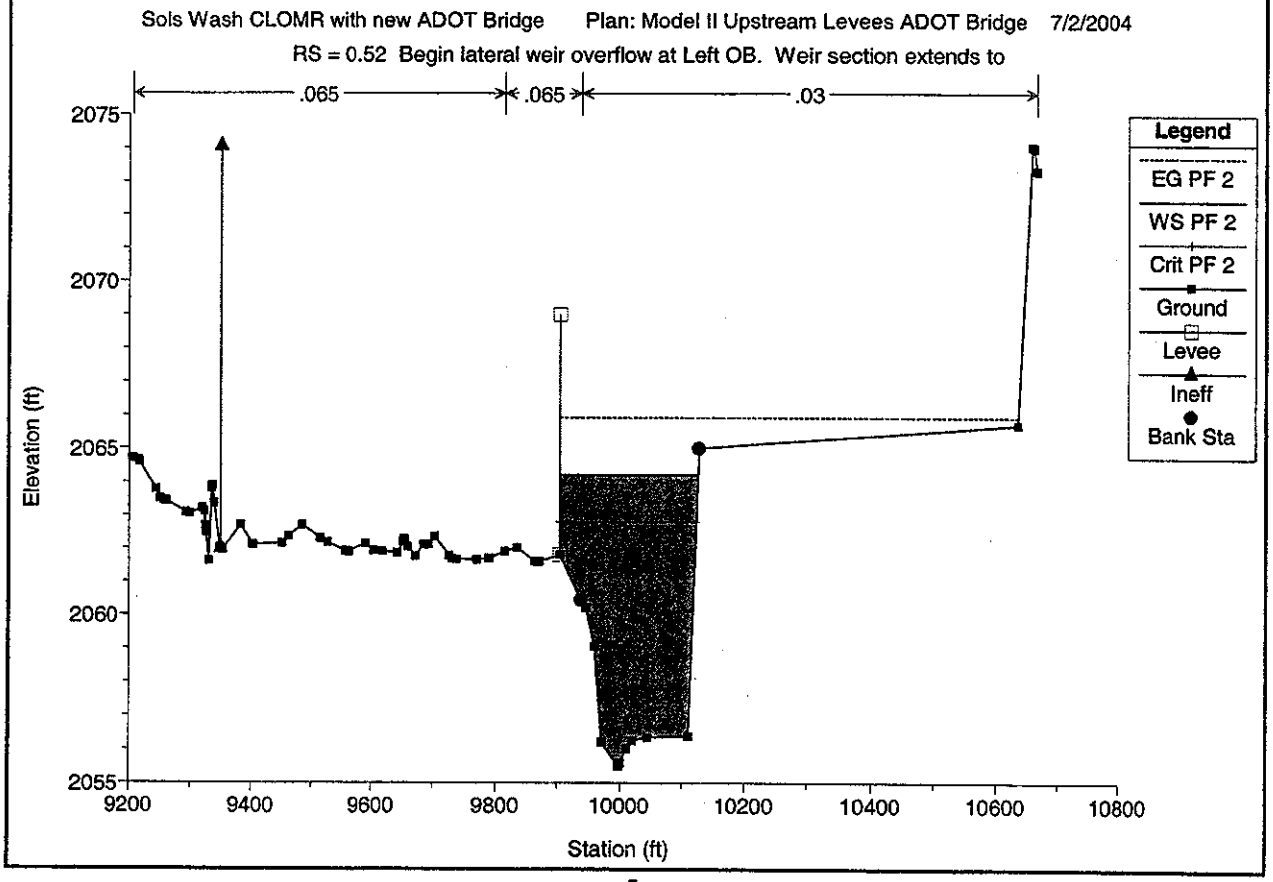

Sols Wash CLOMR with new ADOT Bridge
Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.76
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Encroachment
Elevation (ft)
2085
2080
2075
2070
2065
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

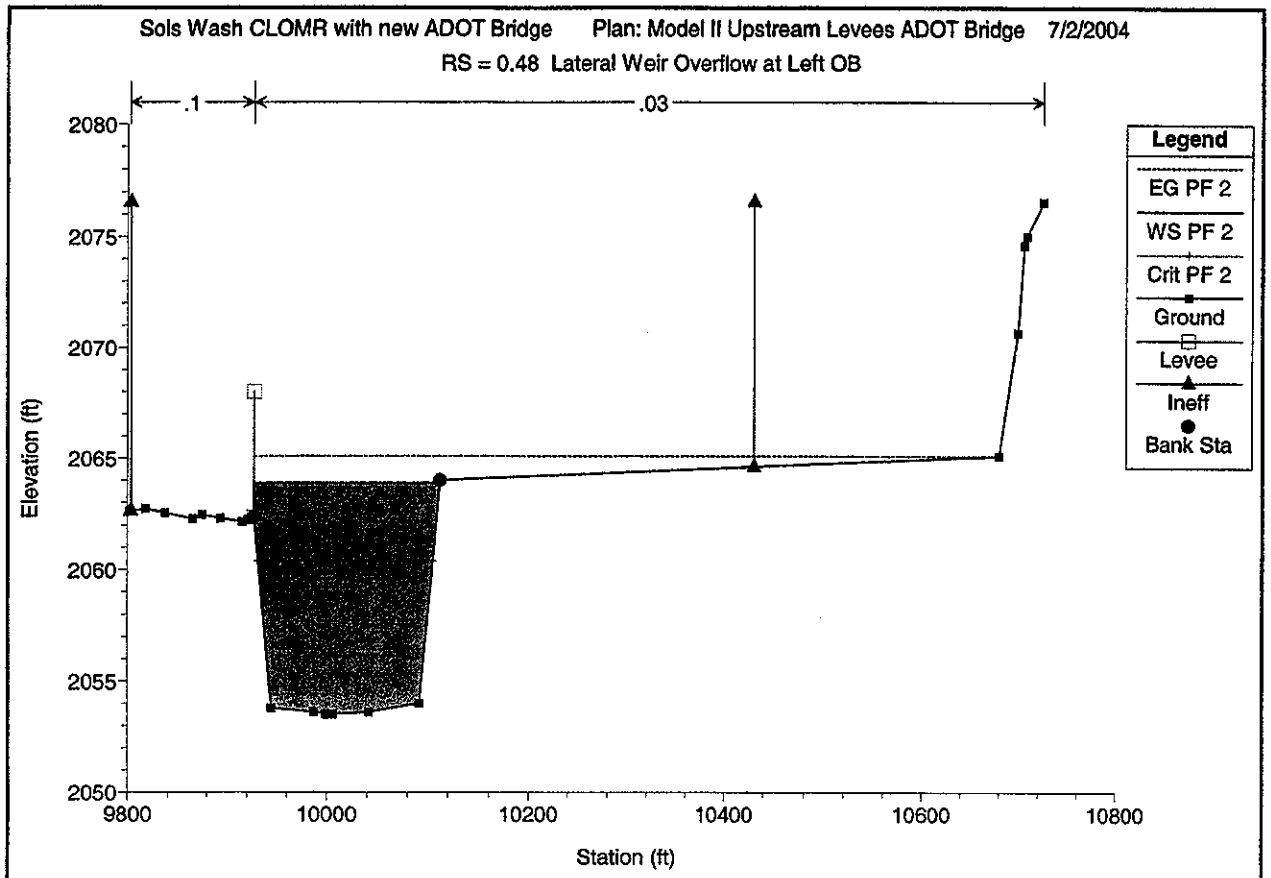

Sols Wash CLOMR with new ADOT Bridge
Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.71
.065
1.
.035
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

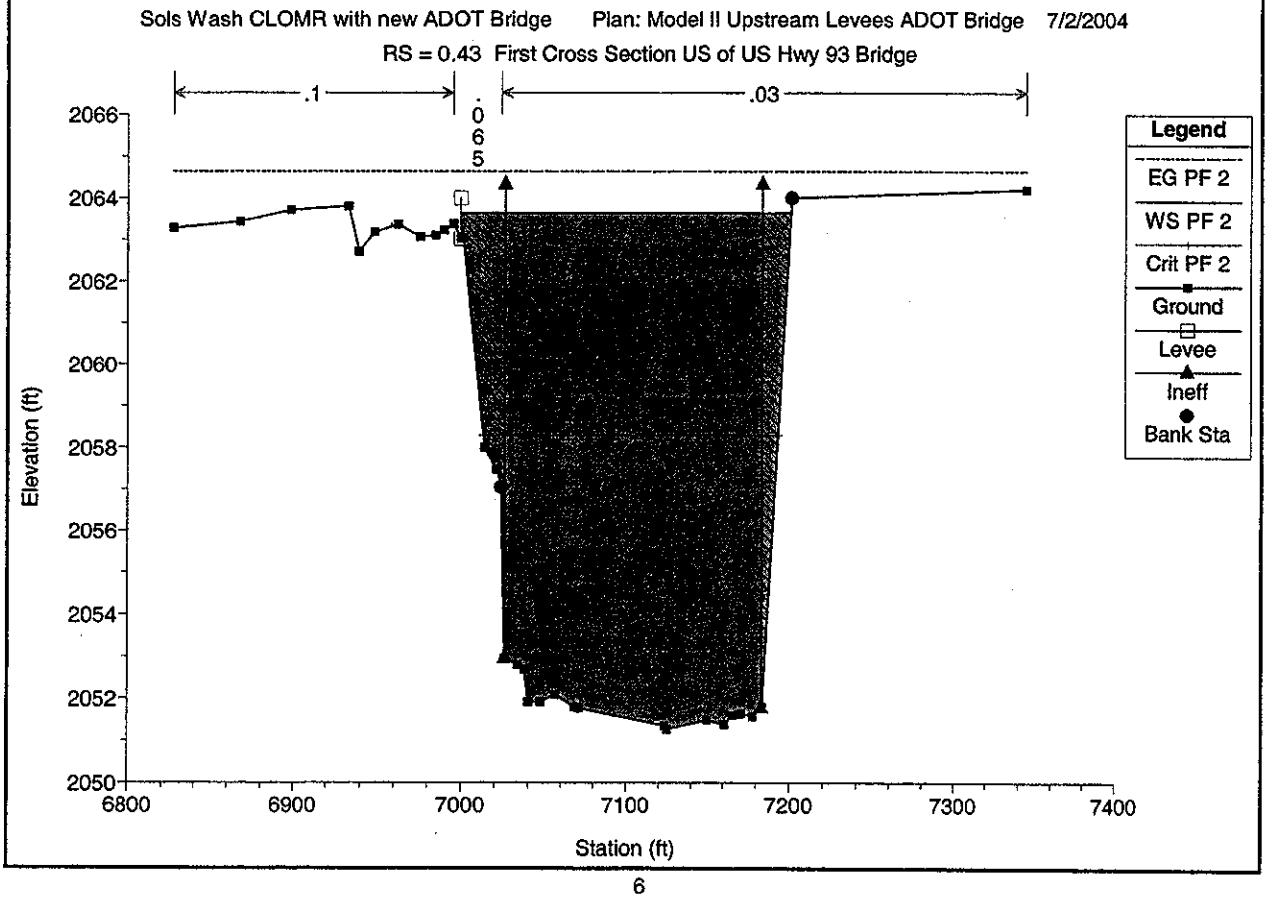

Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.66
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

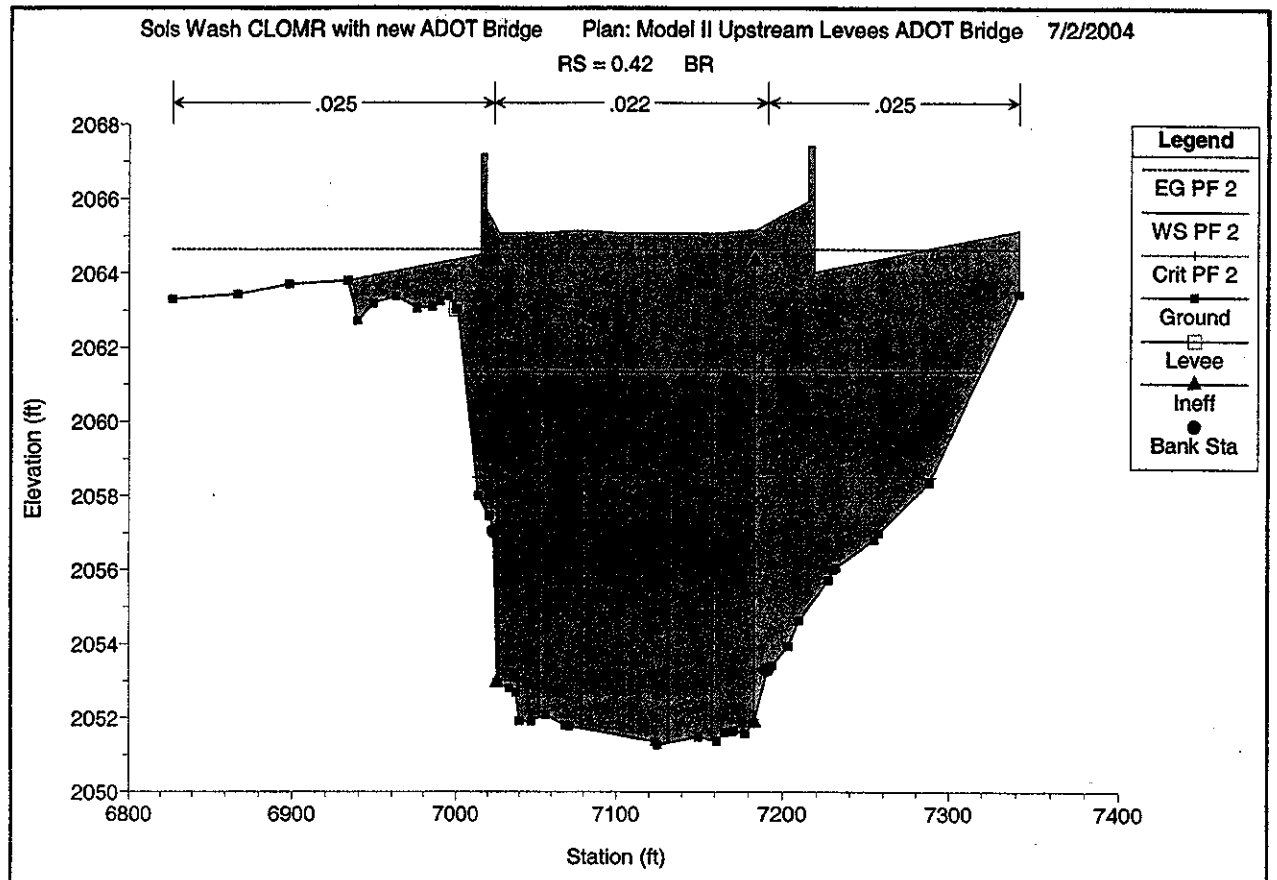

Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.61
.1
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

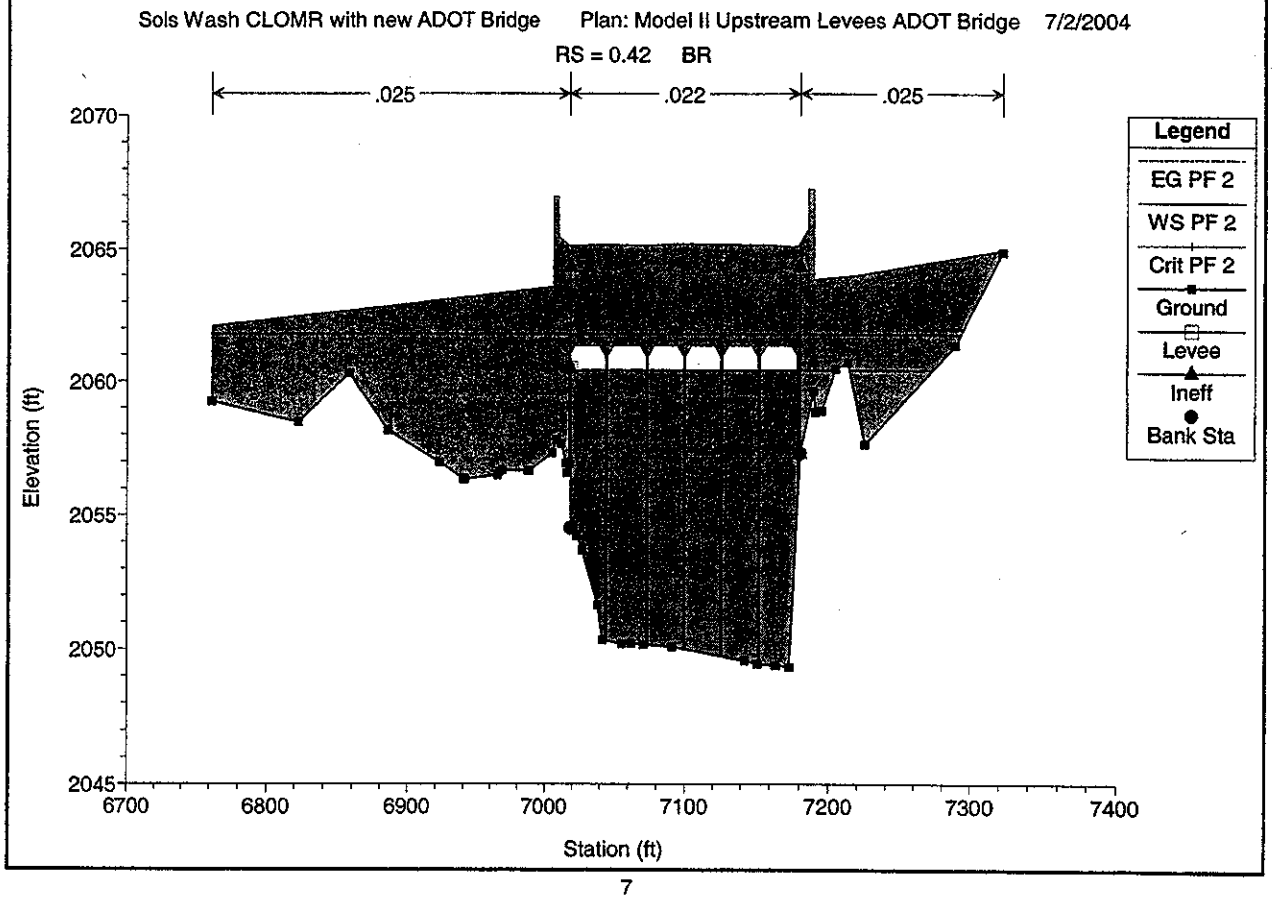

Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.57
.1
.1
.065
.03
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
2058
2056
8500
9000
9500
10000
10500
11000

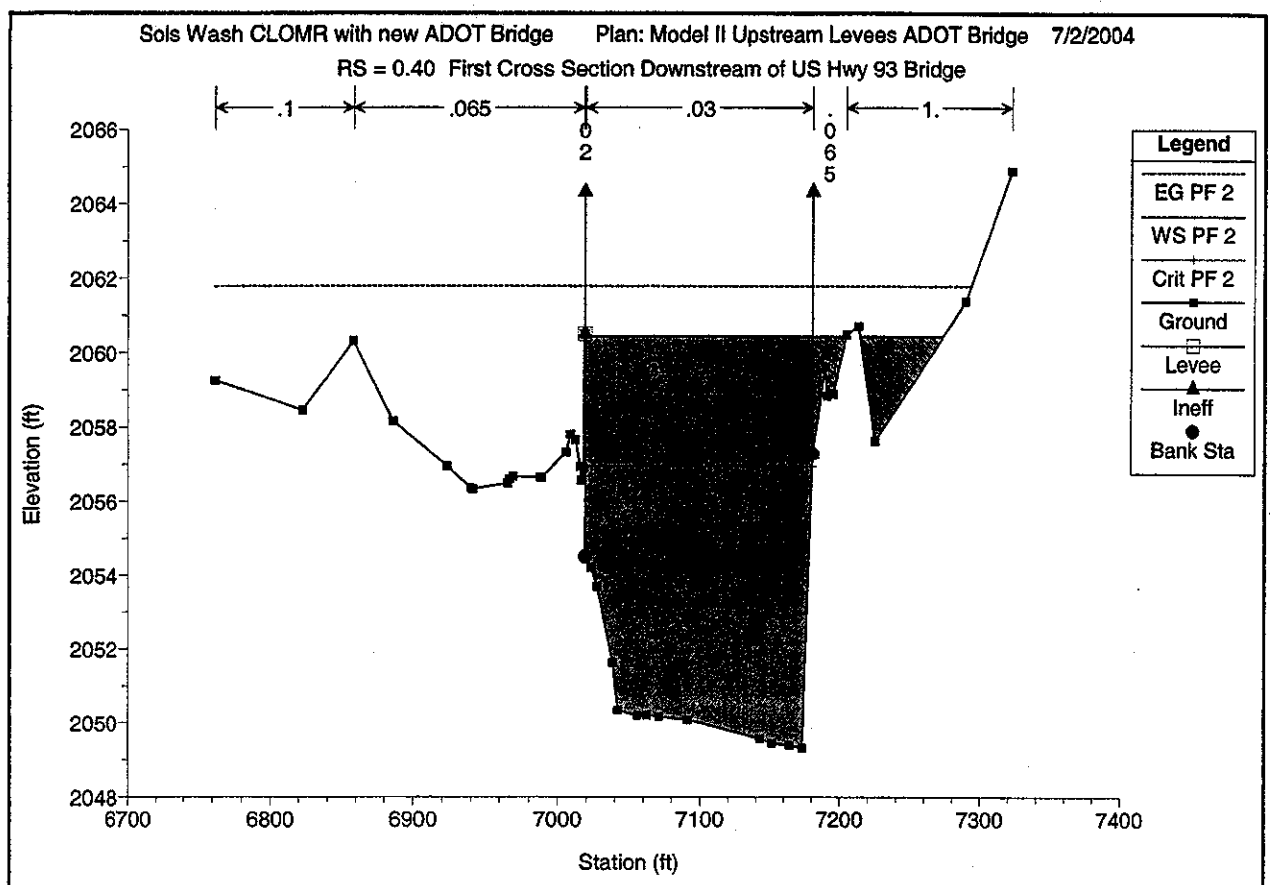

Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.52 Begin lateral weir overflow at Left OB. Weir section extends to
.065
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2075
2070
2065
2060
2055
9200
9400
9600
9800
10000
10200
10400
10600
10800

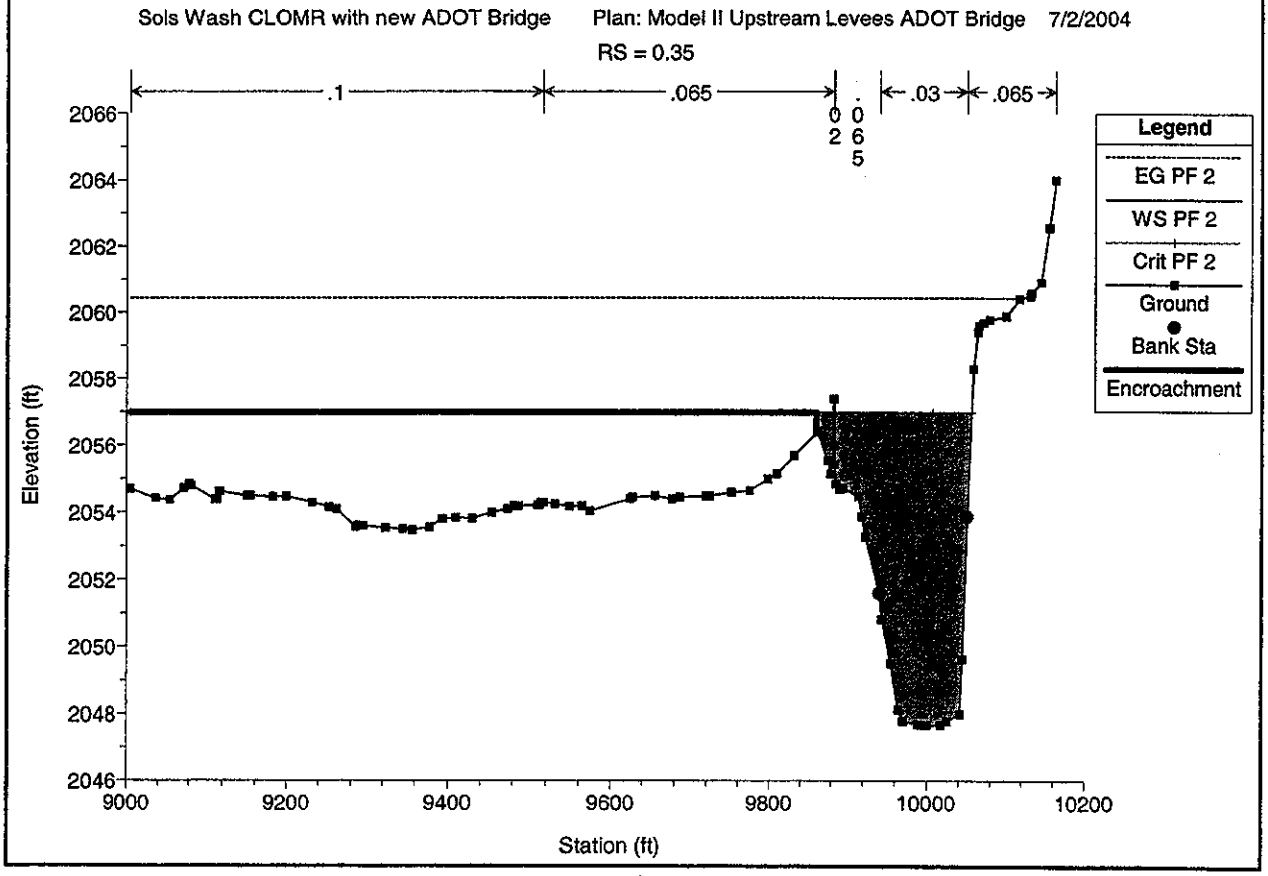

Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.48 Lateral Weir Overflow at Left OB
.1
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2080
2075
2070
2065
2060
2055
2050
9800
10000
10200
10400
10600
10800
Station (ft)

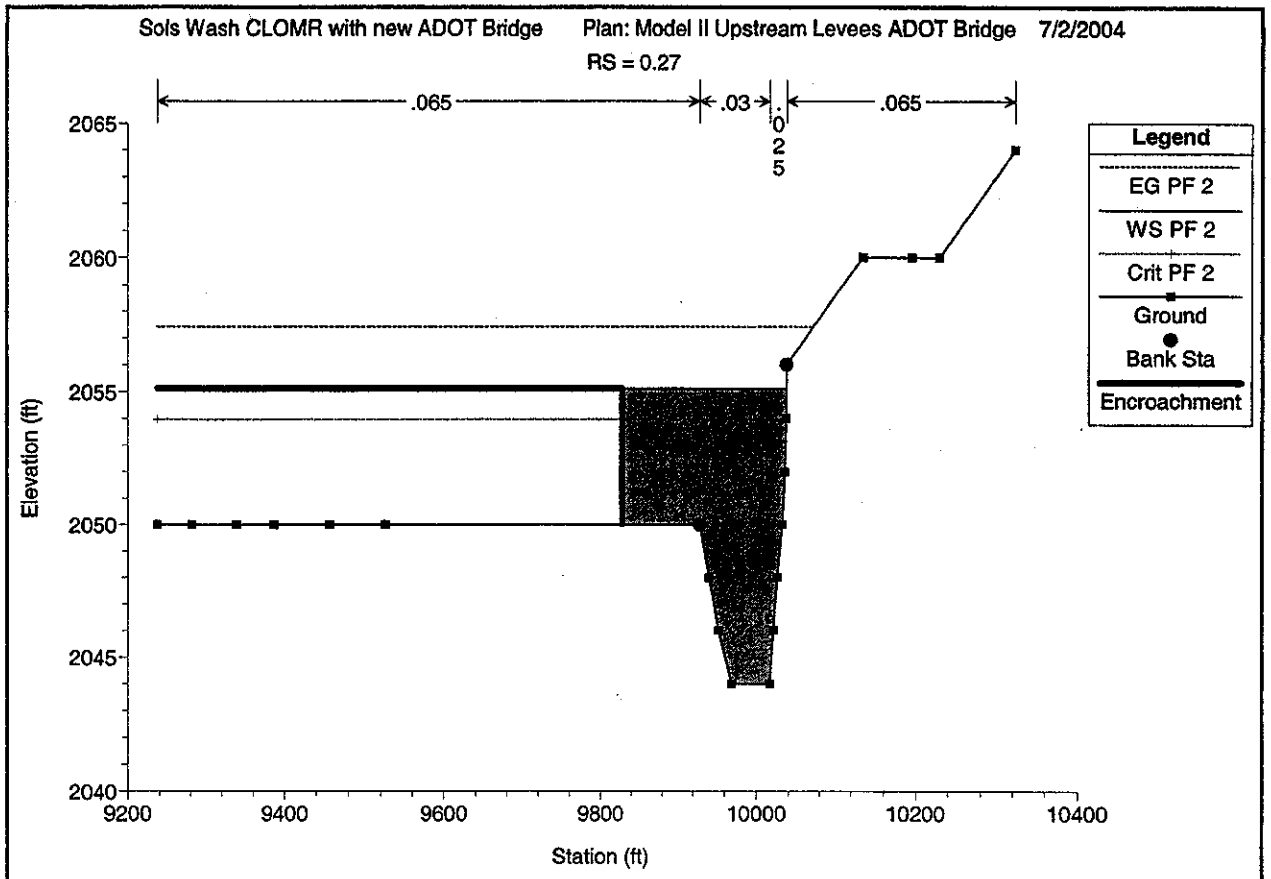

Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.43 First Cross Section US of US Hwy 93 Bridge
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

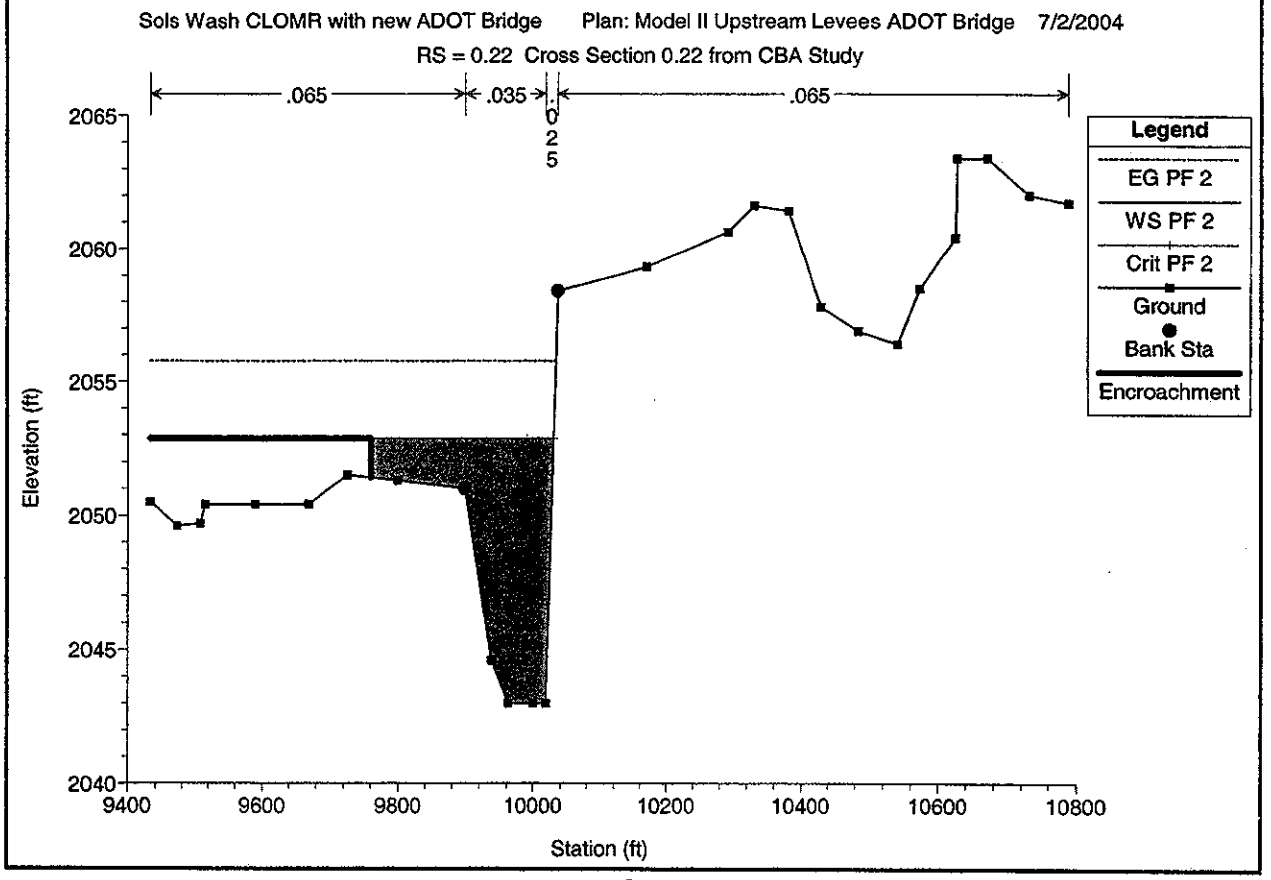

Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2068
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

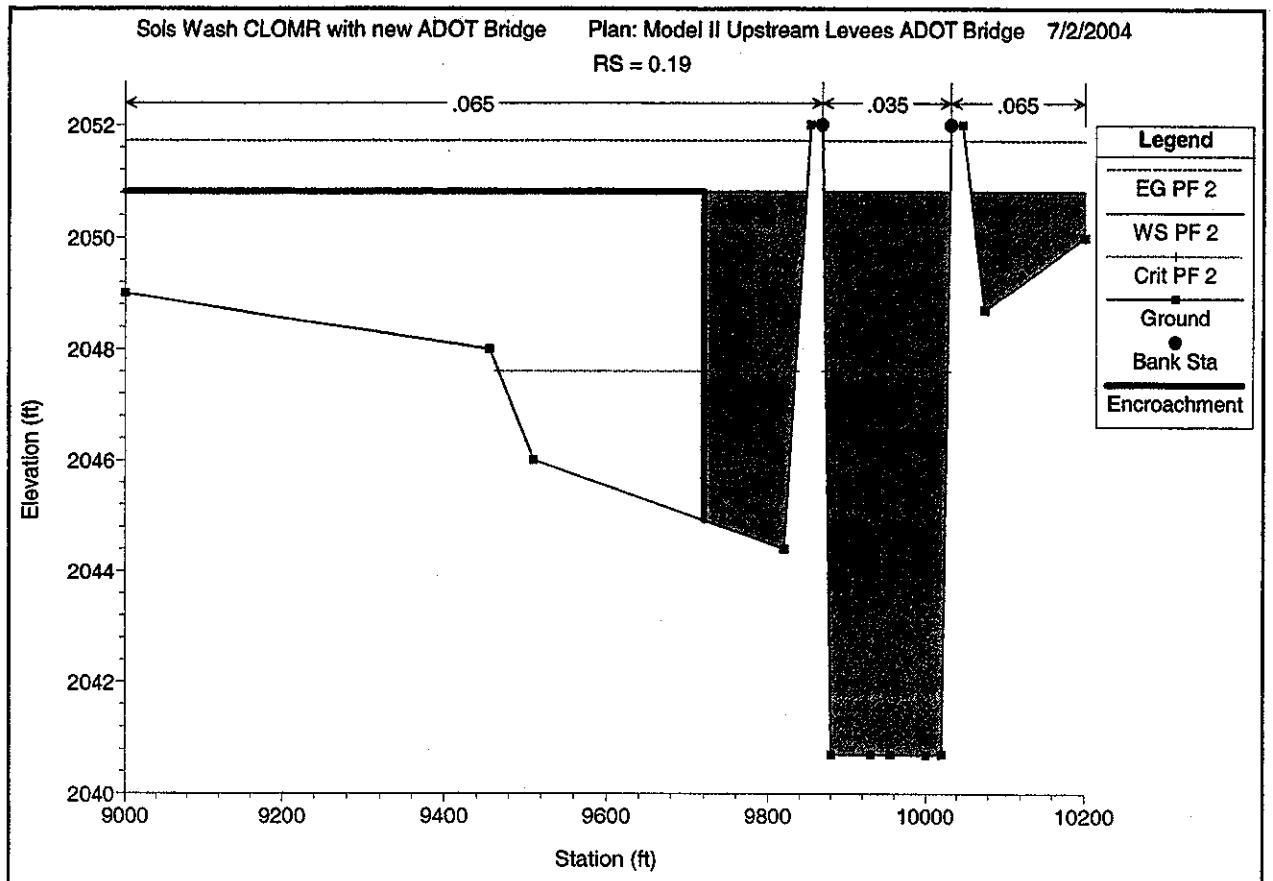

Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2070
2065
2060
2055
2050
2045
6700
6800
6900
7000
7100
7200
7300
7400
Station (ft)

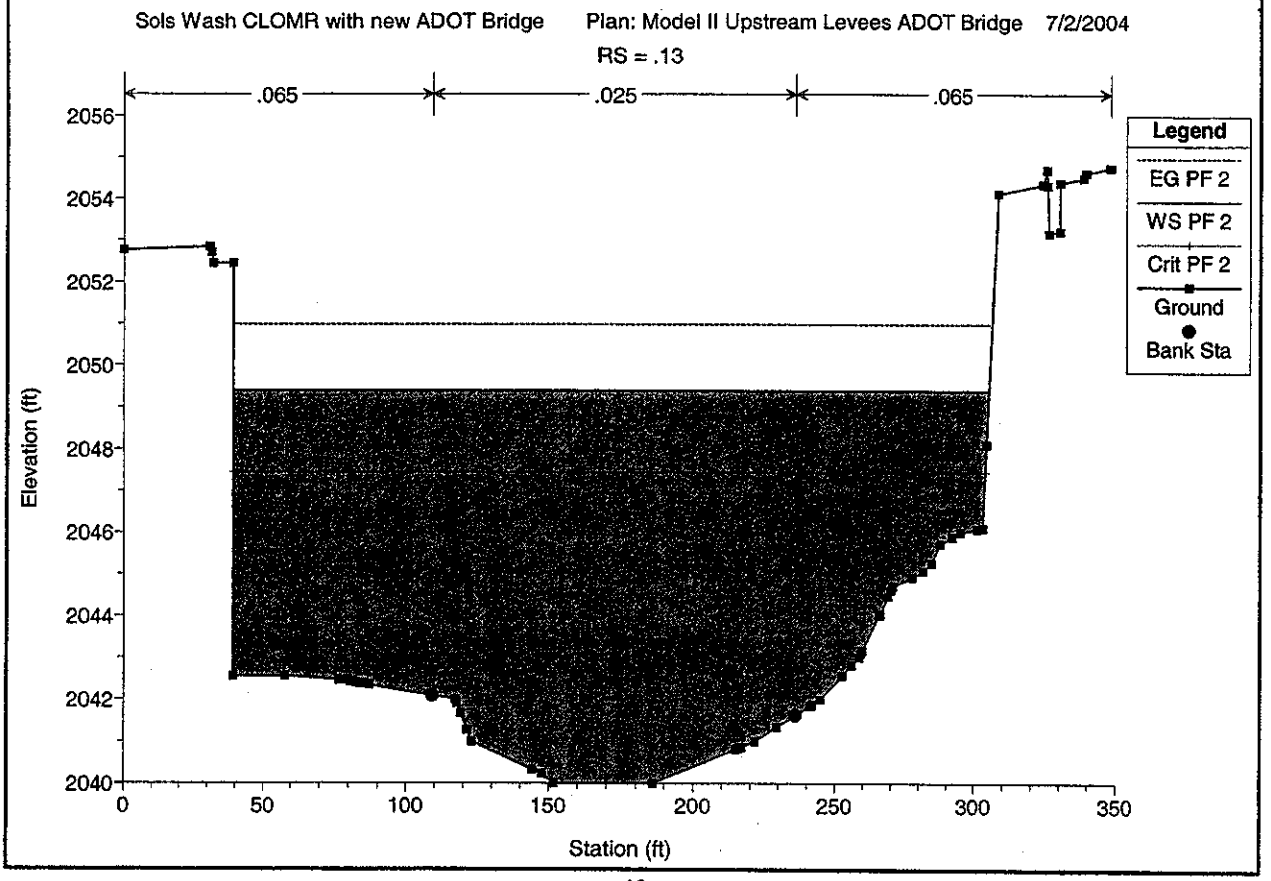

Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.40 First Cross Section Downstream of US Hwy 93 Bridge
.1
.065
.03
.065
1.
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

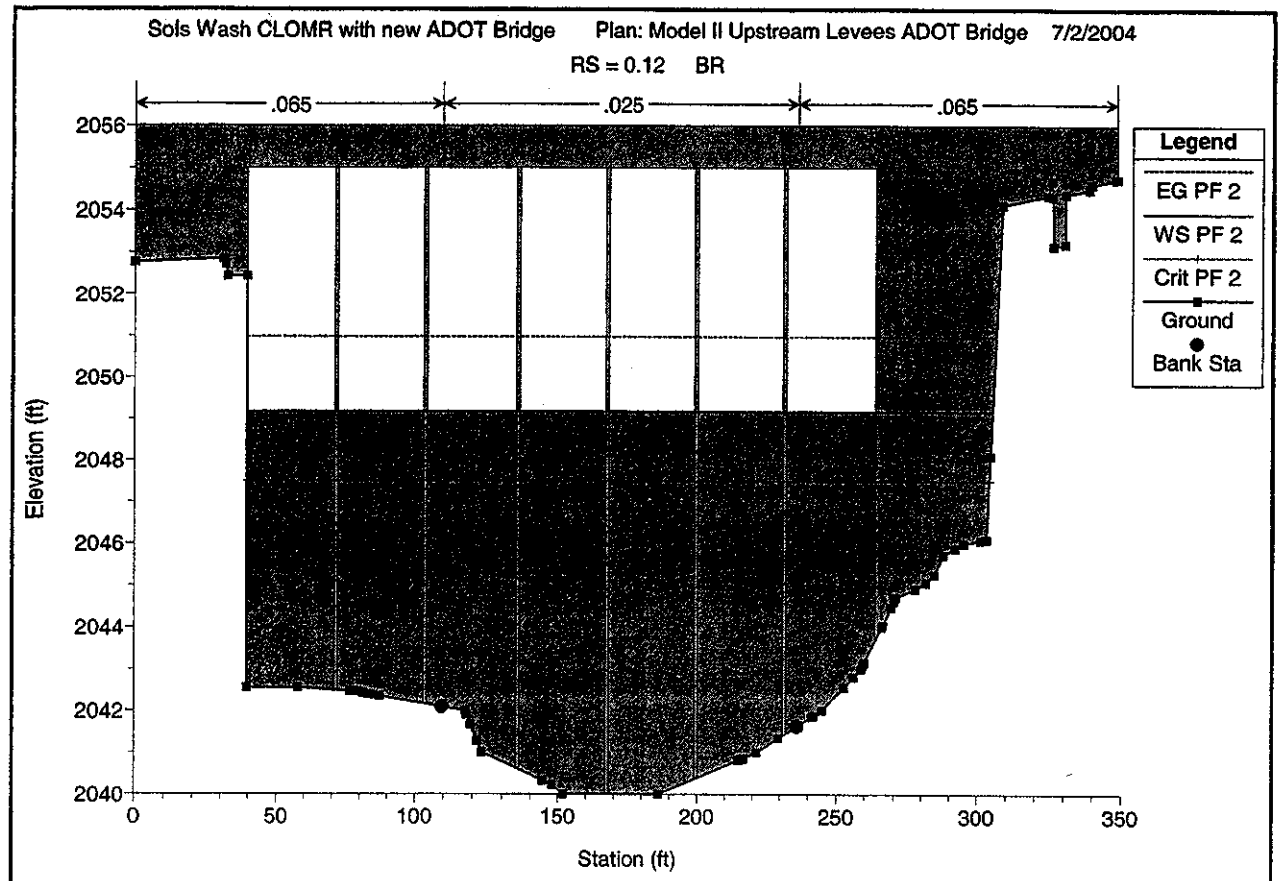

Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.35
.1
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

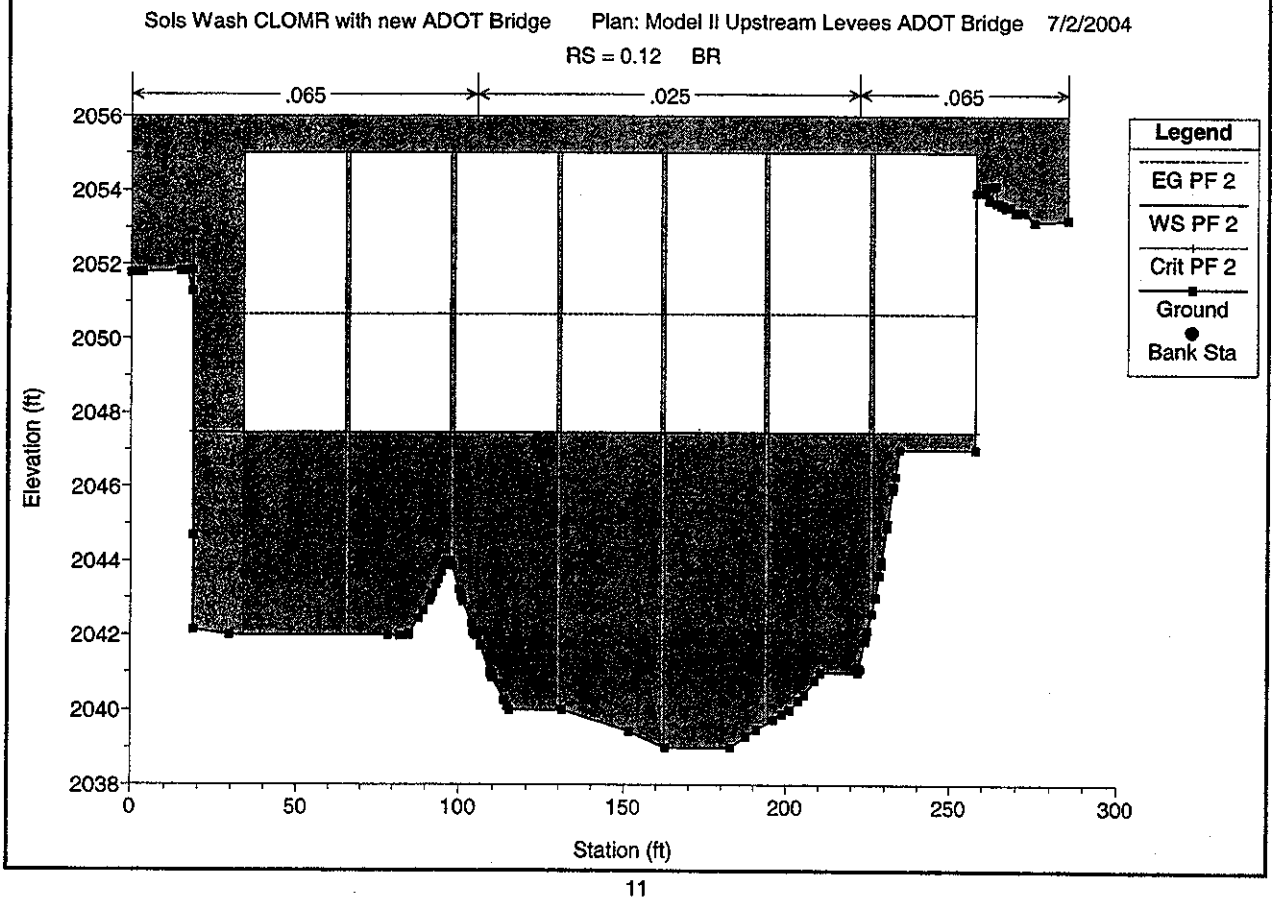

Sols Wash CLOMR with new ADOT Bridge
Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.27
.065
.03
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2065
2060
2055
2050
2045
2040
9200
9400
9600
9800
10000
10200
10400
Station (ft)

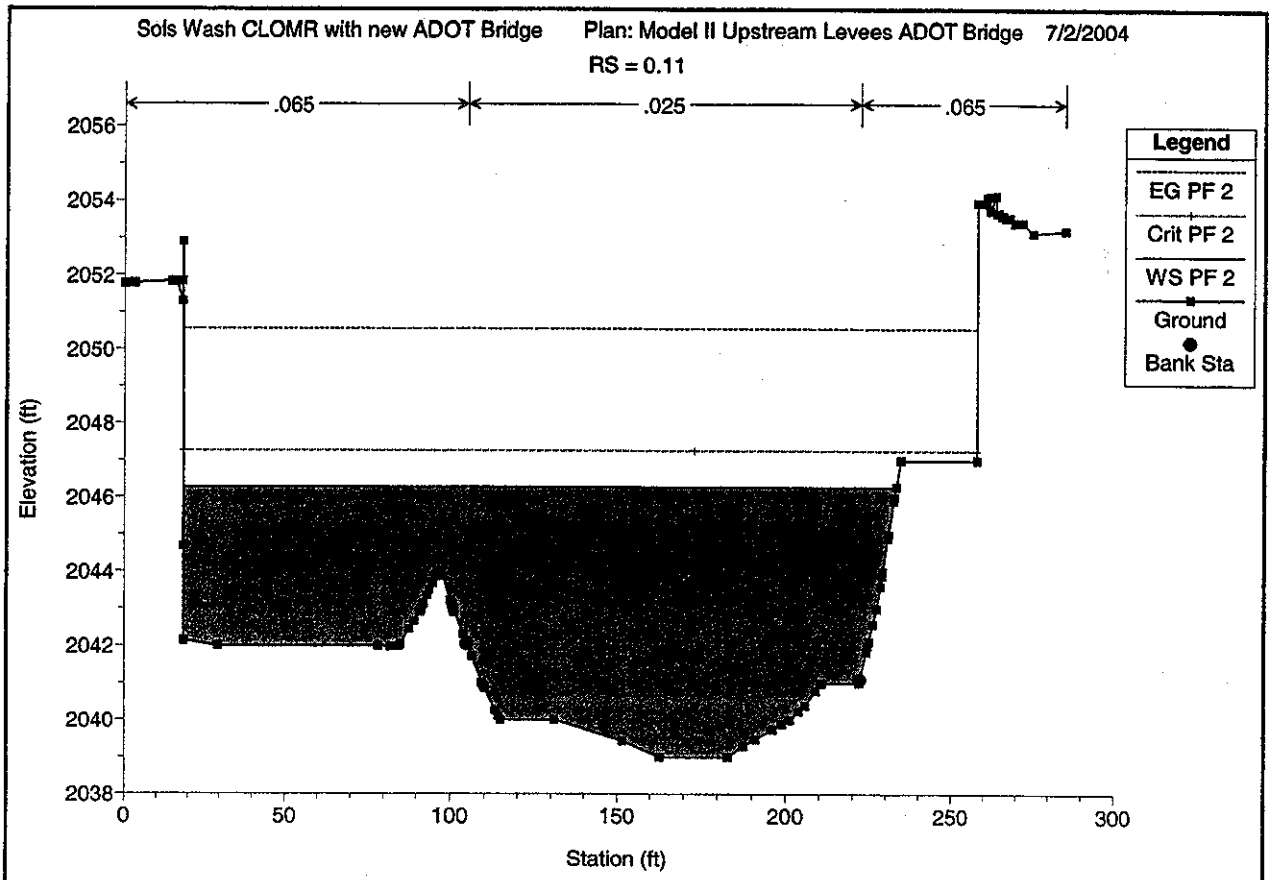

Sols Wash CLOMR with new ADOT Bridge
Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.22 Cross Section 0.22 from CBA Study
.065
.035
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2065
2060
2055
2050
2045
2040
9400
9600
9800
10000
10200
10400
10600
10800
Station (ft)

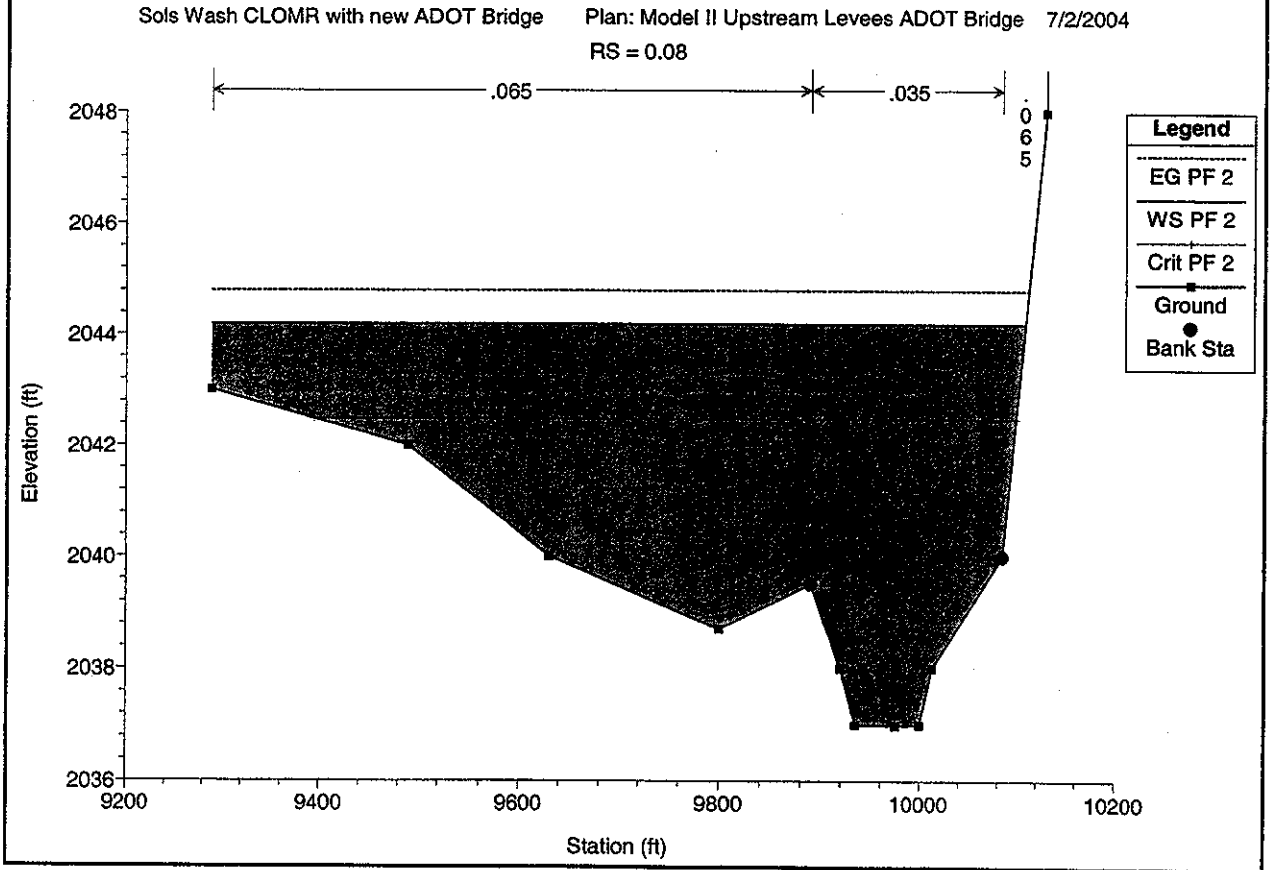

Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.19
.065
.035
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2052
2050
2048
2046
2044
2042
2040
9000
9200
9400
9600
9800
10000
10200
Station (ft)

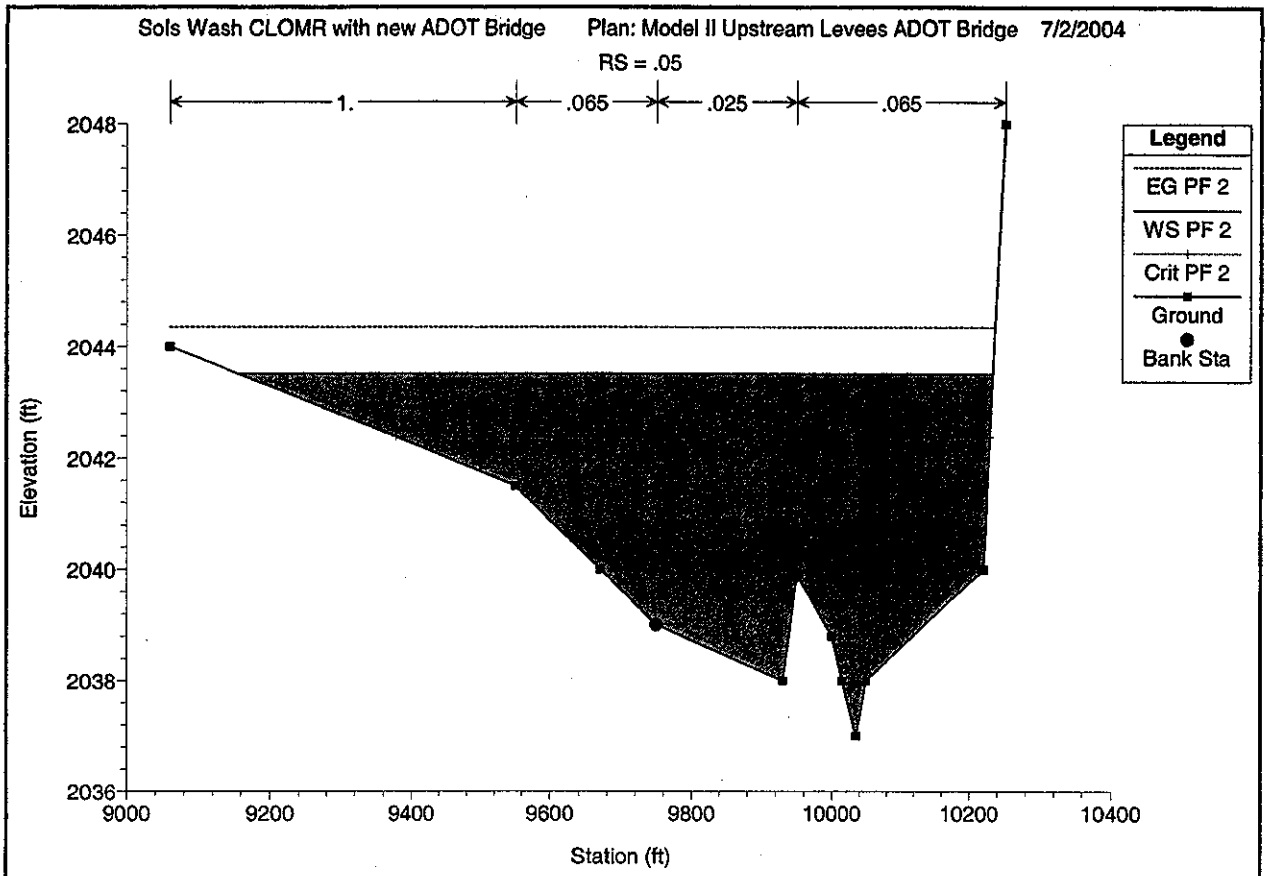

Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = .13
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
0
50
100
150
200
250
300
350
Station (ft)

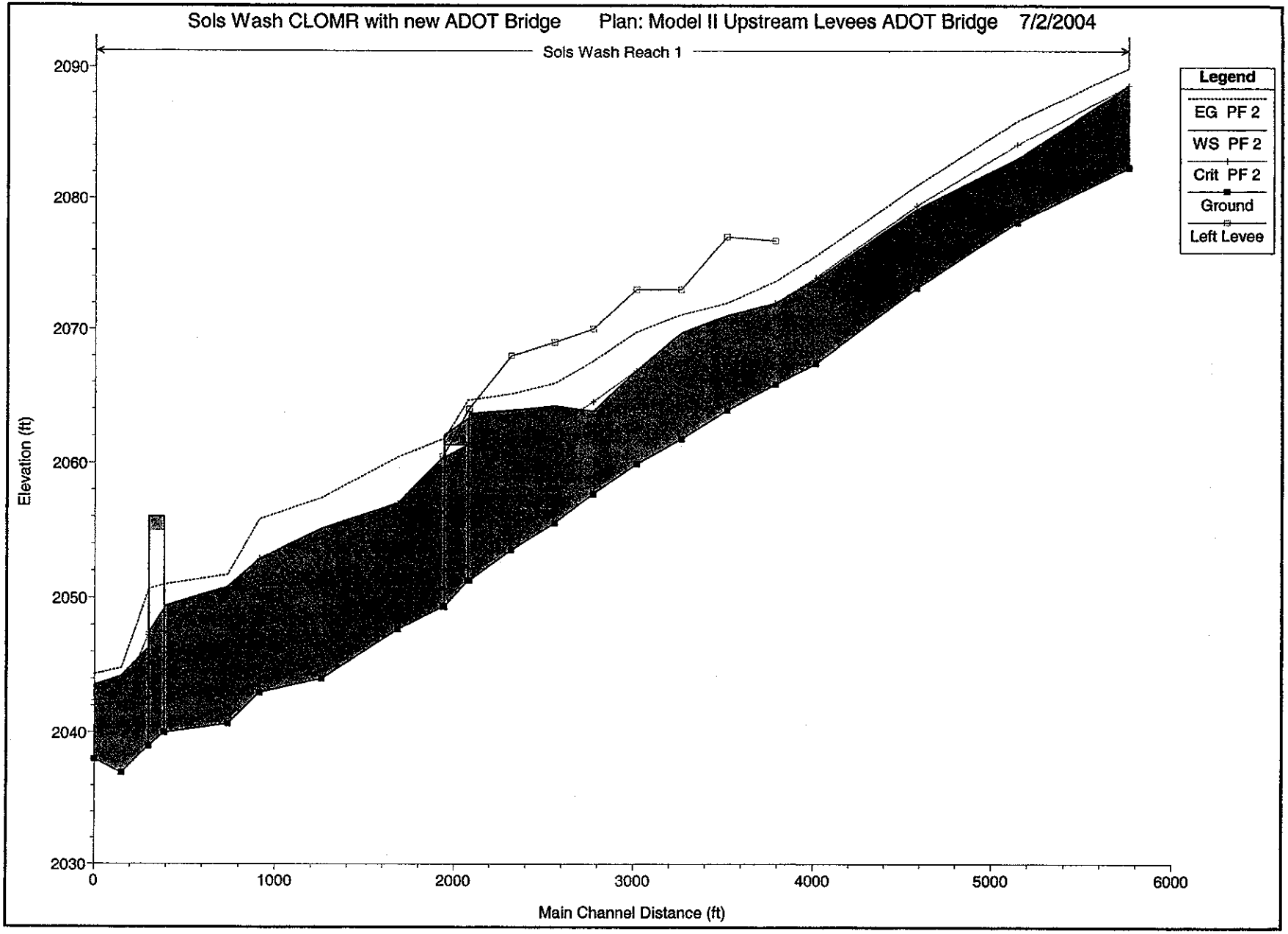

Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
0
50
100
150
200
250
300
350
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
2038
0
50
100
150
200
250
300
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.11
.065
.025
.065
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
2038
0
50
100
150
200
250
300
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = 0.08
.065
.035
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9200
9400
9600
9800
10000
10200
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
RS = .05
1.
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Model II Upstream Levees ADOT Bridge 7/2/2004
Sols Wash Reach 1
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Left Levee
Elevation (ft)
2090
2080
2070
2060
2050
2040
2030
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)

ATTACHMENT D:
REVISED MODEL III – HOSPITAL WASH
BASELINE CONDITIONS

Model III - Hospital Wash - Baseline Conditions

Model III represents the existing conditions in Hospital Wash utilizing 3-D contours from aerial mapping provided to AZTEC. Cross sections were then cut along the wash and utilized in the model. The sections in this model have been modified since the submission on March 23, 2004 to an orientation more normal to the flow resulting in a more defined channel. A 100 year flow of 900 cfs was used for the Hospital Wash model and a beginning water surface elevation of 2066.54 was used. This elevation corresponds to a 10 year Q of 6,758 cfs in Sols Wash. Due to peaking differences during storm events for Hospital and Sols Wash, the 100 year Q in Sols Wash was not used. The attached information has been provided to detail the baseline conditions in Hospital Wash.

SUBCR

HEC-RAS Plan: AZ03152 River: Reach #1 Reach: Hospital Wash in Profile: Q=100 year

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Hospital Wash in	18	Q=100 year	900.00	2072.00	2080.85		2081.47	0.003624	6.31	142.65	32.24	0.53
Hospital Wash in	17	Q=100 year	900.00	2072.00	2081.21		2081.24	0.000181	1.57	573.47	124.59	0.13
Hospital Wash in	16	Q=100 year	900.00	2076.00	2079.93	2079.93	2081.06	0.009541	9.17	131.11	73.90	0.88
Hospital Wash in	15	Q=100 year	900.00	2074.00	2077.56	2077.56	2078.92	0.011608	9.48	102.66	43.40	0.96
Hospital Wash in	14	Q=100 year	900.00	2072.00	2076.37		2076.88	0.005008	5.74	157.70	63.46	0.62
Hospital Wash in	13	Q=100 year	900.00	2072.00	2076.31		2076.53	0.001513	4.03	295.57	129.72	0.36
Hospital Wash in	12	Q=100 year	900.00	2072.00	2076.09		2076.29	0.001240	3.55	275.02	95.39	0.33
Hospital Wash in	11	Q=100 year	900.00	2072.00	2075.13	2075.13	2075.79	0.007799	7.06	199.25	203.16	0.77
Hospital Wash in	10	Q=100 year	900.00	2072.00	2074.28	2073.26	2074.39	0.002419	2.63	342.39	199.11	0.35
Hospital Wash in	9	Q=100 year	900.00	2072.00	2073.44	2073.44	2073.93	0.017185	5.66	158.98	154.69	0.98
Hospital Wash in	8	Q=100 year	900.00	2067.62	2071.98		2072.50	0.005597	5.78	155.67	62.44	0.65
Hospital Wash in	7	Q=100 year	900.00	2066.97	2071.70		2072.04	0.002607	4.65	193.61	73.52	0.50
Hospital Wash in	6	Q=100 year	900.00	2066.17	2070.13	2070.00	2071.31	0.011736	8.76	107.37	69.82	0.95
Hospital Wash in	5	Q=100 year	900.00	2065.53	2069.57		2070.02	0.004656	5.69	218.43	157.45	0.64
Hospital Wash in	4	Q=100 year	900.00	2065.30	2068.94	2068.94	2069.62	0.007020	7.01	192.44	206.85	0.74
Hospital Wash in	3	Q=100 year	900.00	2064.39	2066.58		2066.62	0.001138	1.71	581.07	337.43	0.28
Hospital Wash in	2	Q=100 year	900.00	2064.24	2066.55		2066.58	0.001115	2.09	676.21	450.16	0.31
Hospital Wash in	1	Q=100 year	900.00	2060.00	2066.54	2063.07	2066.55	0.000117	1.09	1343.24	629.12	0.10

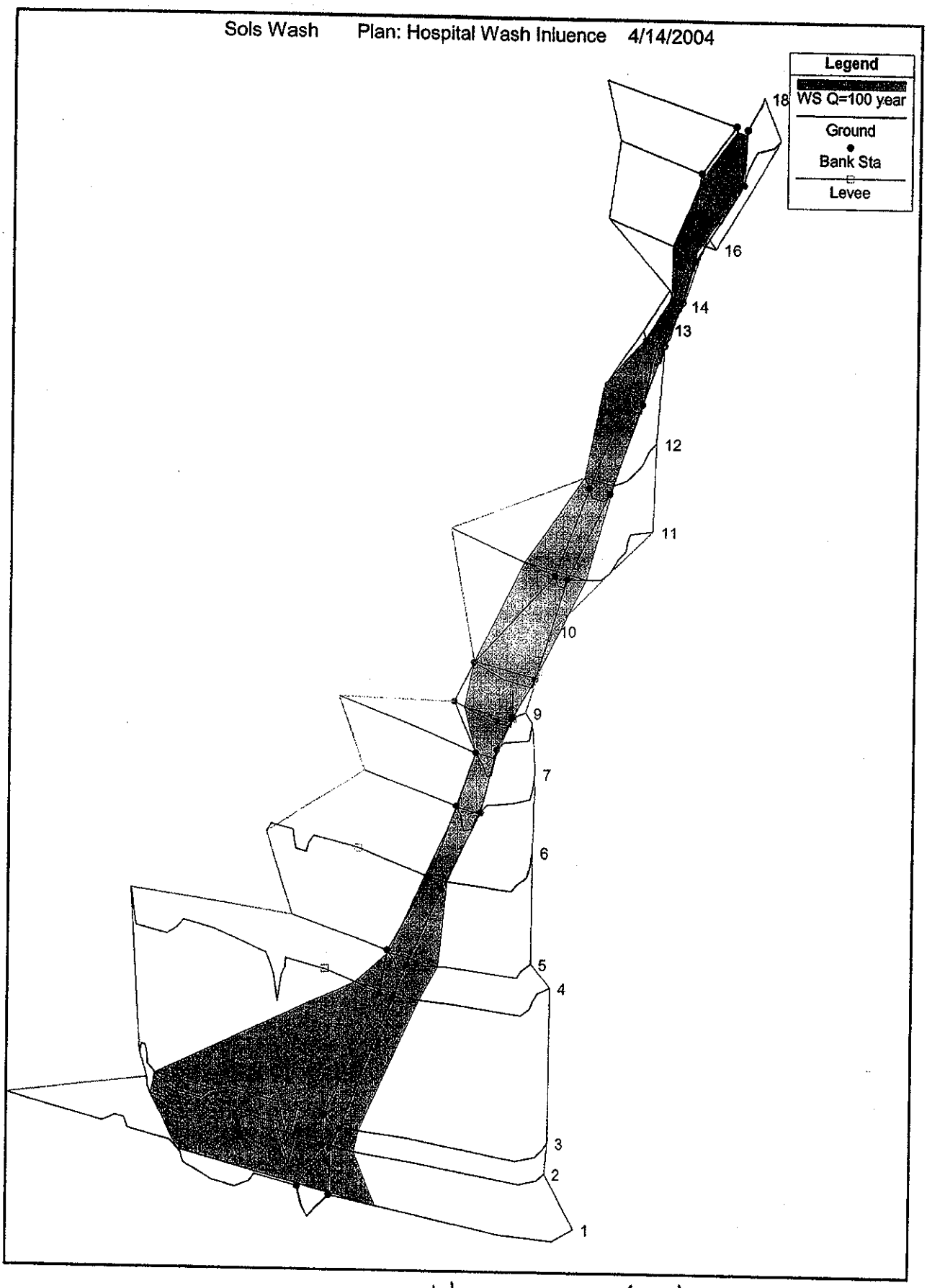
HOSPITAL WASH

HEC-RAS Plan: AZ03152 River: Reach #1 Reach: Hospital Wash In Profile: Q=100 year

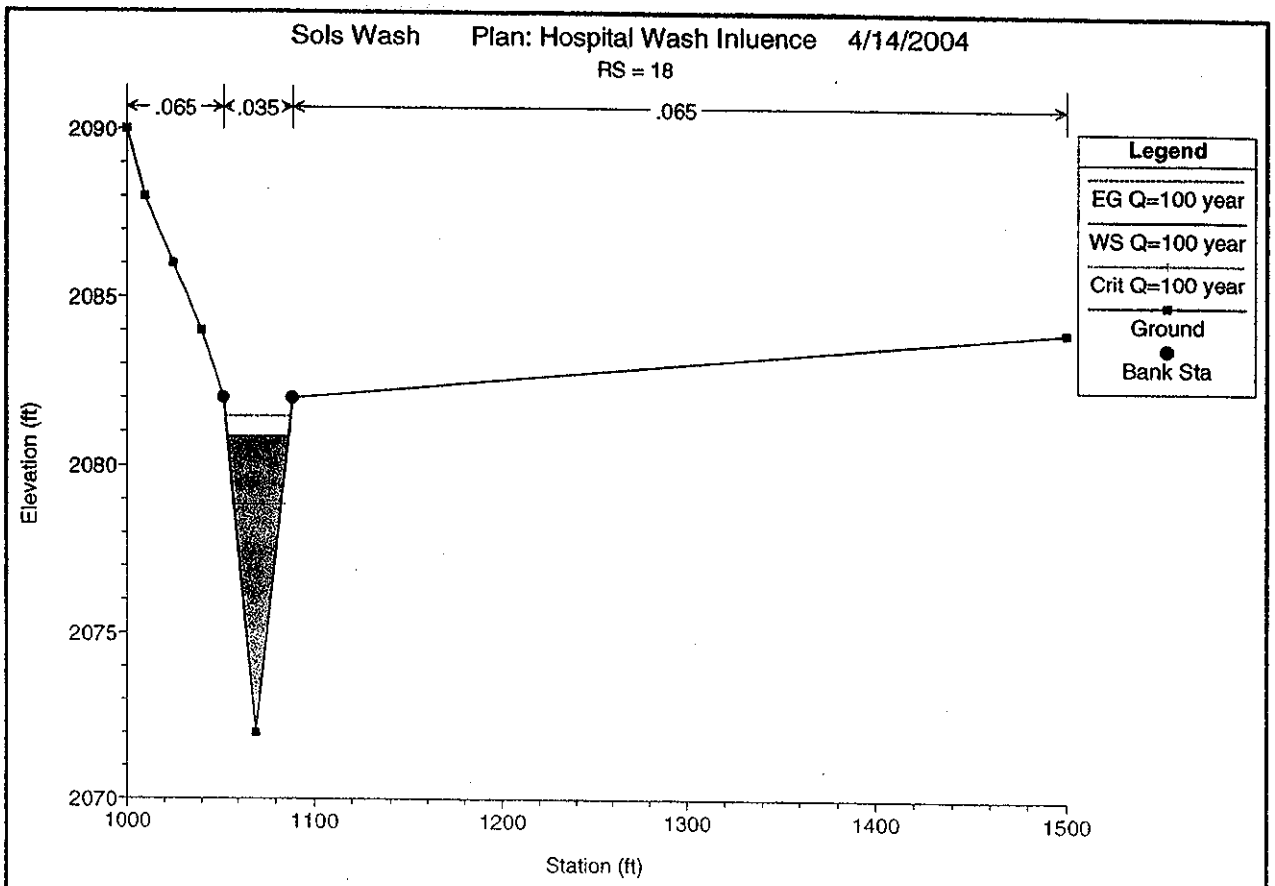
MIXED

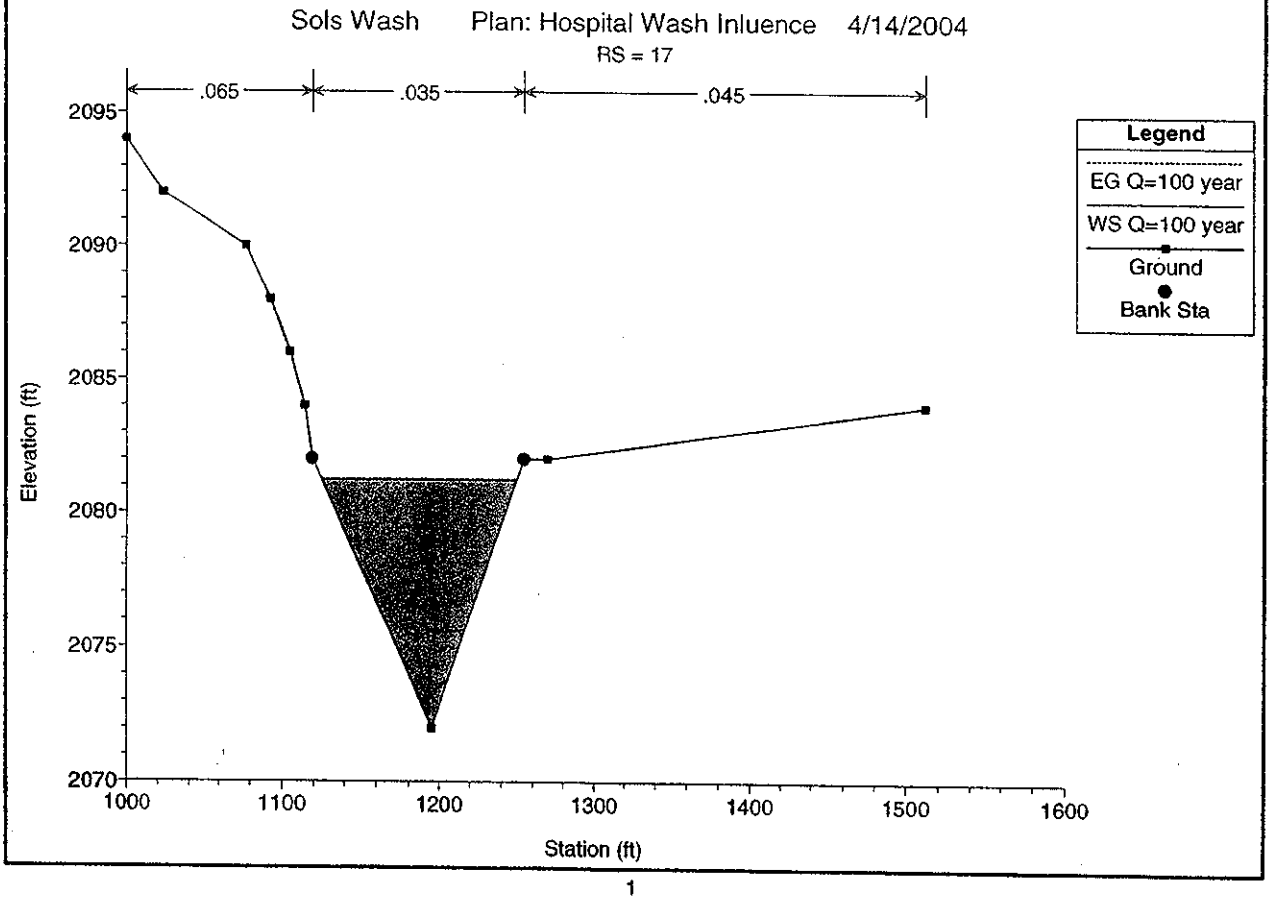
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Hospital Wash In	18	Q=100 year	900.00	2072.00	2080.85	2078.85	2081.47	0.003624	6.31	142.65	32.24	0.53
Hospital Wash In	17	Q=100 year	900.00	2072.00	2081.21		2081.24	0.000181	1.57	573.47	124.59	0.13
Hospital Wash In	16	Q=100 year	900.00	2076.00	2079.93	2079.93	2081.06	0.009541	9.17	131.11	73.90	0.86
Hospital Wash In	15	Q=100 year	900.00	2074.00	2076.57	2077.56	2079.75	0.044274	14.34	63.91	35.05	1.76
Hospital Wash In	14	Q=100 year	900.00	2072.00	2076.37	2075.54	2076.68	0.005008	5.74	157.70	63.46	0.62
Hospital Wash In	13	Q=100 year	900.00	2072.00	2076.31		2076.53	0.001513	4.03	295.57	129.72	0.36
Hospital Wash In	12	Q=100 year	900.00	2072.00	2076.09		2076.29	0.001240	3.55	275.02	95.39	0.33
Hospital Wash In	11	Q=100 year	900.00	2072.00	2075.13	2075.13	2075.79	0.007799	7.06	199.25	203.16	0.77
Hospital Wash In	10	Q=100 year	900.00	2072.00	2074.28	2073.26	2074.39	0.002419	2.63	342.39	199.11	0.35
Hospital Wash In	9	Q=100 year	900.00	2072.00	2073.44	2073.44	2073.93	0.017185	5.66	158.98	154.69	0.98
Hospital Wash In	8	Q=100 year	900.00	2067.62	2071.98	2071.16	2072.50	0.005597	5.78	155.67	62.44	0.65
Hospital Wash In	7	Q=100 year	900.00	2066.97	2071.70		2072.04	0.002807	4.65	193.61	73.52	0.50
Hospital Wash In	6	Q=100 year	900.00	2066.17	2070.13	2070.00	2071.31	0.011736	8.76	107.37	69.82	0.95
Hospital Wash In	5	Q=100 year	900.00	2065.53	2069.57		2070.02	0.004656	5.69	218.43	157.45	0.64
Hospital Wash In	4	Q=100 year	900.00	2065.30	2068.94	2068.94	2069.62	0.007020	7.01	192.44	206.85	0.74
Hospital Wash In	3	Q=100 year	900.00	2064.39	2066.58	2064.65	2066.62	0.001139	1.71	581.07	337.43	0.26
Hospital Wash In	2	Q=100 year	900.00	2064.24	2066.55		2066.58	0.001115	2.09	678.21	450.16	0.31
Hospital Wash In	1	Q=100 year	900.00	2060.00	2066.54	2063.07	2066.55	0.000117	1.09	1343.24	629.12	0.10

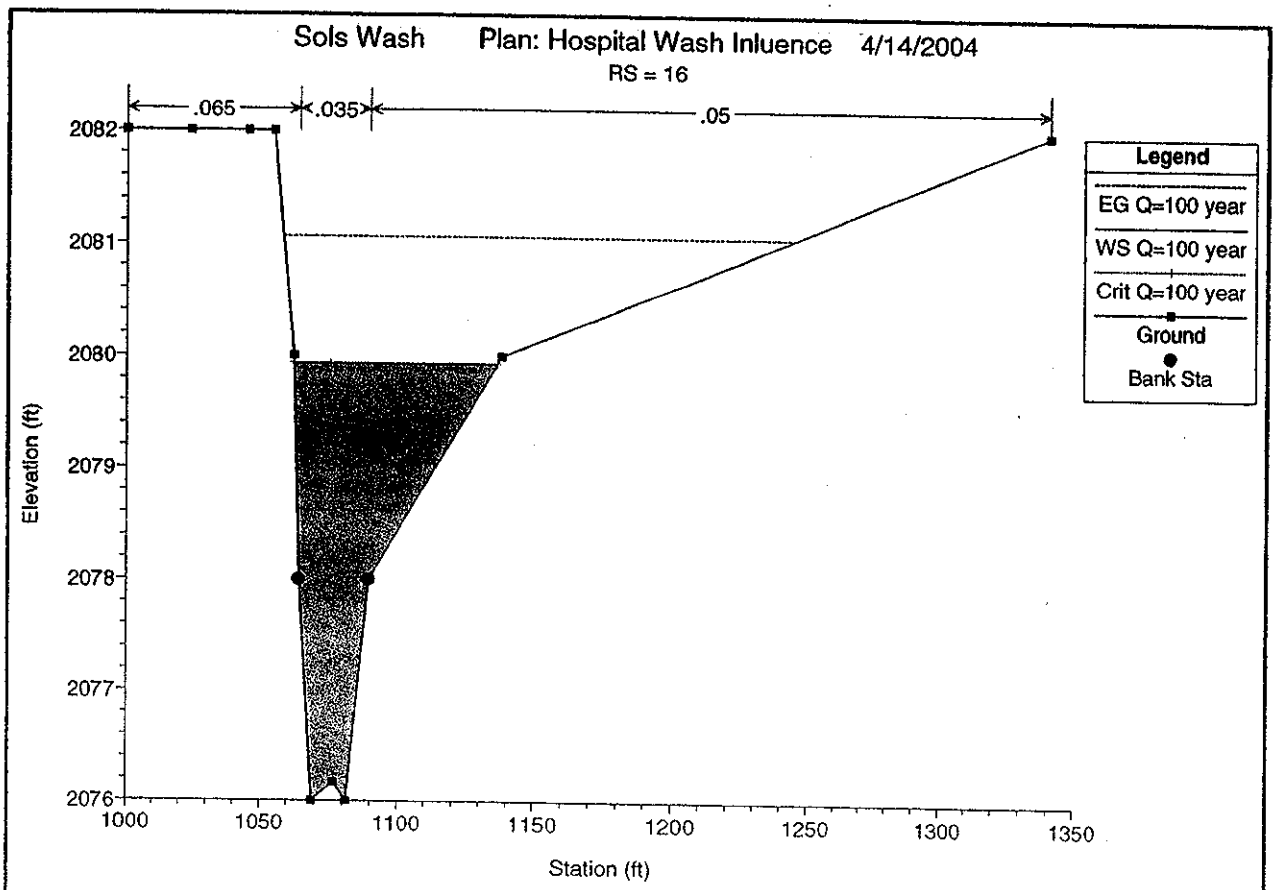
HOSPITAL WASH BASELINE COND

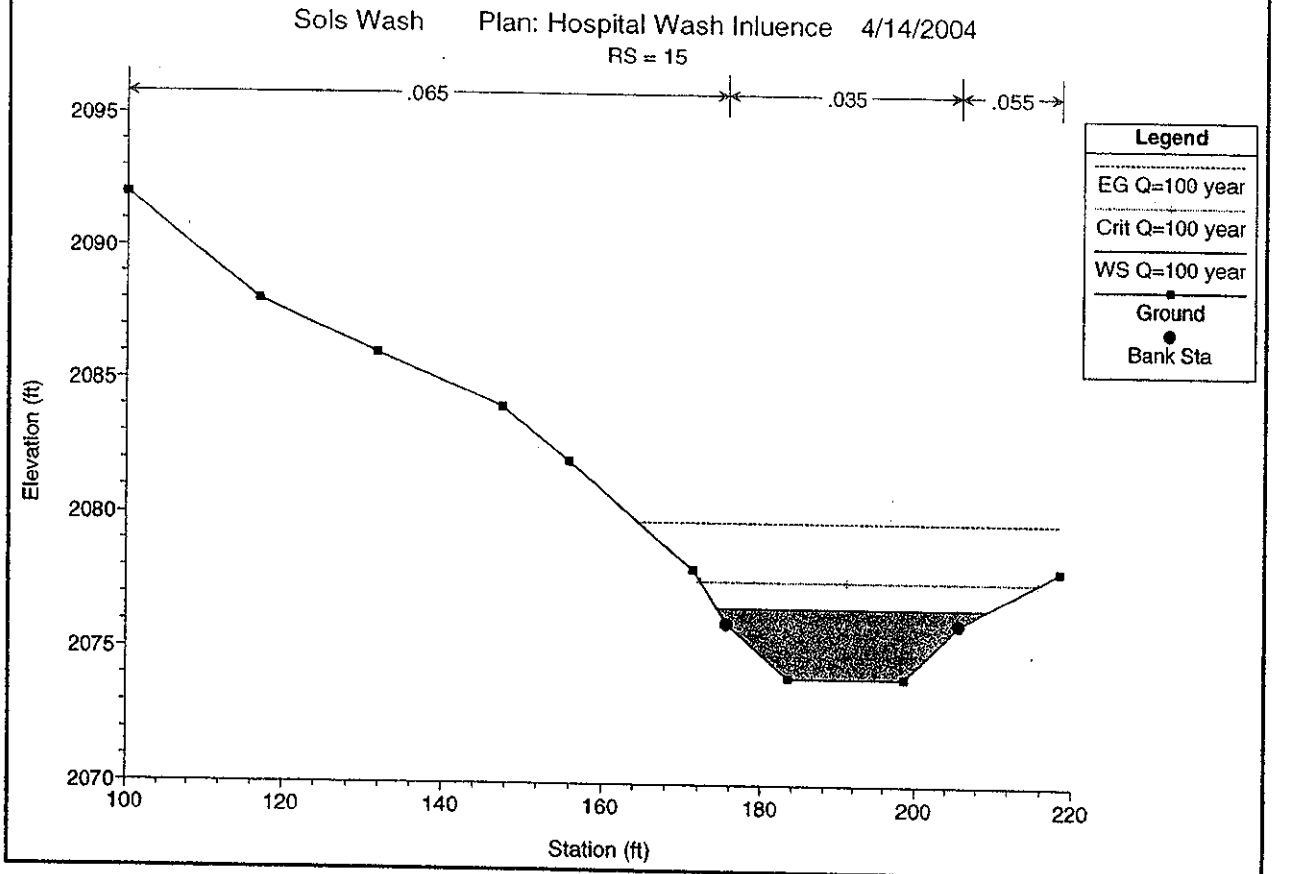


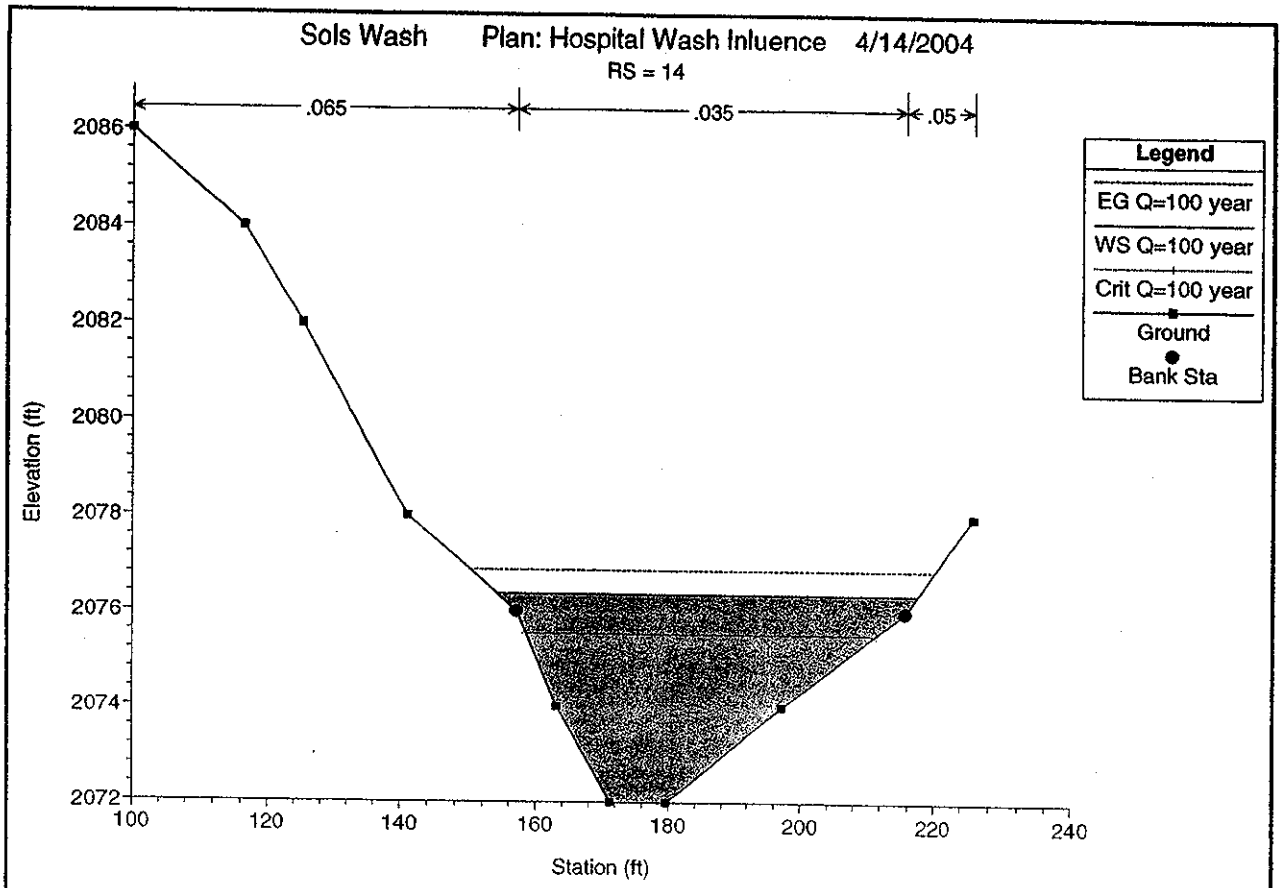
HOSPITAL WASH BASELINE COND.

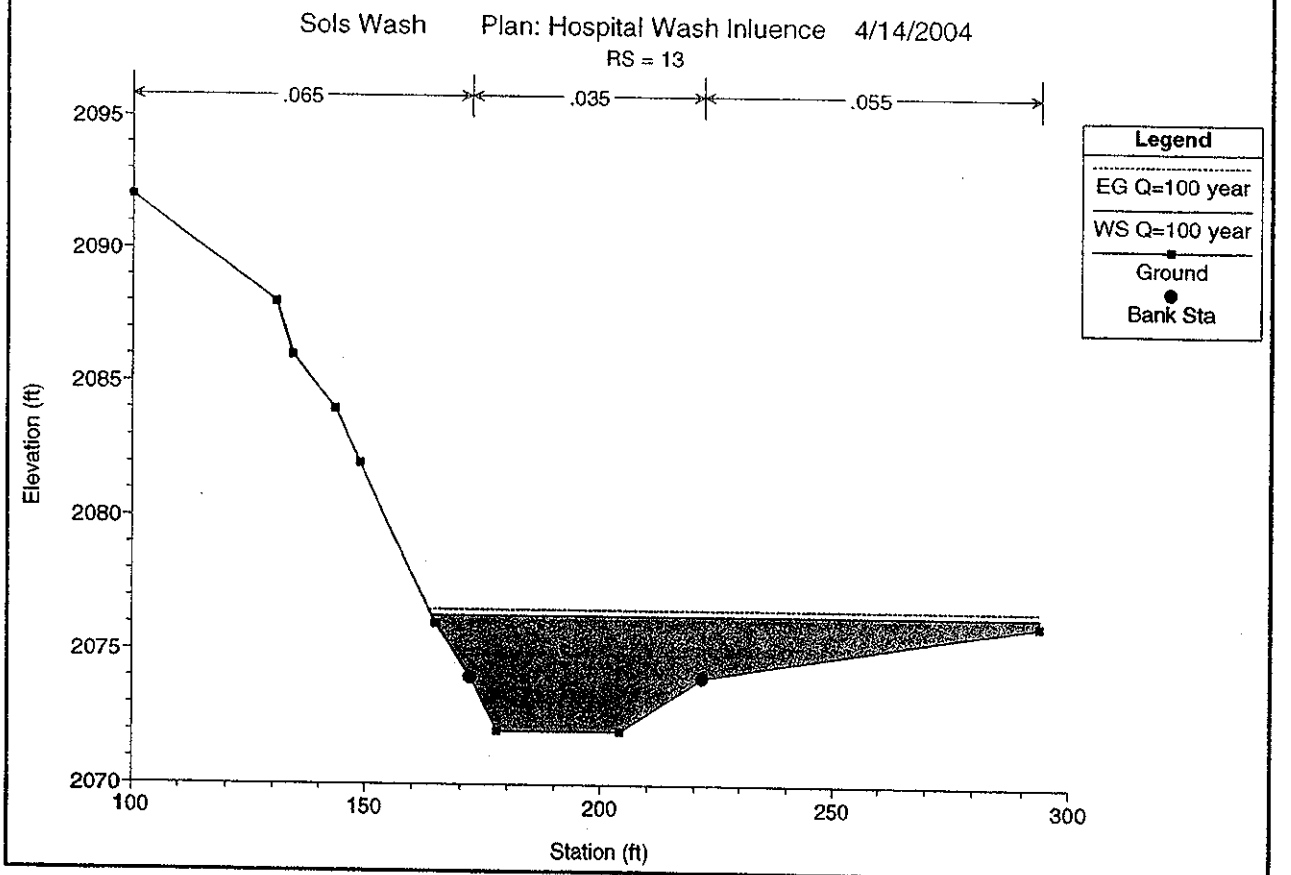

Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 18
.065
.035
.065
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Bank Sta
Elevation (ft)
2090
2085
2080
2075
2070
1000
1100
1200
1300
1400
1500
Station (ft)

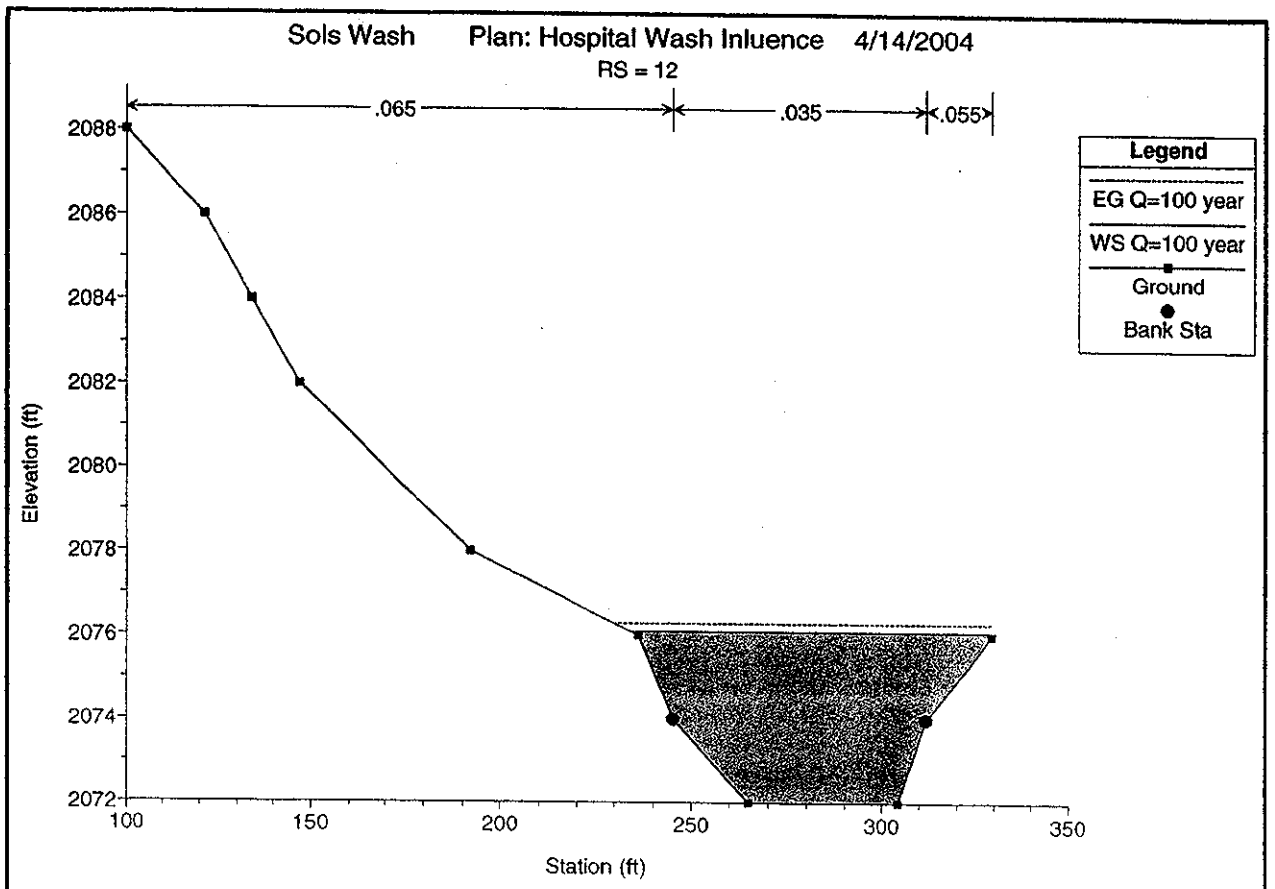

Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 17
.065
.035
.045
Legend
EG Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
2095
2090
2085
2080
2075
2070
1000
1100
1200
1300
1400
1500
1600
Station (ft)

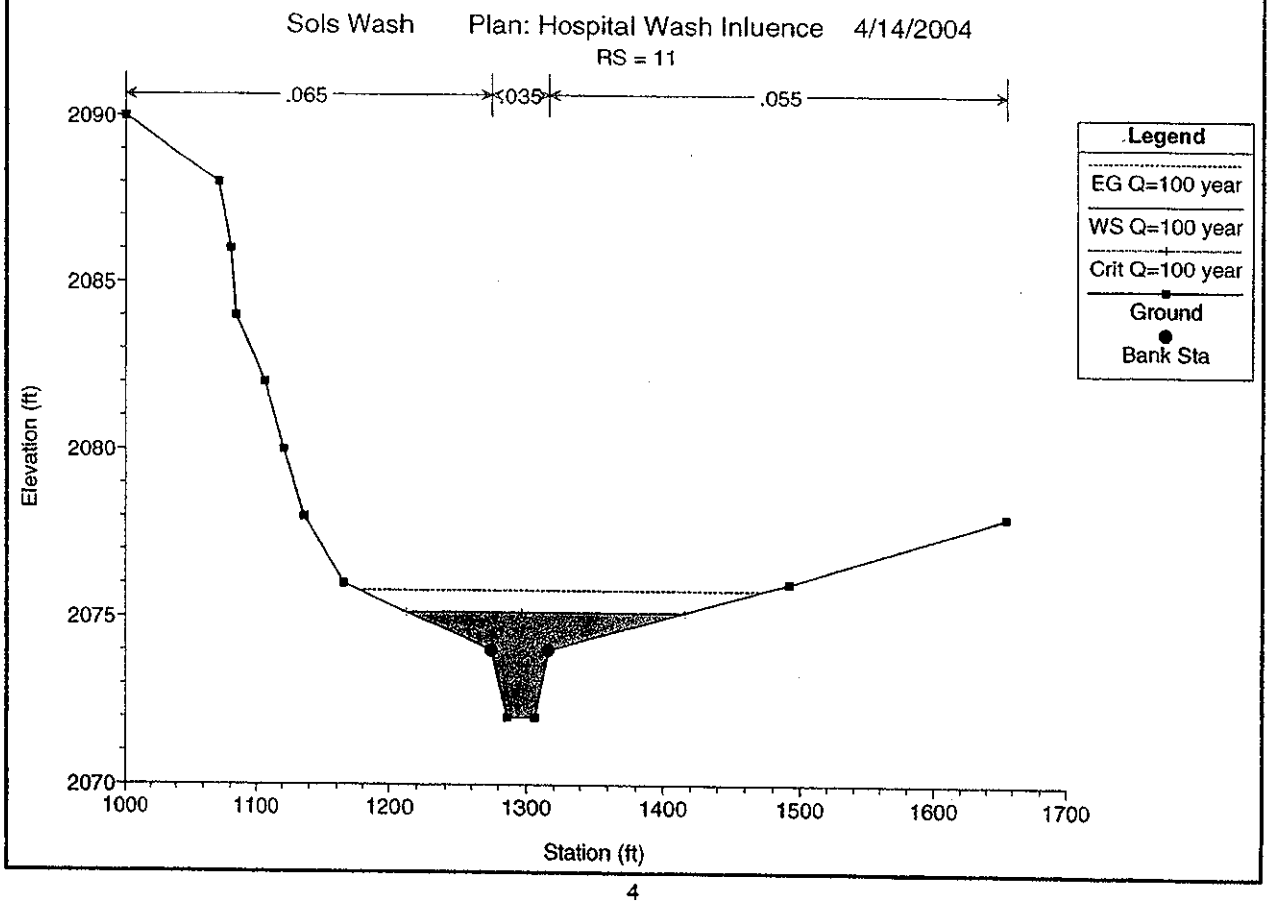

Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 16
.065
.035
.05
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Bank Sta
Elevation (ft)
2082
2081
2080
2079
2078
2077
2076
1000
1050
1100
1150
1200
1250
1300
1350
Station (ft)

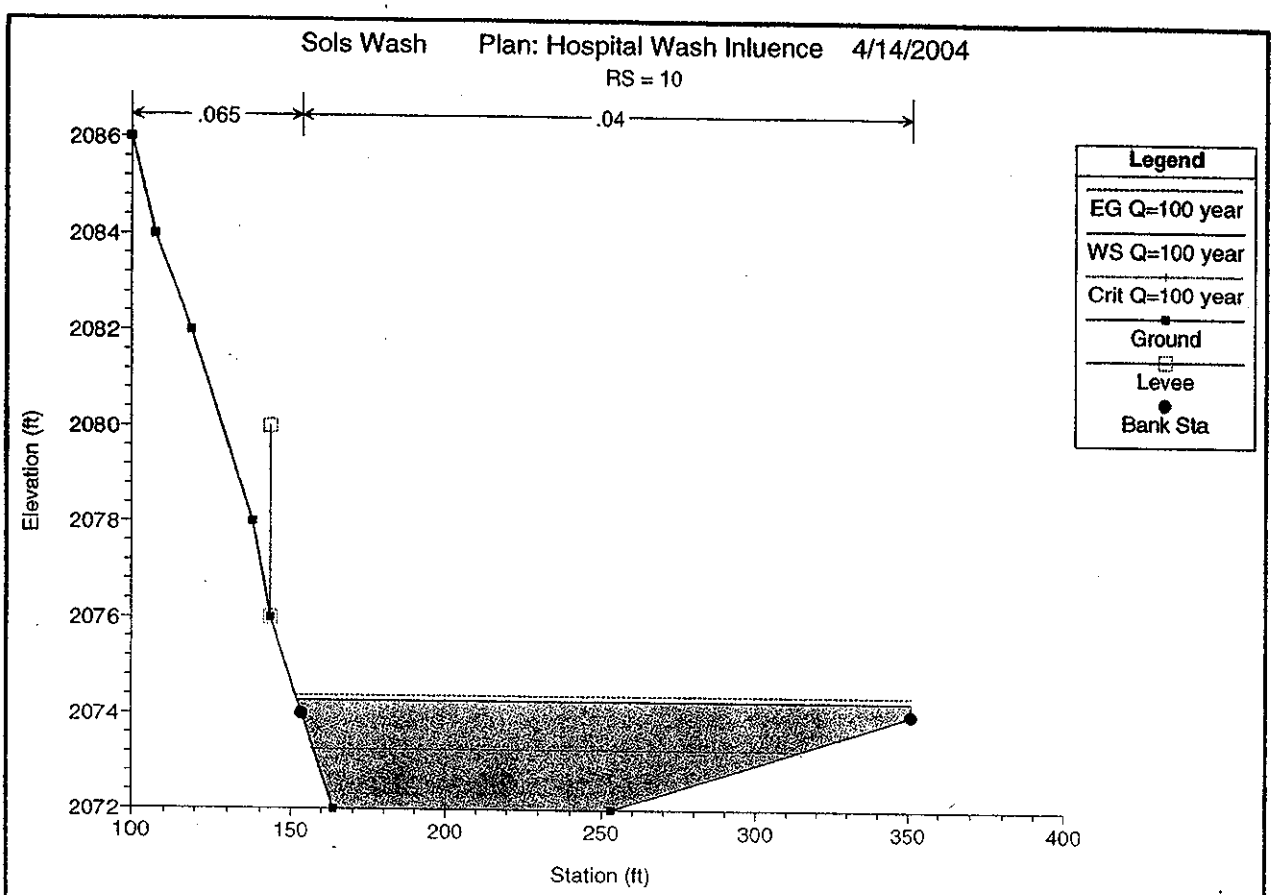

Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 15
.065
.035
.055
Legend
EG Q=100 year
Crit Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
2095
2090
2085
2080
2075
2070
100
120
140
160
180
200
220
Station (ft)

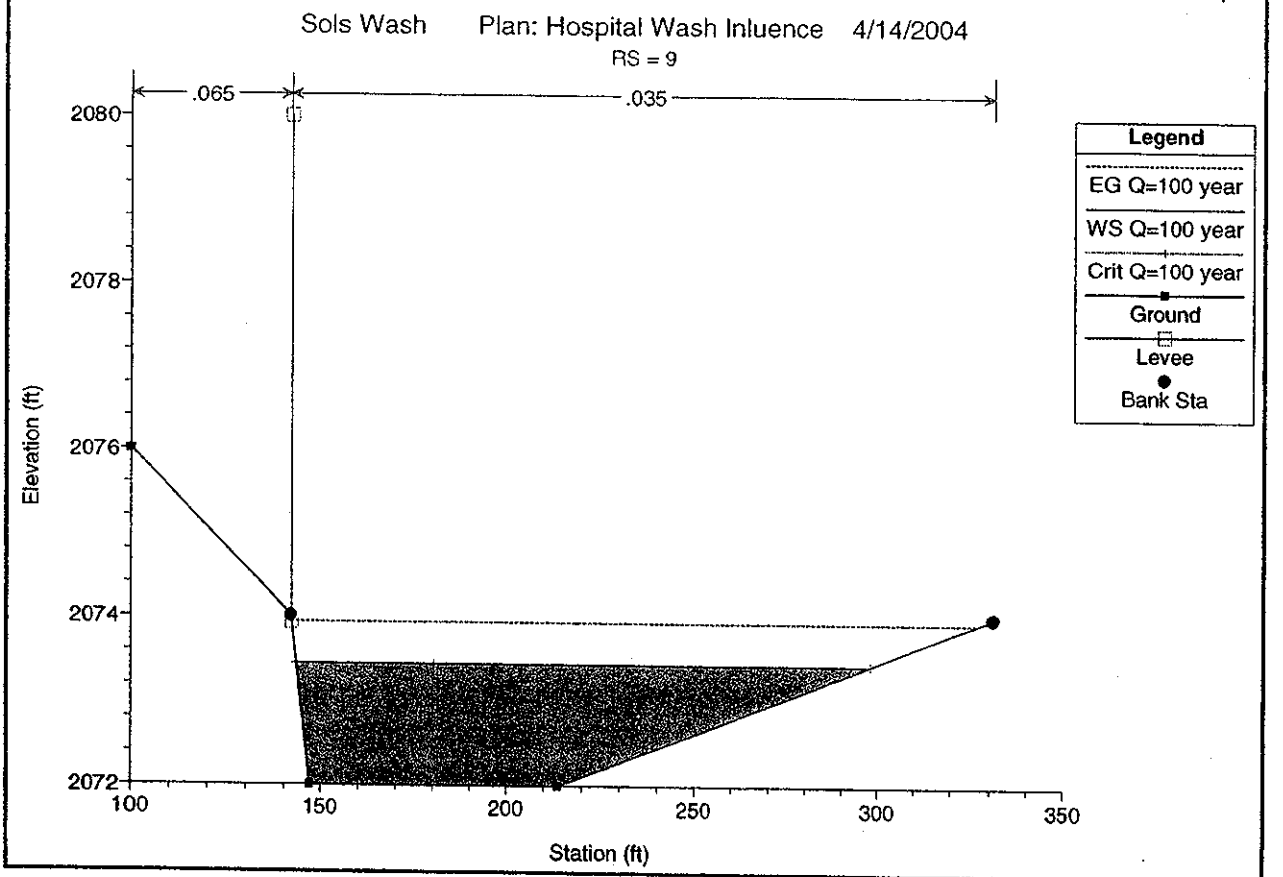

Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 14
.065
.035
.05
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Bank Sta
Elevation (ft)
2086
2084
2082
2080
2078
2076
2074
2072
100
120
140
160
180
200
220
240
Station (ft)

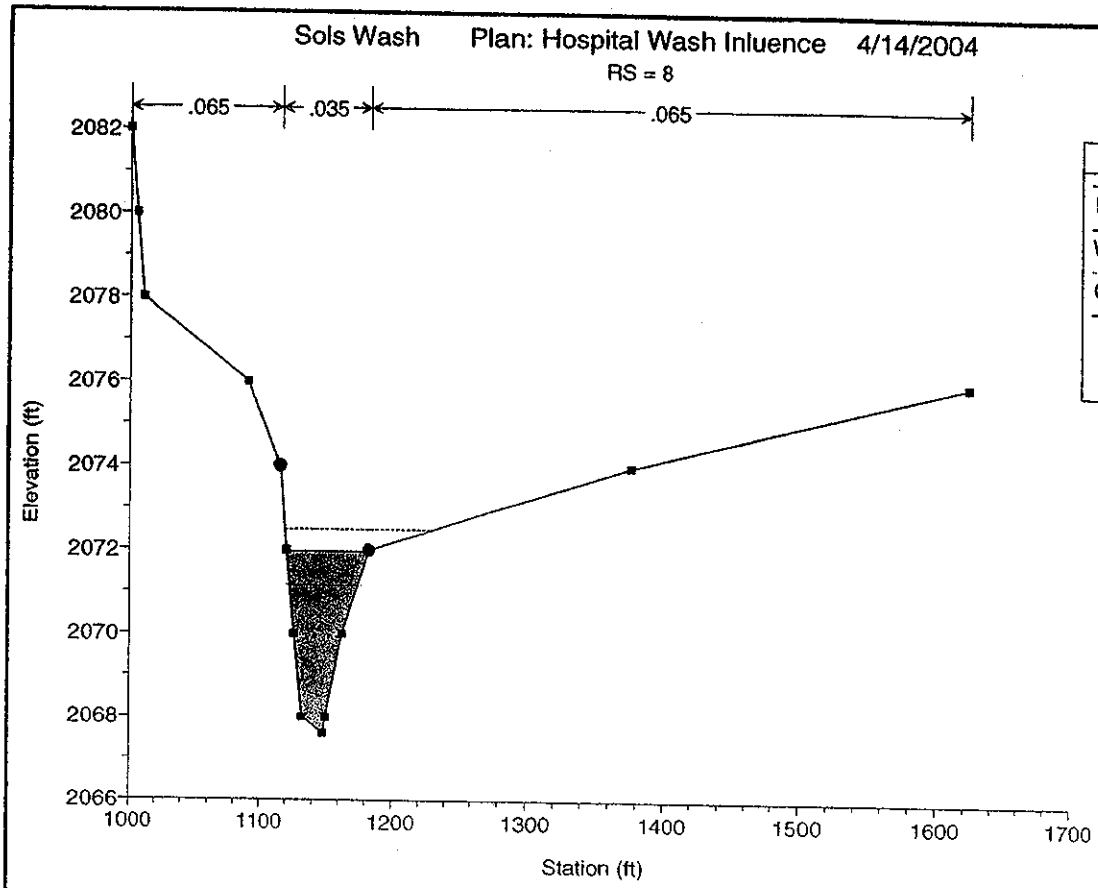

Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 13
.065
.035
.055
Legend
EG Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
2095
2090
2085
2080
2075
2070
100
150
200
250
300
Station (ft)

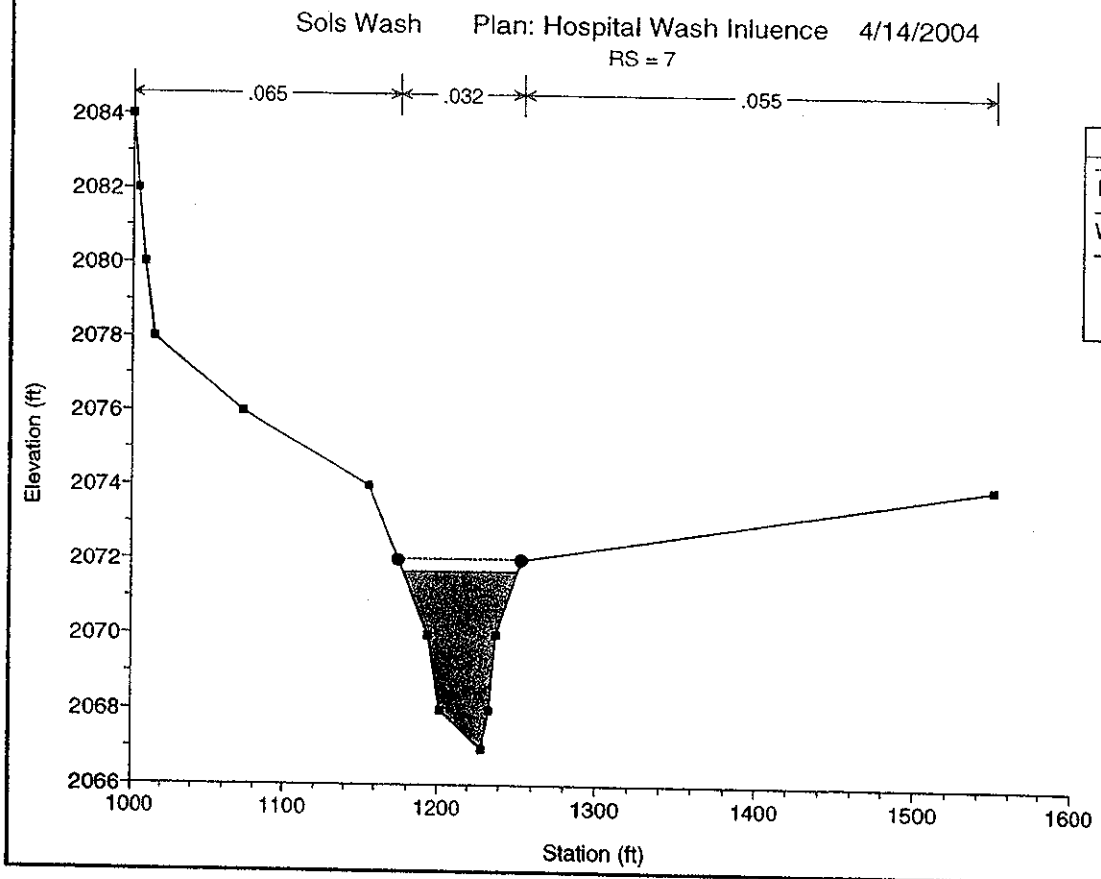

Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 12
.065
.035
.055
Legend
EG Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
2088
2086
2084
2082
2080
2078
2076
2074
2072
100
150
200
250
300
350
Station (ft)

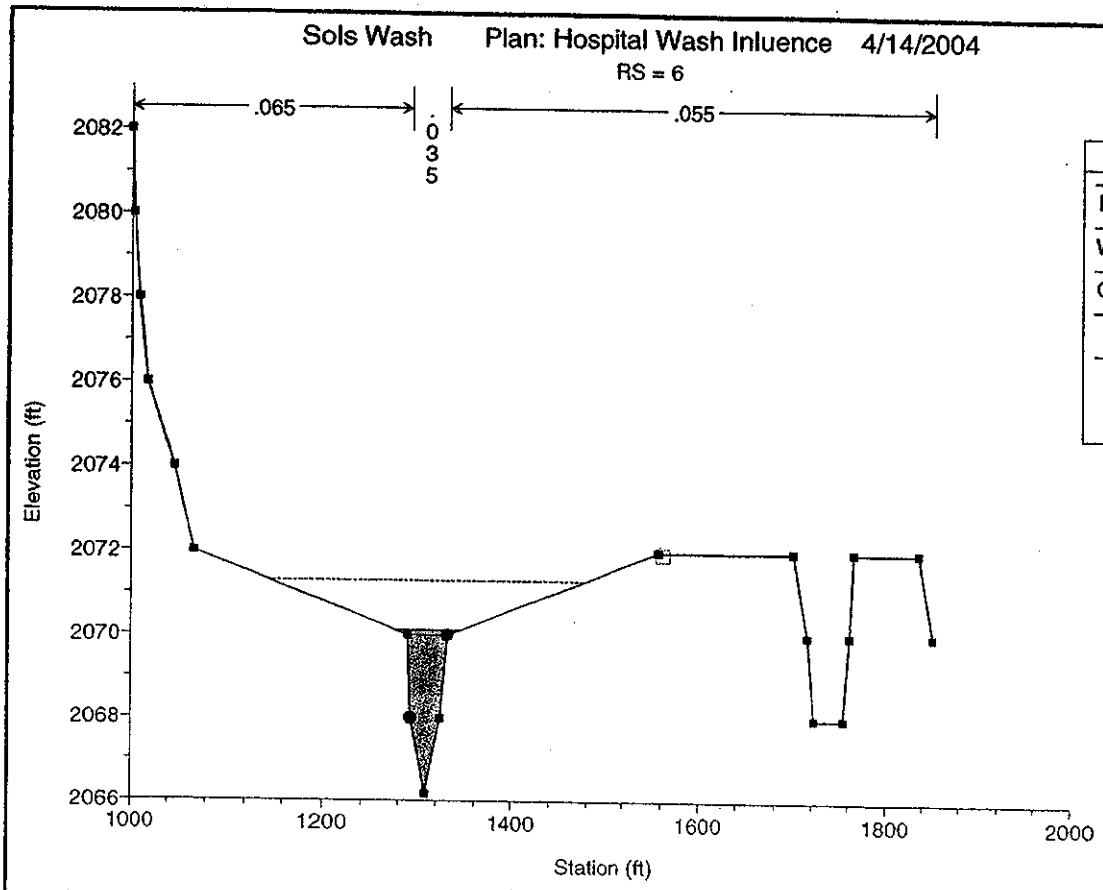

Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 11
.065
.035
.055
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Bank Sta
Elevation (ft)
2090
2085
2080
2075
2070
1000
1100
1200
1300
1400
1500
1600
1700
Station (ft)

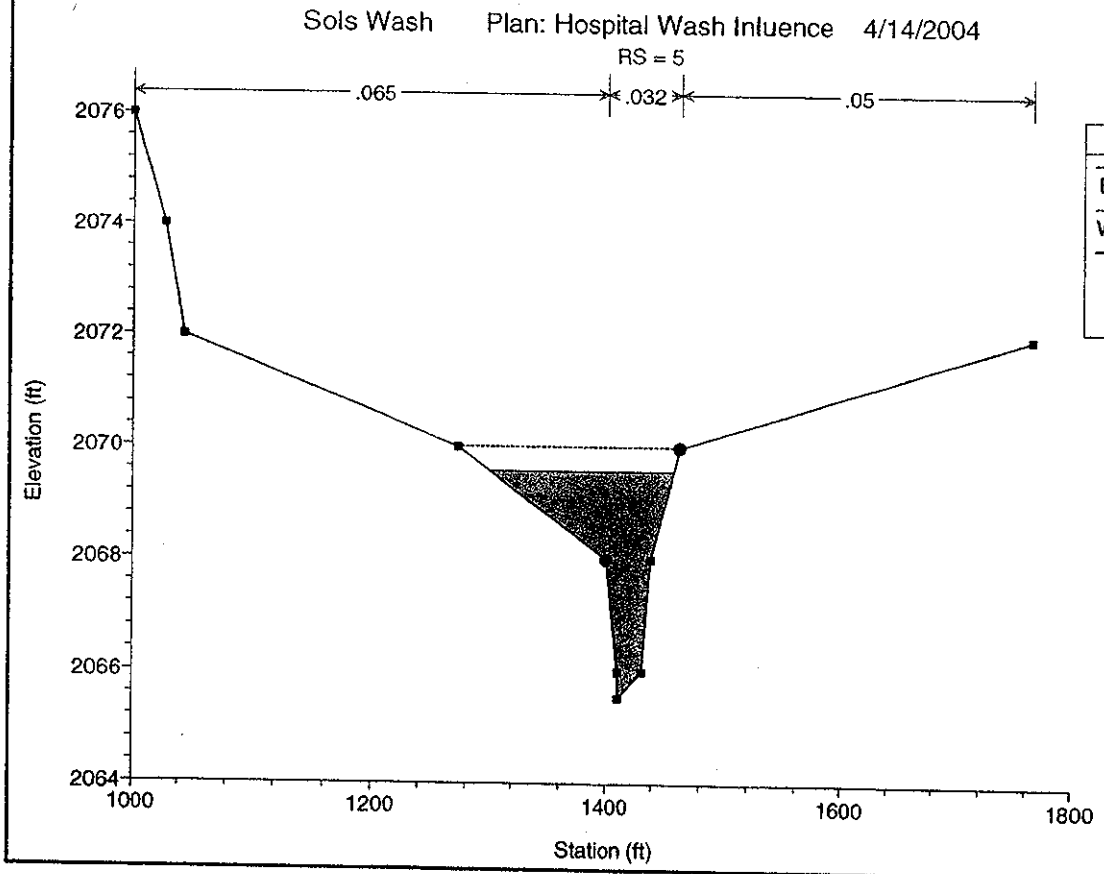

Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 10
.065
.04
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Levee
Bank Sta
Elevation (ft)
2086
2084
2082
2080
2078
2076
2074
2072
100
150
200
250
300
350
400
Station (ft)

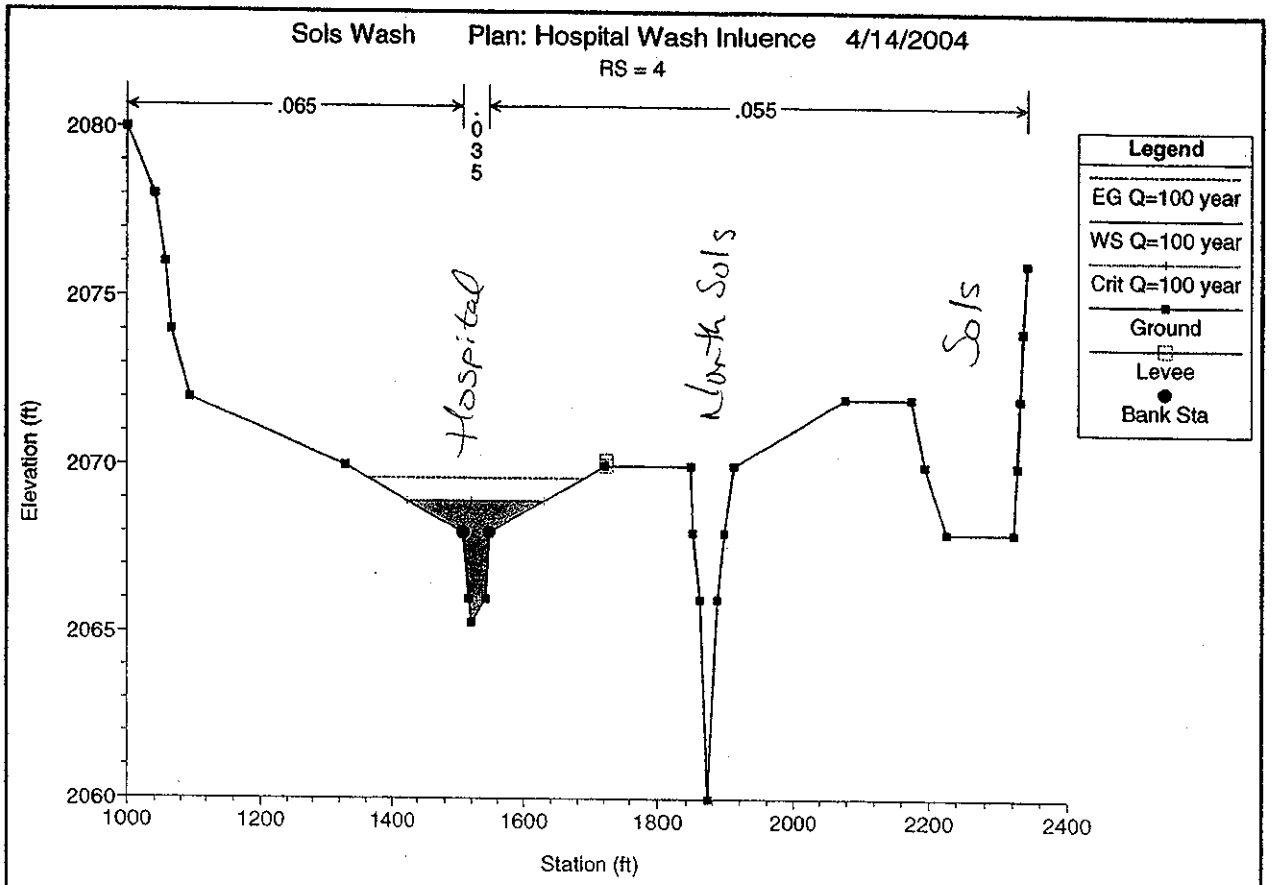

Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 9
.065
.035
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Levee
Bank Sta
Elevation (ft)
2080
2078
2076
2074
2072
100
150
200
250
300
350
Station (ft)

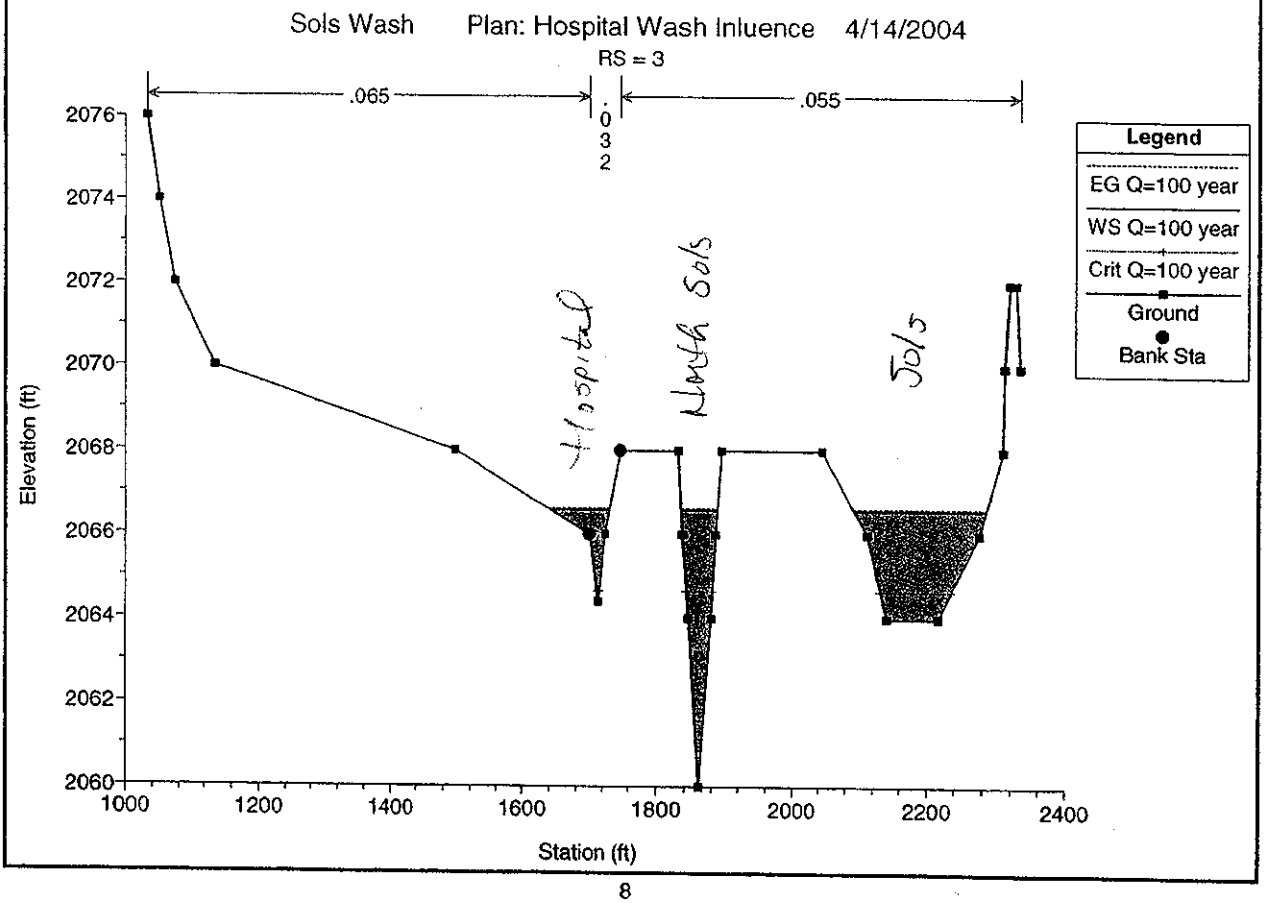

Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 8
.065
.035
.065
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Bank Sta
Elevation (ft)
2082
2080
2078
2076
2074
2072
2070
2068
2066
1000
1100
1200
1300
1400
1500
1600
1700
Station (ft)

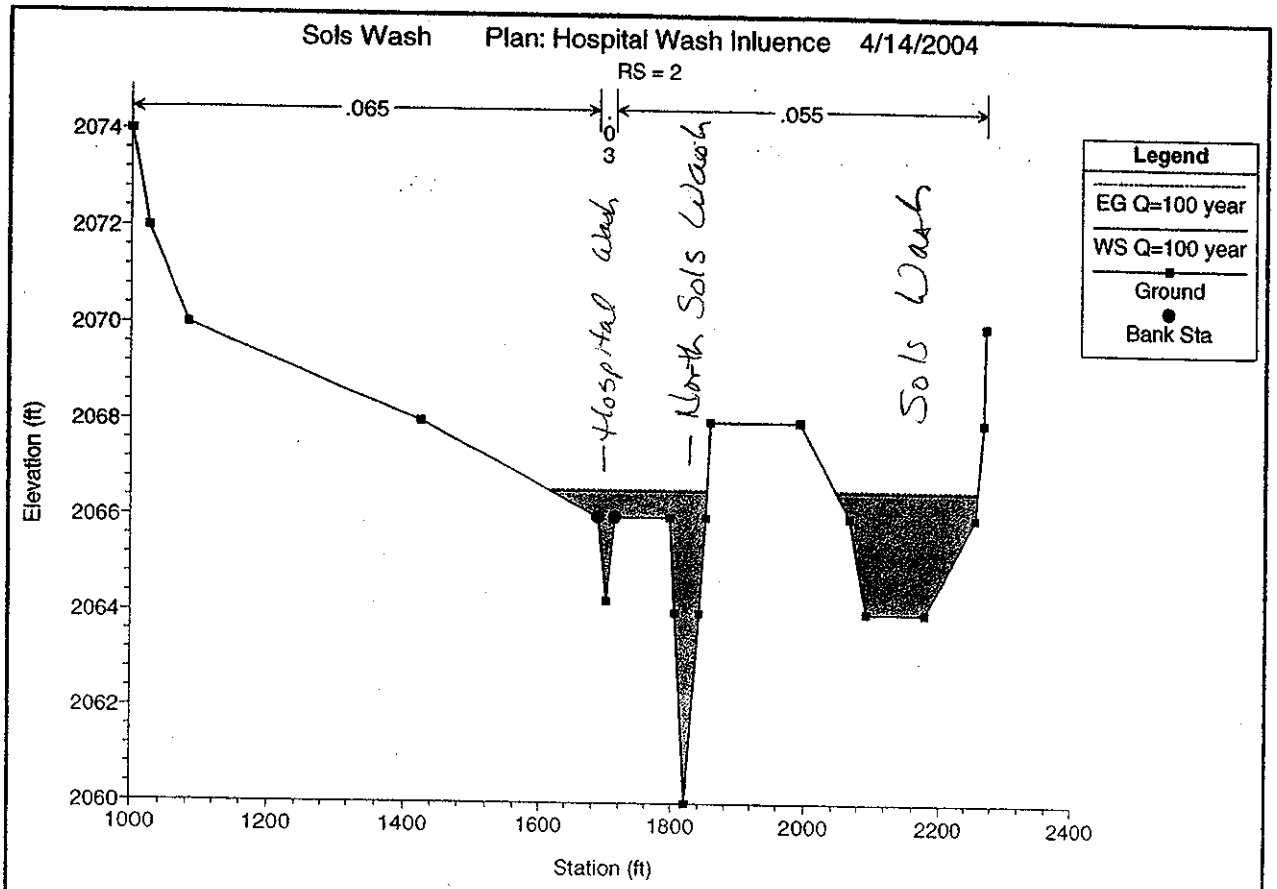

Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 7
.065
.032
.055
Legend
EG Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
2084
2082
2080
2078
2076
2074
2072
2070
2068
2066
1000
1100
1200
1300
1400
1500
1600
Station (ft)

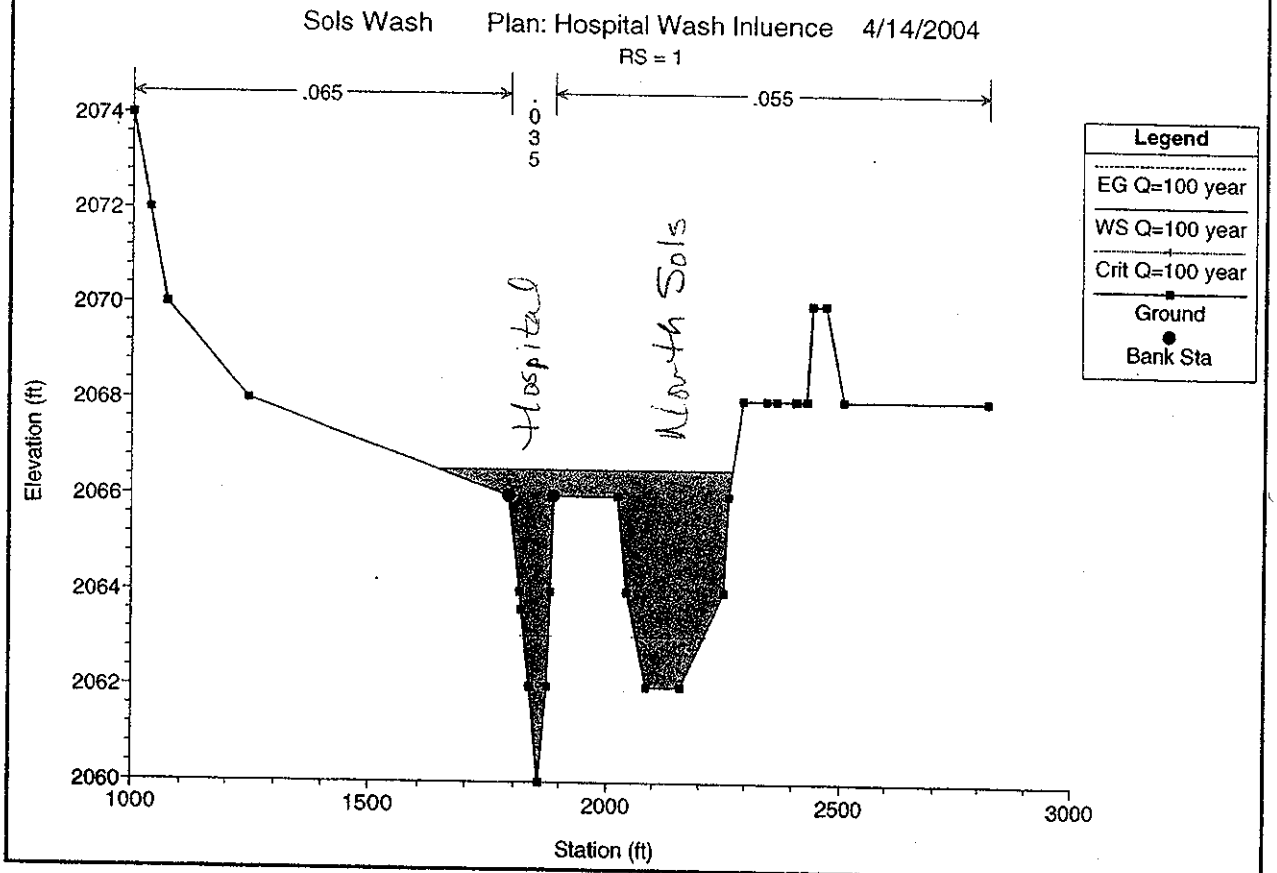

Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 6
.065
.035
.055
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Levee
Bank Sta
Elevation (ft)
2082
2080
2078
2076
2074
2072
2070
2068
2066
1000
1200
1400
1600
1800
2000
Station (ft)


Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 5
.065
.032
.05
Legend
EG Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
2076
2074
2072
2070
2068
2066
2064
1000
1200
1400
1600
1800
Station (ft)


Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 4
.065
.035
.055
Hospital
North Sols
Sols
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
2060
2065
2070
2075
2080
1000
1200
1400
1600
1800
2000
2200
2400


Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 3
.065
.032
.055
Hospital
North Sols
Sols
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Bank Sta
Elevation (ft)
Station (ft)
2060
2062
2064
2066
2068
2070
2072
2074
2076
1000
1200
1400
1600
1800
2000
2200
2400


Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 2
.065
.035
.055
Hospital Wash
North Sols Wash
Sols Wash
Legend
EG Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash Plan: Hospital Wash Inluence 4/14/2004
RS = 1
.065
.035
.055
Hospital
North Sols
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Bank Sta
Elevation (ft)
Station (ft)

ATTACHMENT E:
REVISED MODEL IV – HOSPITAL WASH LEVEE IMPROVEMENTS WEST OF US93

Model IV - Hospital Wash – Levee Improvements West of US 93

Model IV represents the inclusion of a levee along the north bank of Hospital Wash. The purpose is to direct flow toward Sols Wash and eliminate the breakout flows that were identified in Model III. The model will be used to identify if the flows in Hospital Wash control the elevations determined for the levee in Sols Wash. The same flows noted in Model III have been used for this improvements model. The attached information has been provided to detail the levee improvements in Hospital Wash.

SUBCR

HEC-RAS Plan: Hosp-Levee River: Reach #1 Reach: Hospital Wash In Profile: Q=100 year

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Hospital Wash In	18	Q=100 year	900.00	2072.00	2080.85		2081.47	0.003624	6.31	142.65	32.24	0.53
Hospital Wash In	17	Q=100 year	900.00	2072.00	2081.21		2081.24	0.000181	1.57	573.47	124.59	0.13
Hospital Wash In	16	Q=100 year	900.00	2076.00	2079.93	2079.93	2081.06	0.009541	9.17	131.11	73.90	0.88
Hospital Wash In	15	Q=100 year	900.00	2074.00	2077.56	2077.56	2078.92	0.011508	9.48	102.66	43.40	0.96
Hospital Wash In	14	Q=100 year	900.00	2072.00	2076.37		2076.88	0.005008	5.74	157.70	63.46	0.62
Hospital Wash In	13	Q=100 year	900.00	2072.00	2076.31		2076.53	0.001513	4.03	295.57	129.72	0.36
Hospital Wash In	12	Q=100 year	900.00	2072.00	2076.09		2076.29	0.001240	3.55	275.02	95.39	0.33
Hospital Wash In	11	Q=100 year	900.00	2072.00	2075.13	2075.13	2075.79	0.007799	7.06	199.25	203.16	0.77
Hospital Wash In	10	Q=100 year	900.00	2072.00	2074.26	2073.26	2074.39	0.002416	2.63	342.54	199.12	0.35
Hospital Wash In	9	Q=100 year	900.00	2072.00	2073.44	2073.44	2073.93	0.017165	5.66	158.98	154.69	0.98
Hospital Wash In	8	Q=100 year	900.00	2067.62	2071.93		2072.47	0.005900	5.90	152.58	61.78	0.66
Hospital Wash In	7	Q=100 year	900.00	2066.97	2071.62		2071.98	0.003021	4.76	188.04	72.22	0.52
Hospital Wash In	6	Q=100 year	900.00	2066.17	2070.45	2070.03	2071.35	0.007728	7.68	130.63	92.62	0.78
Hospital Wash In	5	Q=100 year	900.00	2065.53	2069.61	2069.00	2070.23	0.005907	6.33	142.13	57.73	0.71
Hospital Wash In	4	Q=100 year	900.00	2065.30	2068.84	2068.84	2069.73	0.009203	7.74	141.60	114.48	0.83
Hospital Wash In	3	Q=100 year	900.00	2064.39	2066.59	2064.68	2066.62	0.001154	1.70	563.80	278.11	0.28
Hospital Wash In	2	Q=100 year	900.00	2064.24	2066.55	2064.62	2066.58	0.001135	2.07	658.11	377.46	0.31
Hospital Wash In	1	Q=100 year	900.00	2060.00	2066.54	2063.07	2066.55	0.000117	1.09	1343.24	629.12	0.10

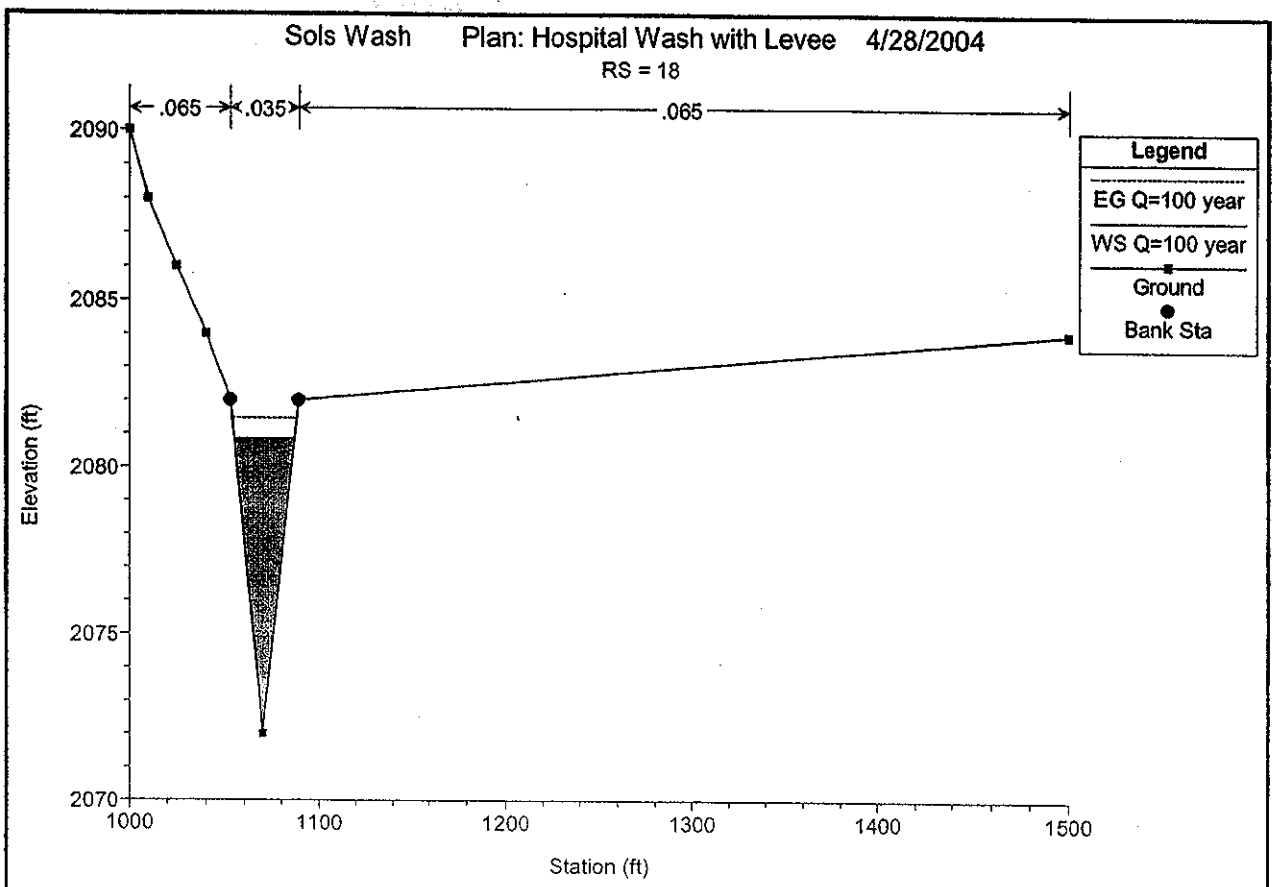
HOSPITAL WASH WITH LEVEE

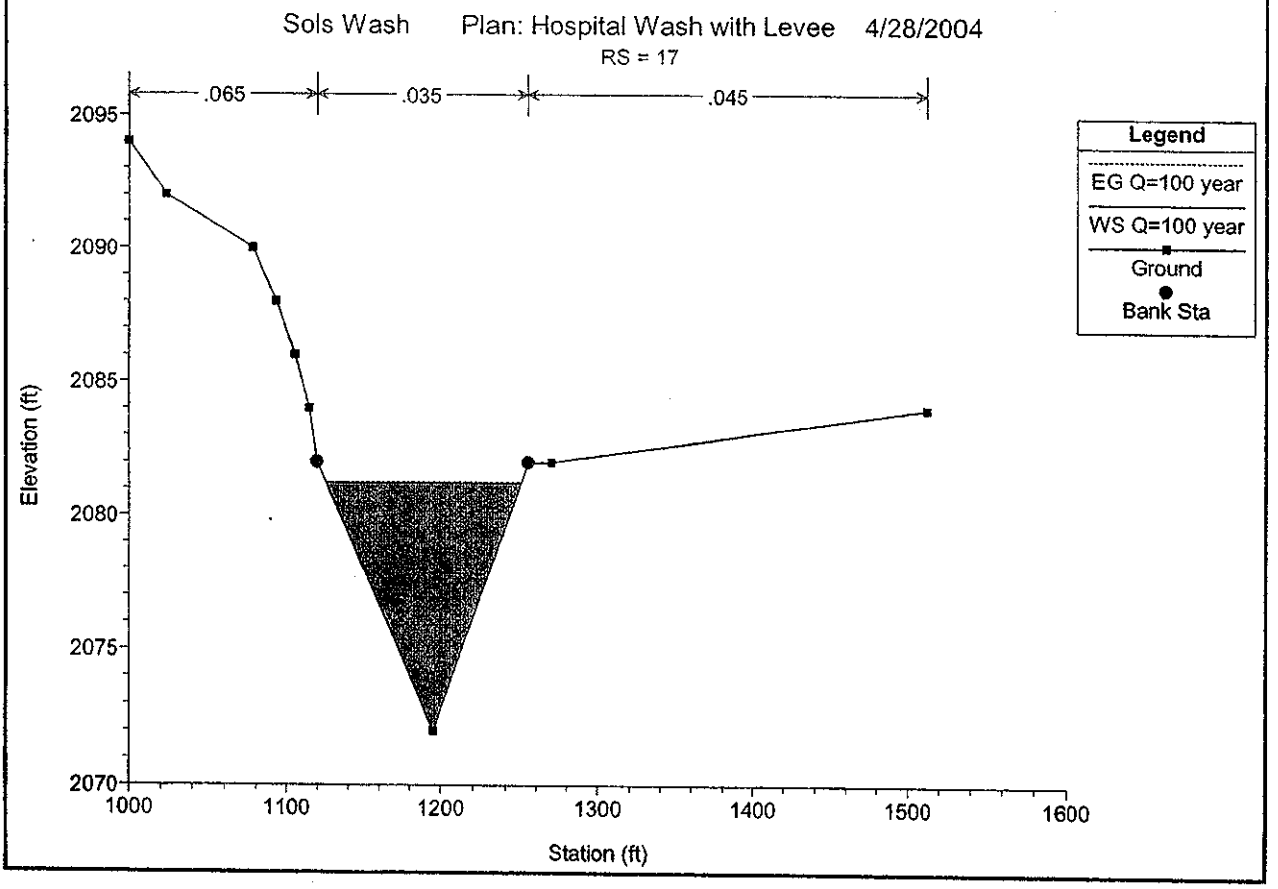
MIXED

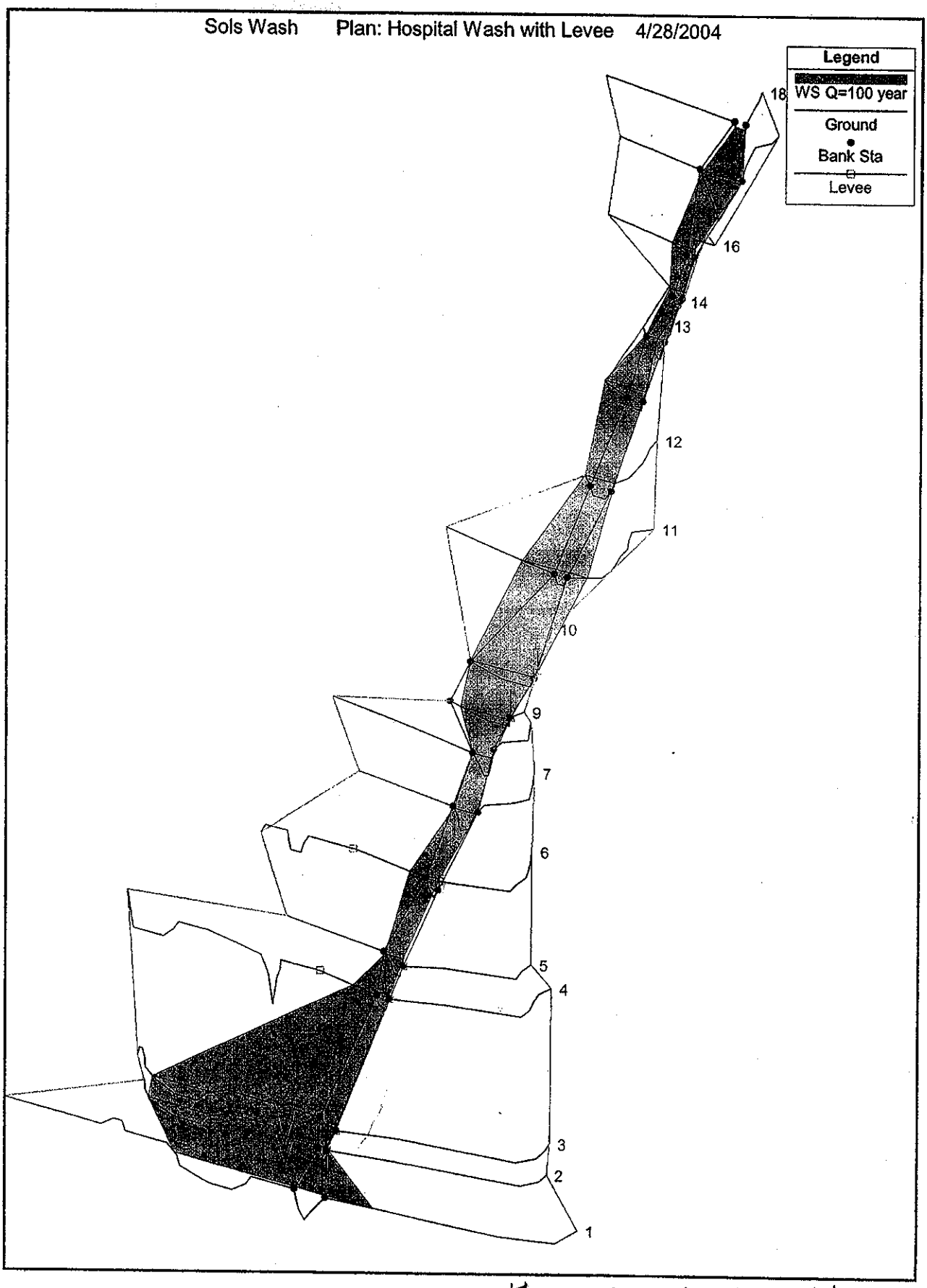
HEC-RAS Plan: Hosp-Levee River: Reach #1 Reach: Hospital Wash In Profile: Q=100 year

Reach	River Sta	Profile	Q Total	Min Ch El		W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)		(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Hospital Wash In	18	Q=100 year	900.00	2072.00	=	2080.85	2078.85	2081.47	0.003624	6.31	142.65	32.24	0.53
Hospital Wash In	17	Q=100 year	900.00	2072.00	=	2081.21		2081.24	0.000181	1.57	573.47	124.59	0.13
Hospital Wash In	16	Q=100 year	900.00	2076.00	=	2079.93	2079.93	2081.06	0.009541	9.17	131.11	73.90	0.88
Hospital Wash In	15	Q=100 year	900.00	2074.00	=	2076.57	2077.56	2079.75	0.044274	14.34	63.91	35.05	1.76
Hospital Wash In	14	Q=100 year	900.00	2072.00	=	2076.37	2075.54	2076.88	0.005008	5.74	157.70	63.46	0.62
Hospital Wash In	13	Q=100 year	900.00	2072.00	=	2076.31		2076.53	0.001513	4.03	295.57	129.72	0.36
Hospital Wash In	12	Q=100 year	900.00	2072.00	=	2076.09		2076.29	0.001240	3.55	275.02	95.39	0.33
Hospital Wash In	11	Q=100 year	900.00	2072.00	=	2075.13	2075.13	2075.79	0.007799	7.06	199.25	203.16	0.77
Hospital Wash In	10	Q=100 year	900.00	2072.00	=	2074.28	2073.26	2074.39	0.002416	2.63	342.54	199.12	0.35
Hospital Wash In	9	Q=100 year	900.00	2072.00	=	2073.44	2073.44	2073.93	0.017185	5.66	158.98	154.69	0.98
Hospital Wash In	8	Q=100 year	900.00	2067.62	>	2071.93	2071.16	2072.47	0.005900	5.90	152.58	61.78	0.66
Hospital Wash In	7	Q=100 year	900.00	2066.97	>	2071.62		2071.98	0.003021	4.79	188.04	72.22	0.52
Hospital Wash In	6	Q=100 year	900.00	2066.17	<	2070.45	2070.03	2071.35	0.007728	7.68	130.63	92.62	0.78
Hospital Wash In	5	Q=100 year	900.00	2065.53	<	2069.61	2069.00	2070.23	0.005907	6.33	142.13	57.73	0.71
Hospital Wash In	4	Q=100 year	900.00	2065.30	>	2068.84	2068.84	2069.73	0.009203	7.74	141.60	114.48	0.83
Hospital Wash In	3	Q=100 year	900.00	2064.39	<	2066.59	2064.68	2066.62	0.001154	1.70	563.80	278.11	0.28
Hospital Wash In	2	Q=100 year	900.00	2064.24	=	2066.55	2064.62	2066.58	0.001135	2.07	658.11	377.46	0.31
Hospital Wash In	1	Q=100 year	900.00	2060.00	=	2066.54	2063.07	2066.55	0.000117	1.09	1343.24	629.12	0.10

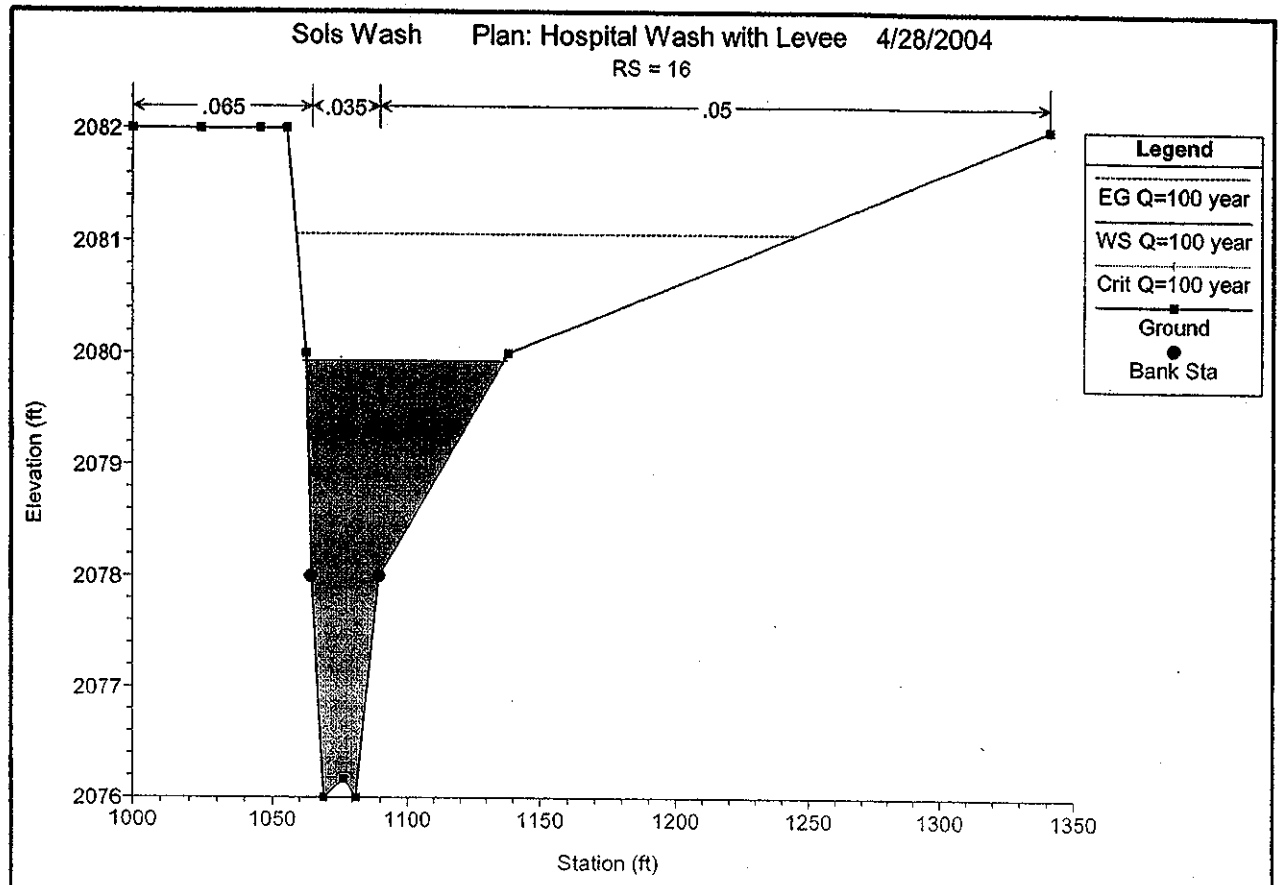
HOSPITAL WASH W/LEVEE

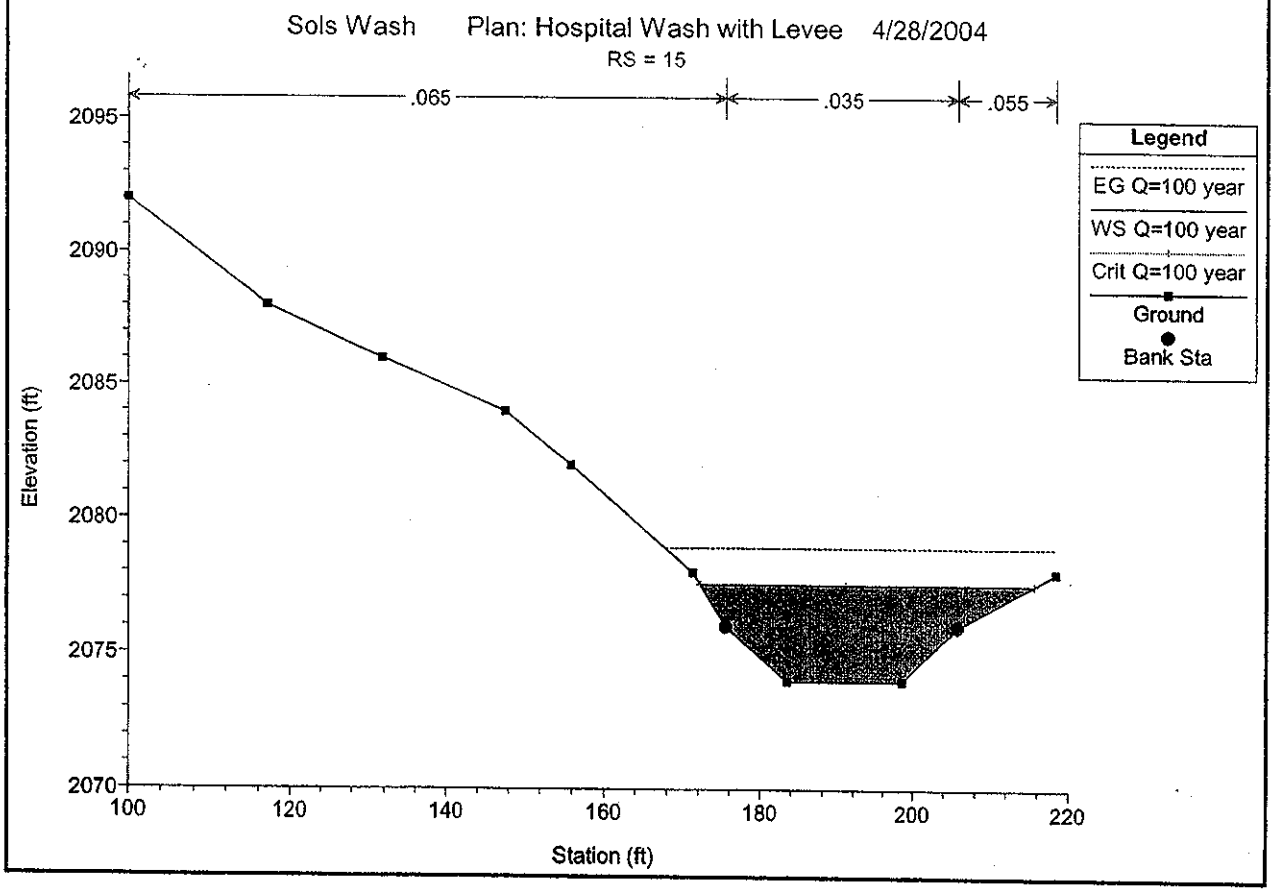

Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 18
.065
.035
.065
Legend
EG Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
2090
2085
2080
2075
2070
1000
1100
1200
1300
1400
1500
Station (ft)

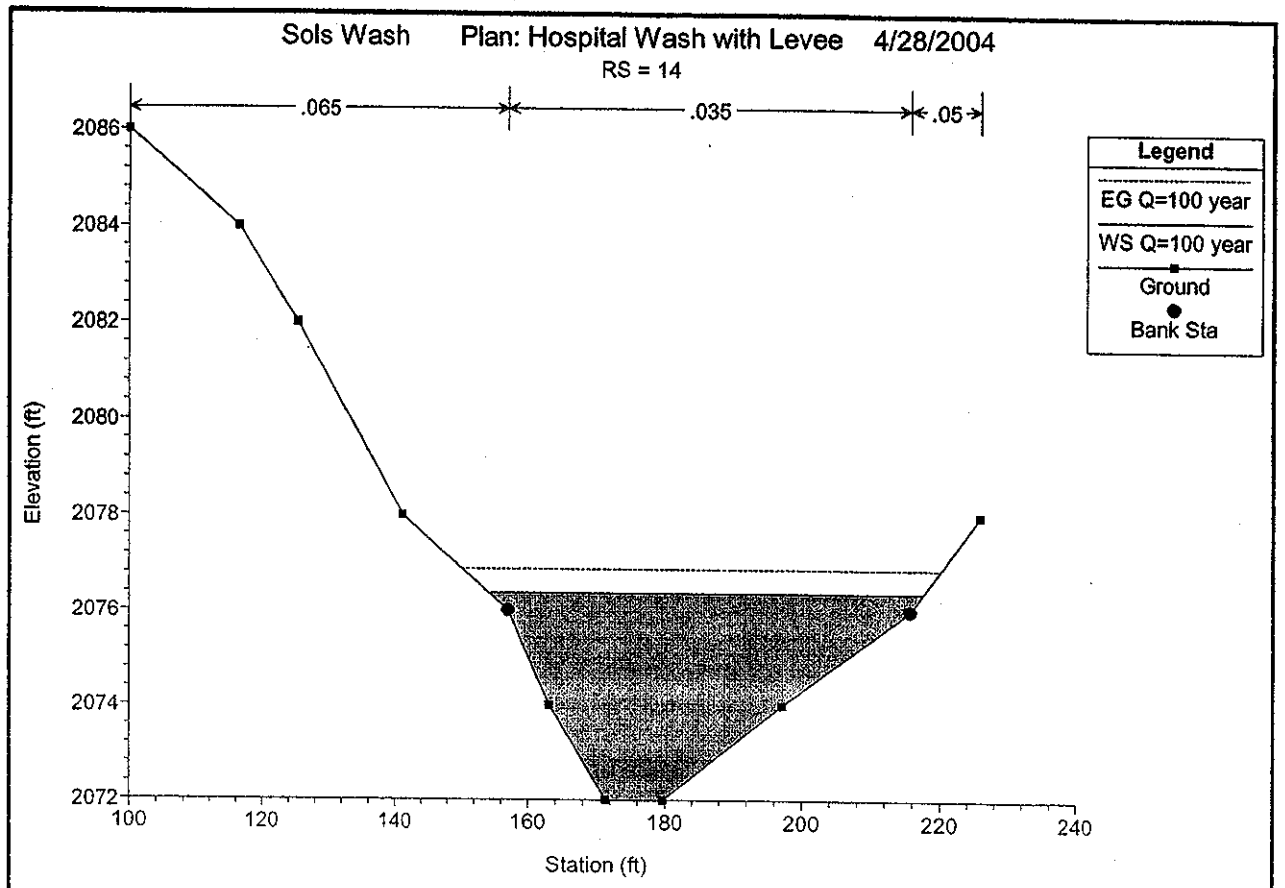

Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 17
.065
.035
.045
Legend
EG Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
2095
2090
2085
2080
2075
2070
1000
1100
1200
1300
1400
1500
1600
Station (ft)

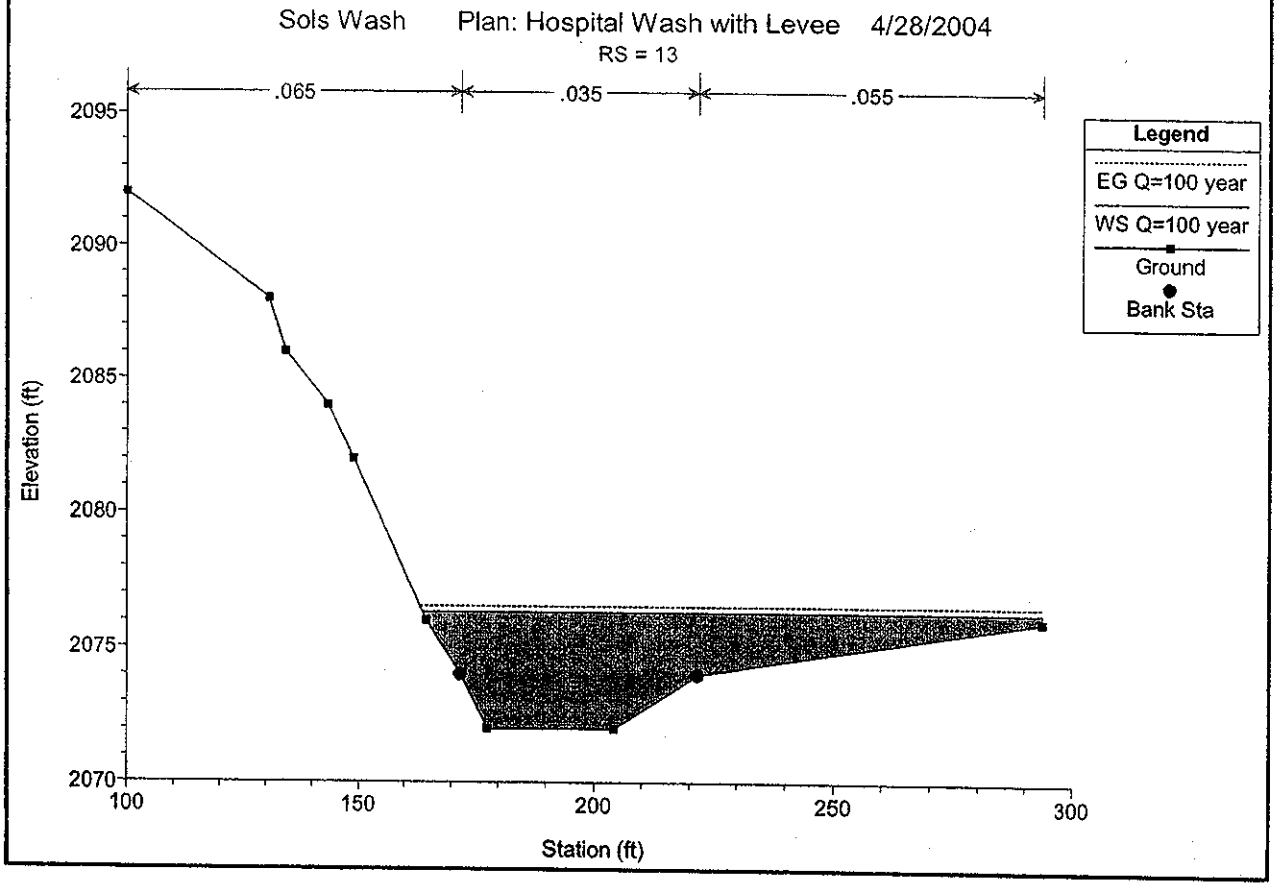


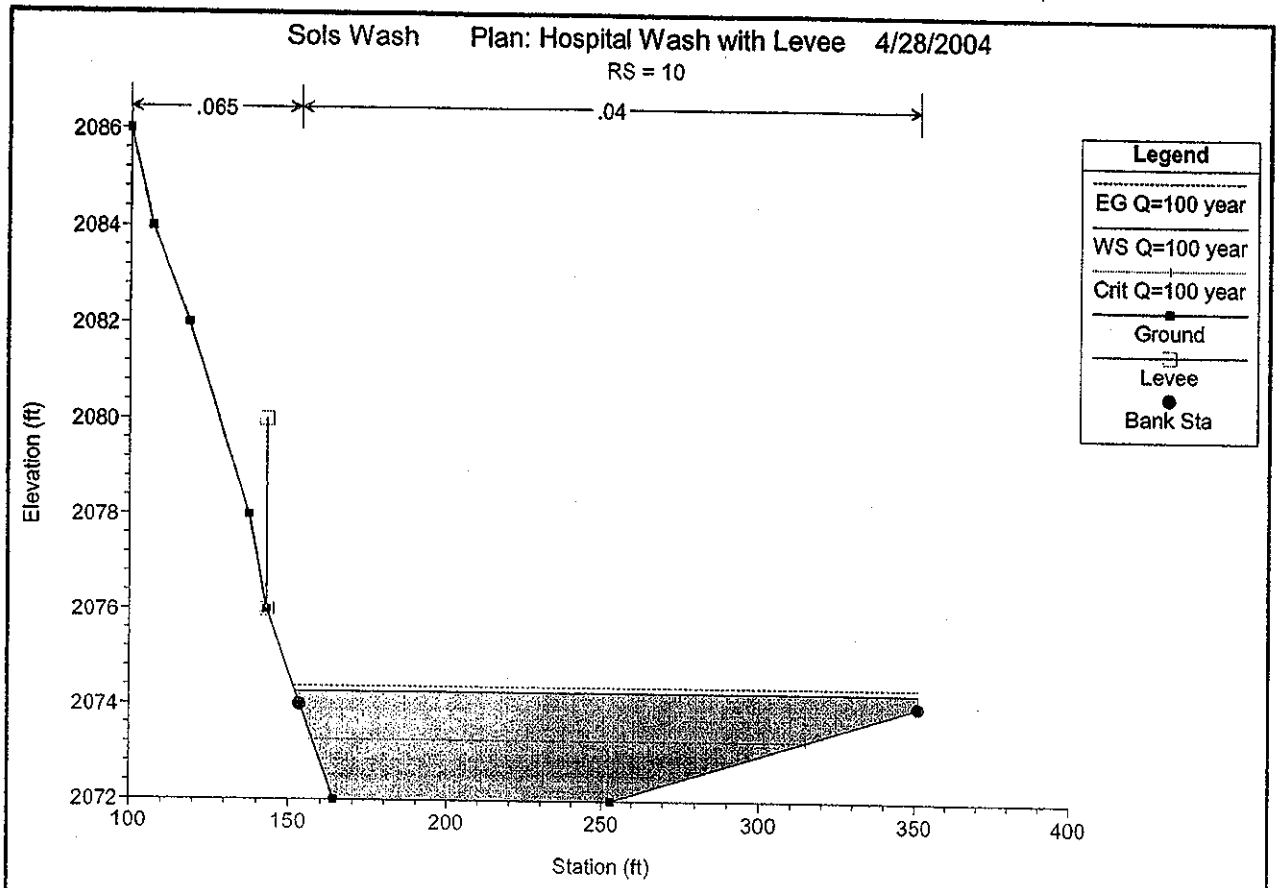
HOSPITAL WASH WITH LEVEE

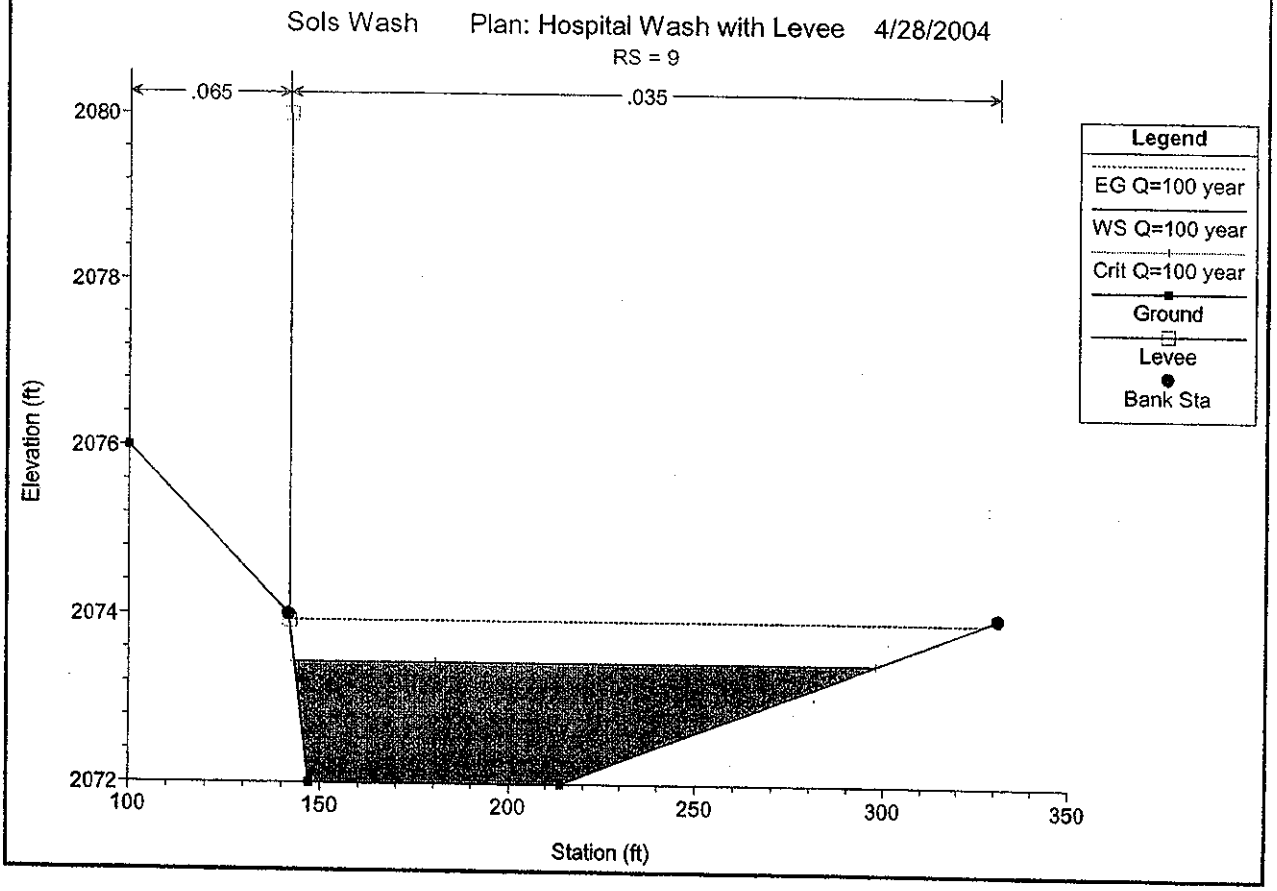

Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 16
.065
.035
.05
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Bank Sta
Elevation (ft)
2082
2081
2080
2079
2078
2077
2076
1000
1050
1100
1150
1200
1250
1300
1350
Station (ft)

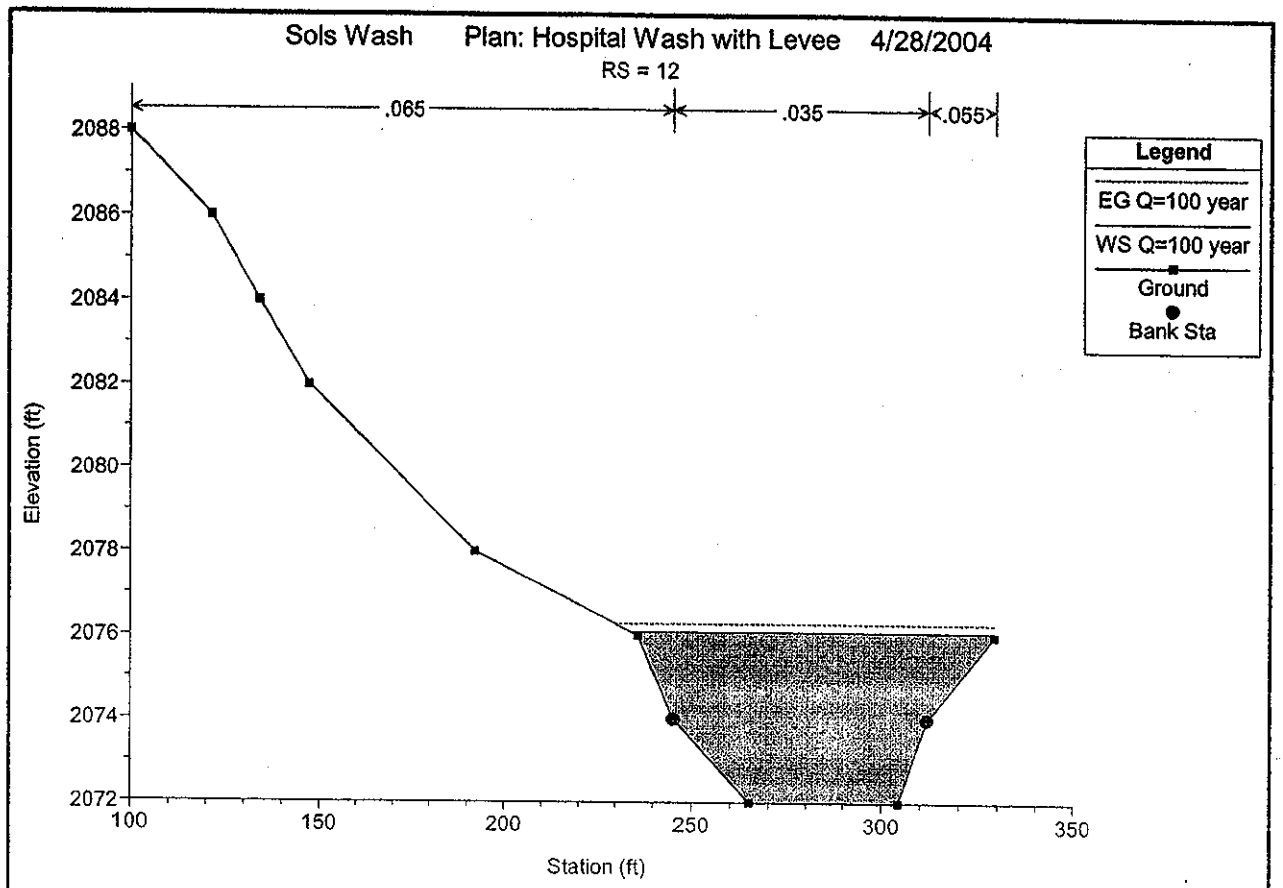

Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 15
.065
.035
.055
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Bank Sta
Elevation (ft)
2095
2090
2085
2080
2075
2070
100
120
140
160
180
200
220
Station (ft)

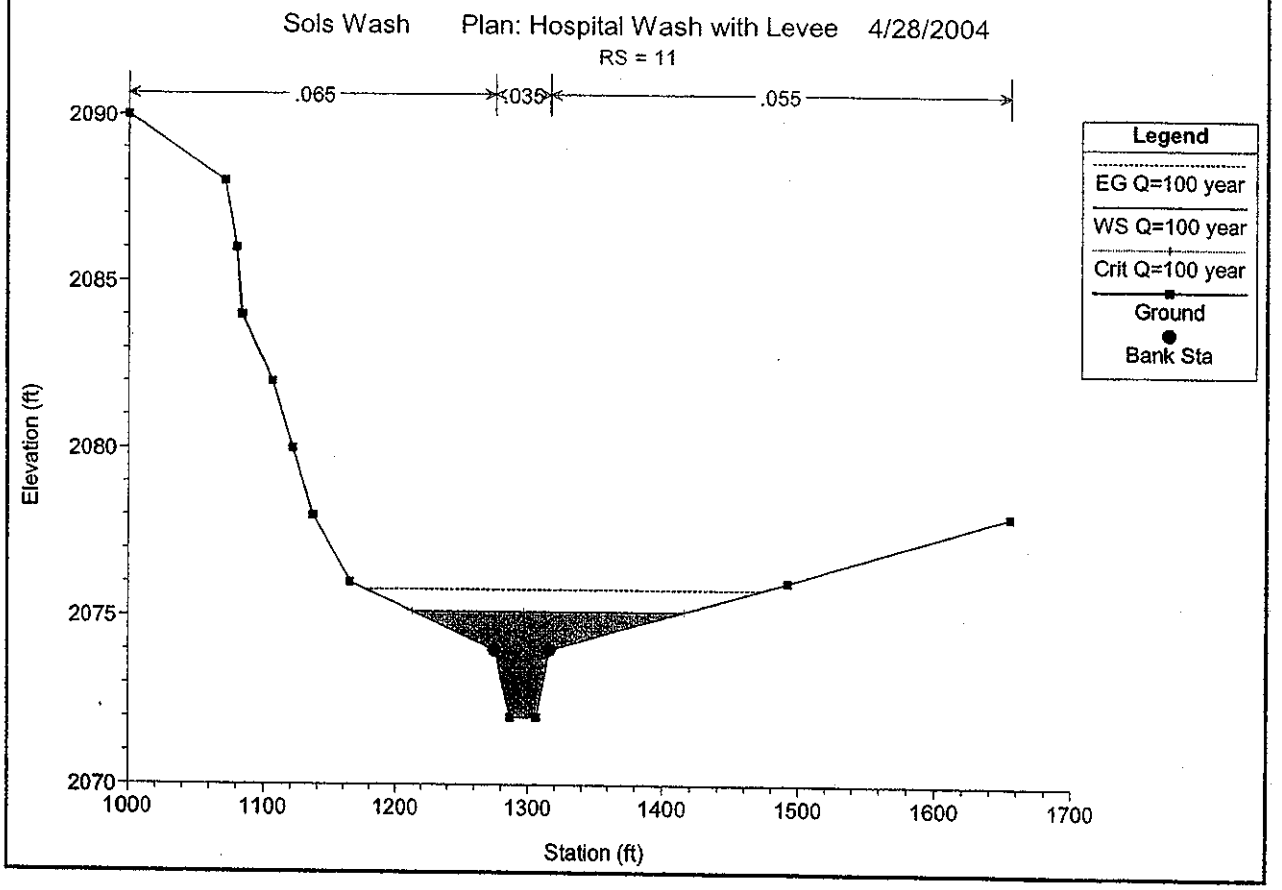

Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 14
.065
.035
.05
Legend
EG Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
2086
2084
2082
2080
2078
2076
2074
2072
100
120
140
160
180
200
220
240
Station (ft)

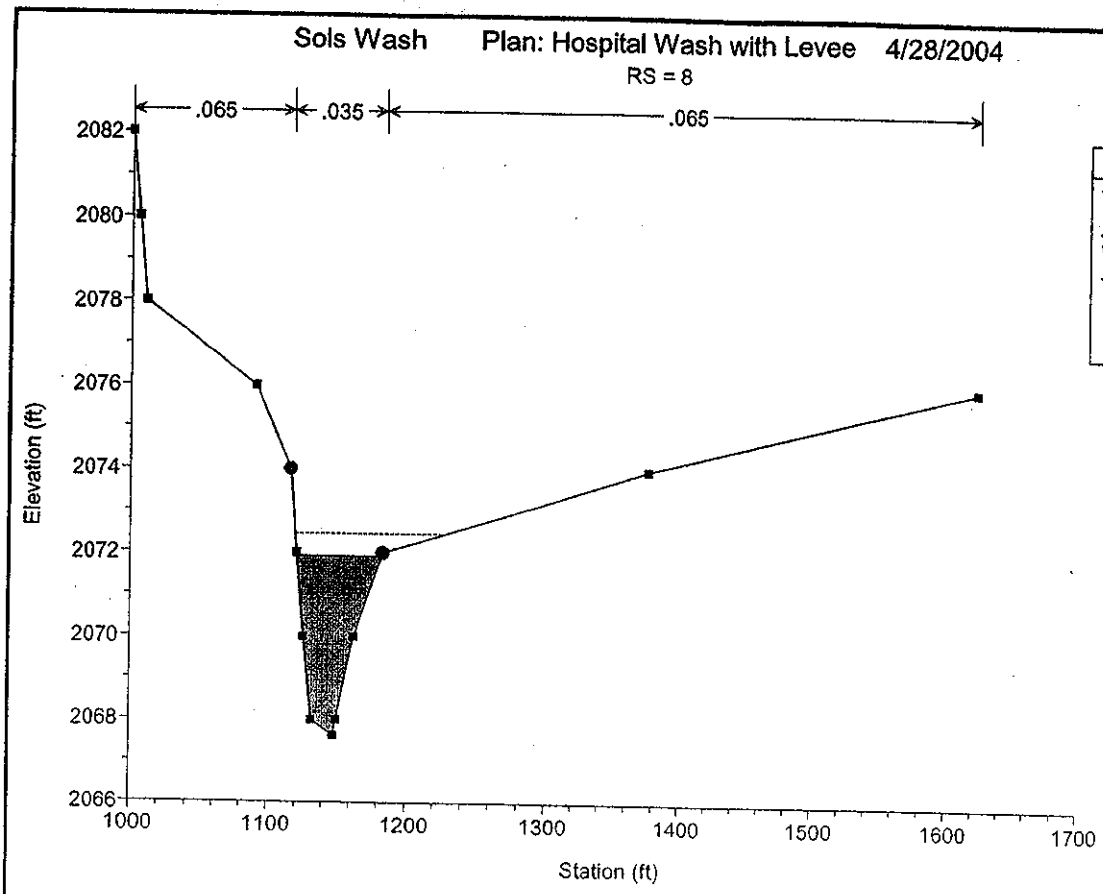

Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 13
.065
.035
.055
Legend
EG Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
2095
2090
2085
2080
2075
2070
100
150
200
250
300
Station (ft)

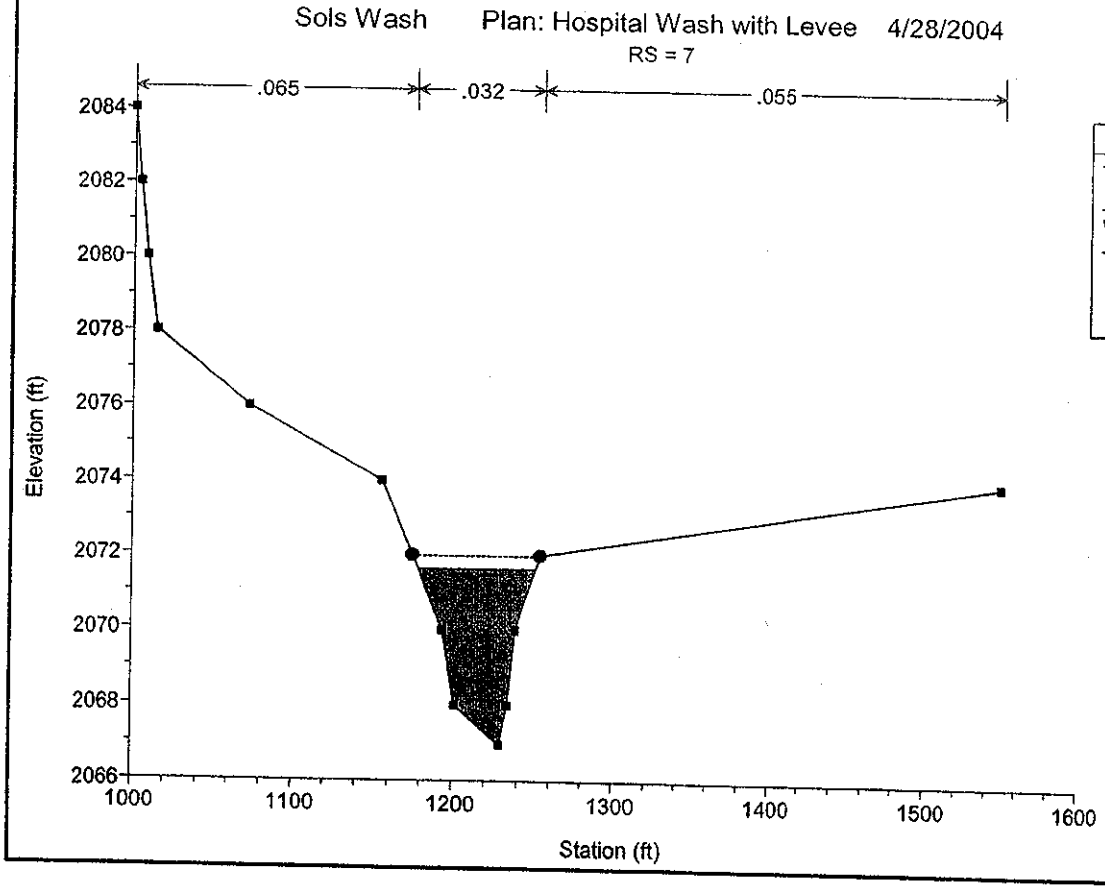

Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 10
.065
.04
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Levee
Bank Sta
Elevation (ft)
2086
2084
2082
2080
2078
2076
2074
2072
100
150
200
250
300
350
400
Station (ft)

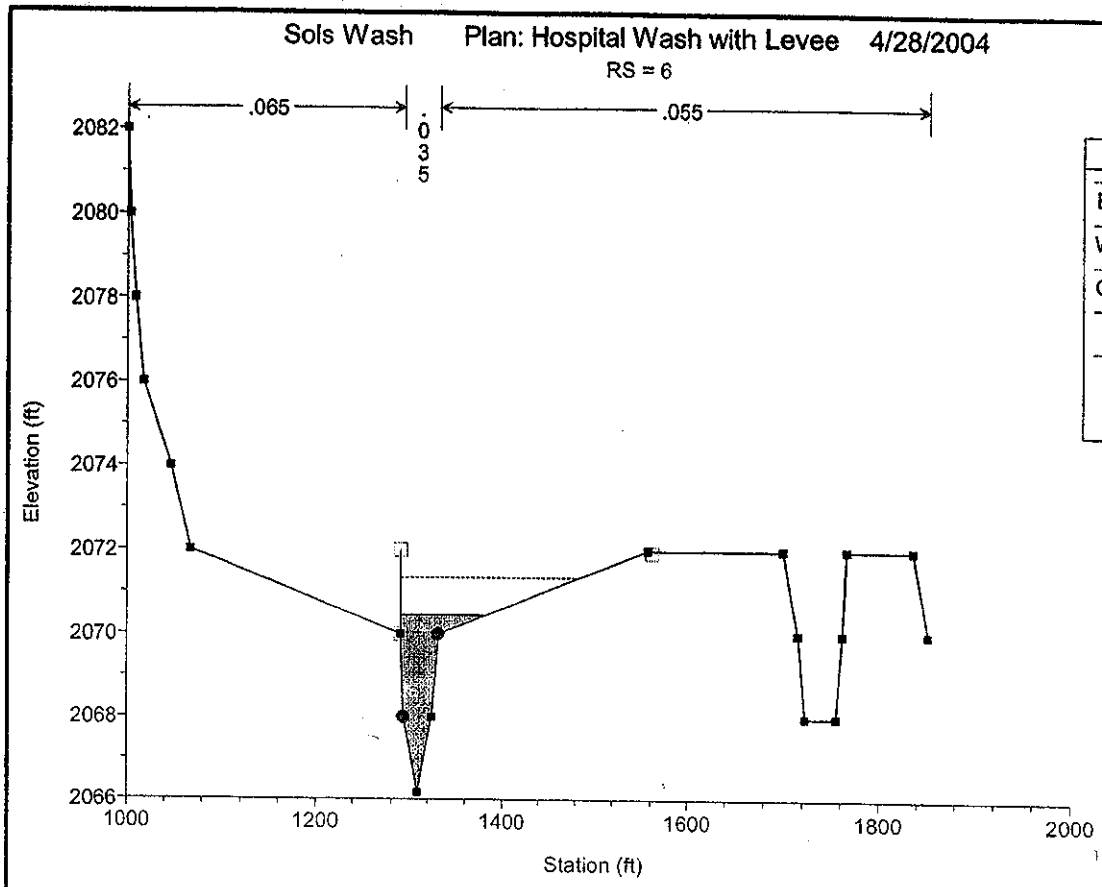

Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 9
.065
.035
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Levee
Bank Sta
Elevation (ft)
2080
2078
2076
2074
2072
100
150
200
250
300
350
Station (ft)

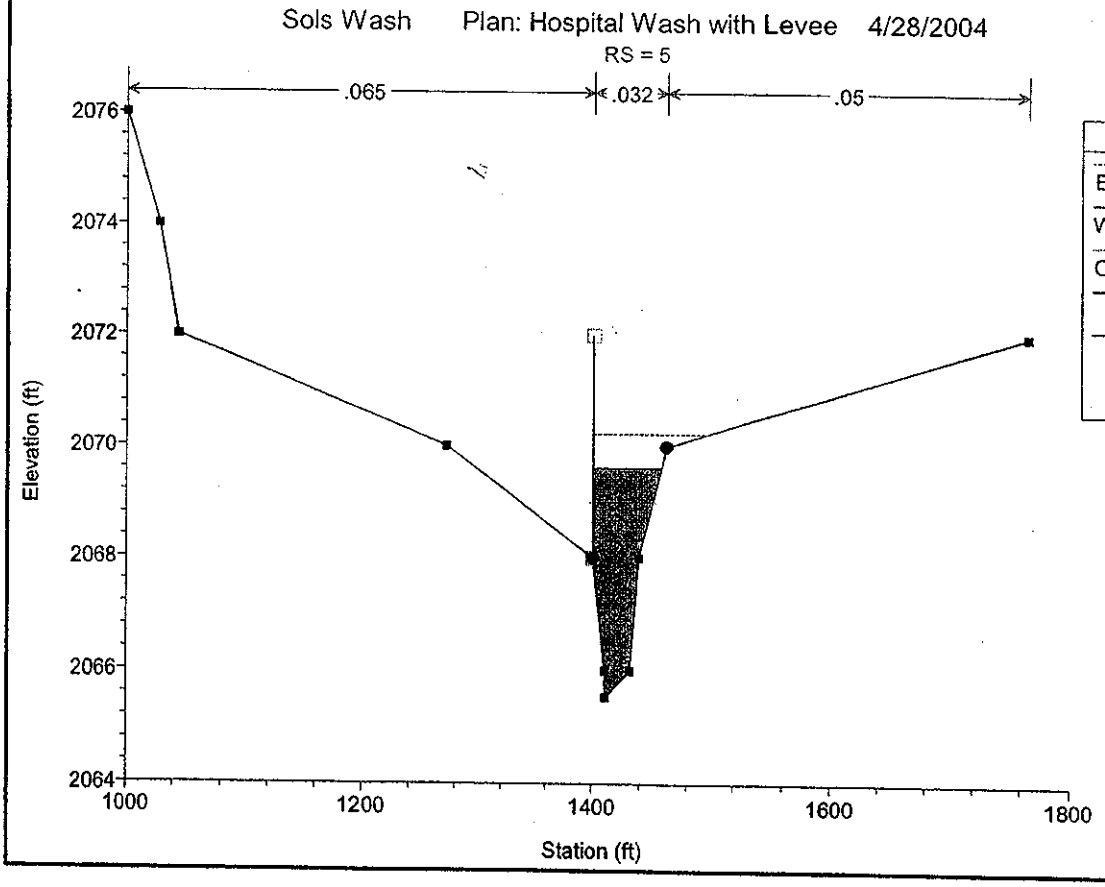

Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 12
.065
.035
.055
Legend
EG Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
2088
2086
2084
2082
2080
2078
2076
2074
2072
100
150
200
250
300
350
Station (ft)

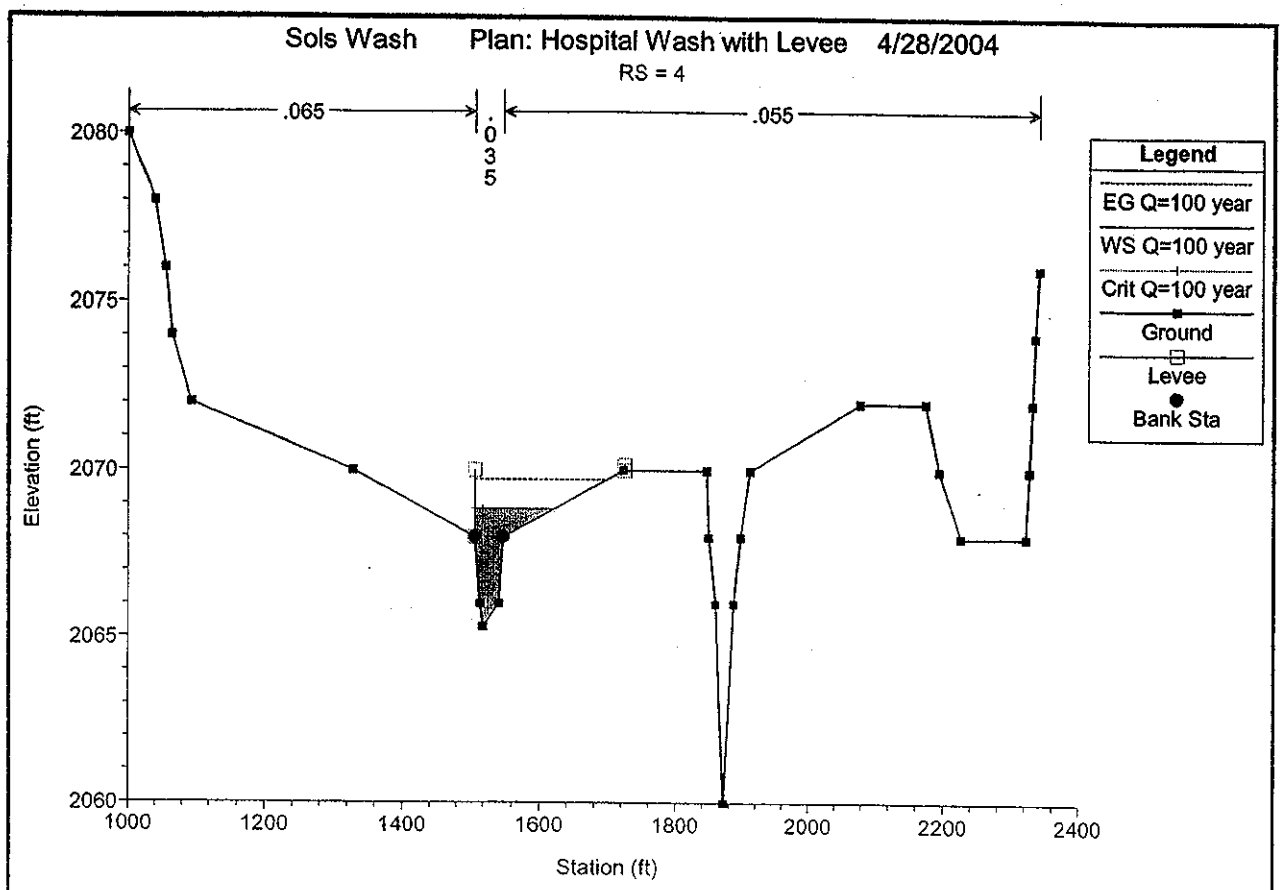

Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 11
.065
.035
.055
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Bank Sta
Elevation (ft)
2090
2085
2080
2075
2070
1000
1100
1200
1300
1400
1500
1600
1700
Station (ft)

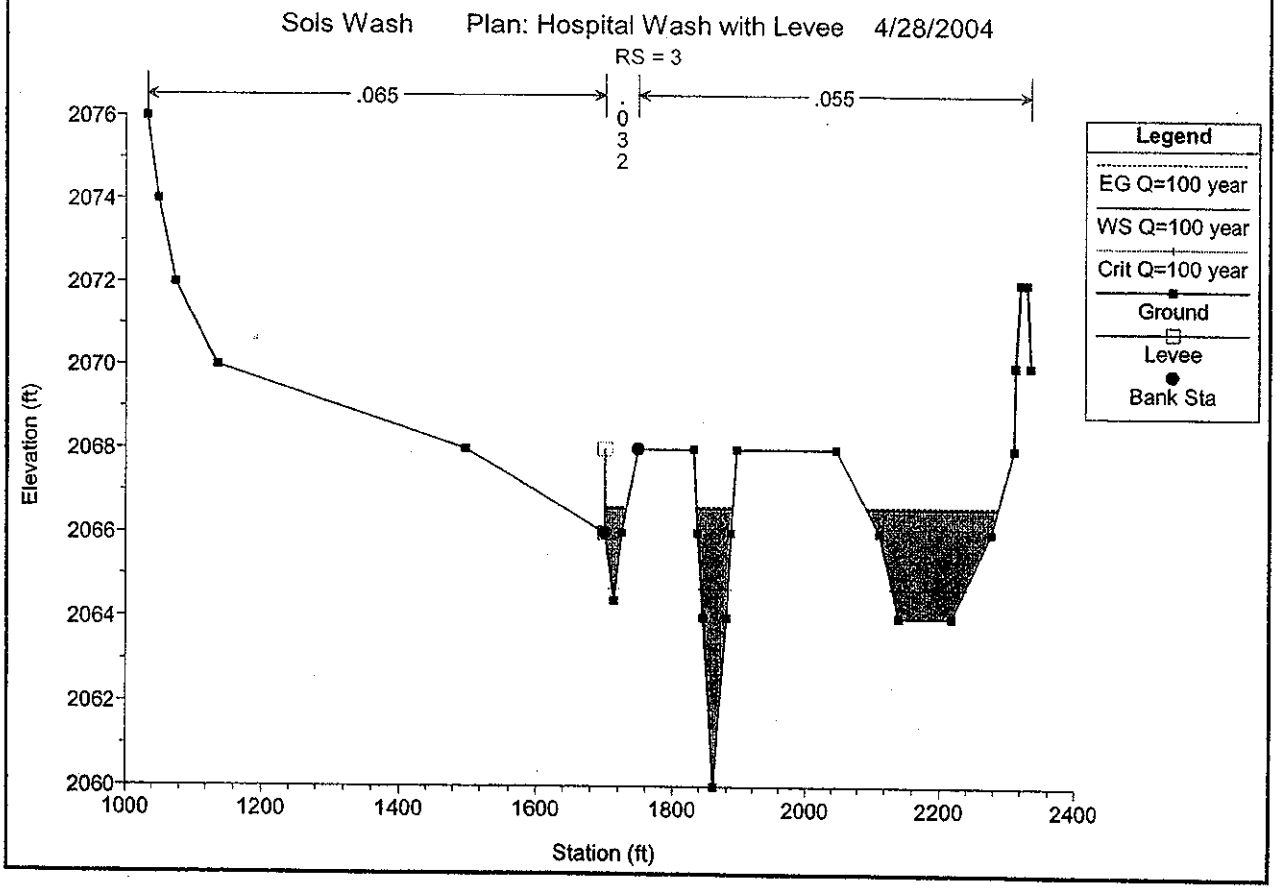

Sols Wash
Plan: Hospital Wash with Levee 4/28/2004
RS = 8
.065
.035
.065
Legend
EG Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
2082
2080
2078
2076
2074
2072
2070
2068
2066
1000
1100
1200
1300
1400
1500
1600
1700
Station (ft)

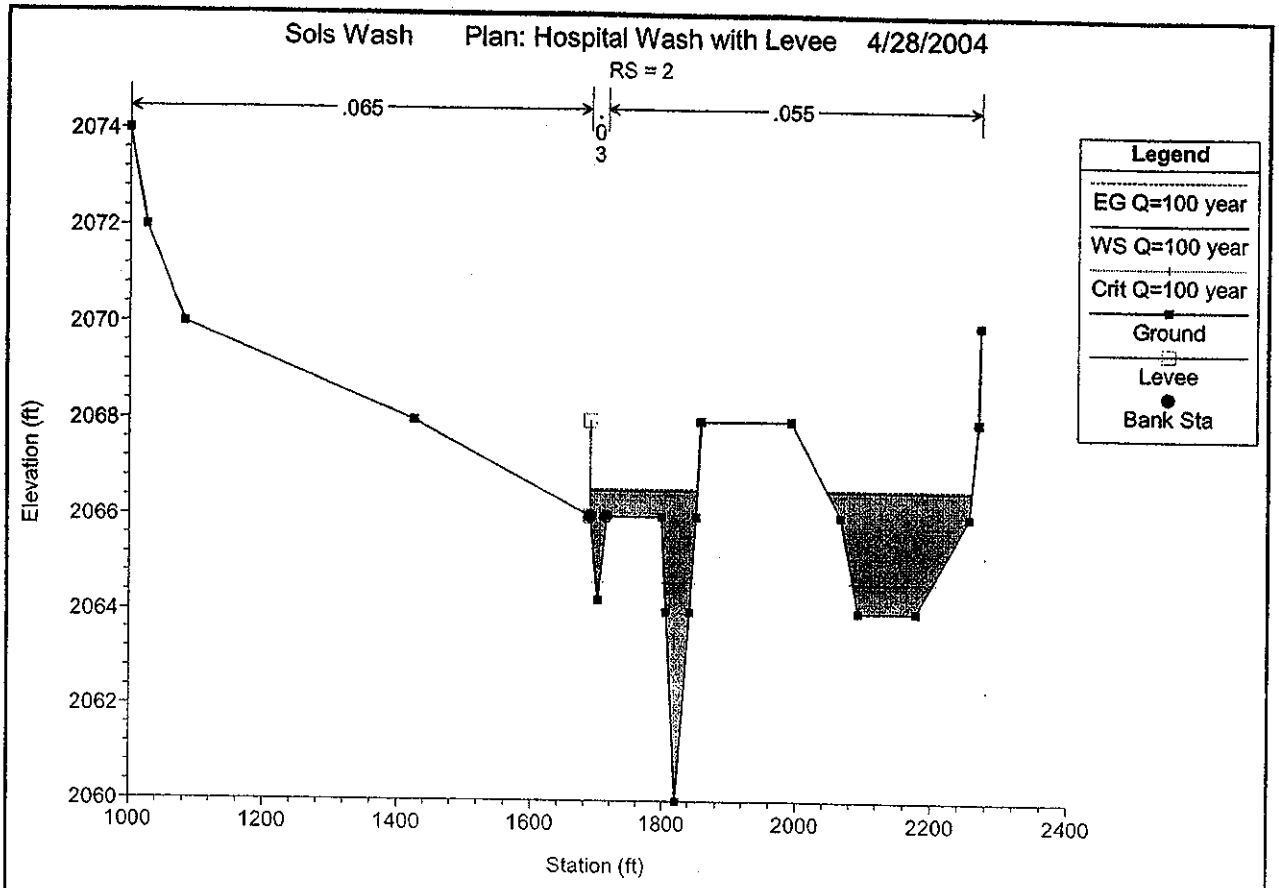

Sols Wash
Plan: Hospital Wash with Levee 4/28/2004
RS = 7
.065
.032
.055
Legend
EG Q=100 year
WS Q=100 year
Ground
Bank Sta
Elevation (ft)
2084
2082
2080
2078
2076
2074
2072
2070
2068
2066
1000
1100
1200
1300
1400
1500
1600
Station (ft)

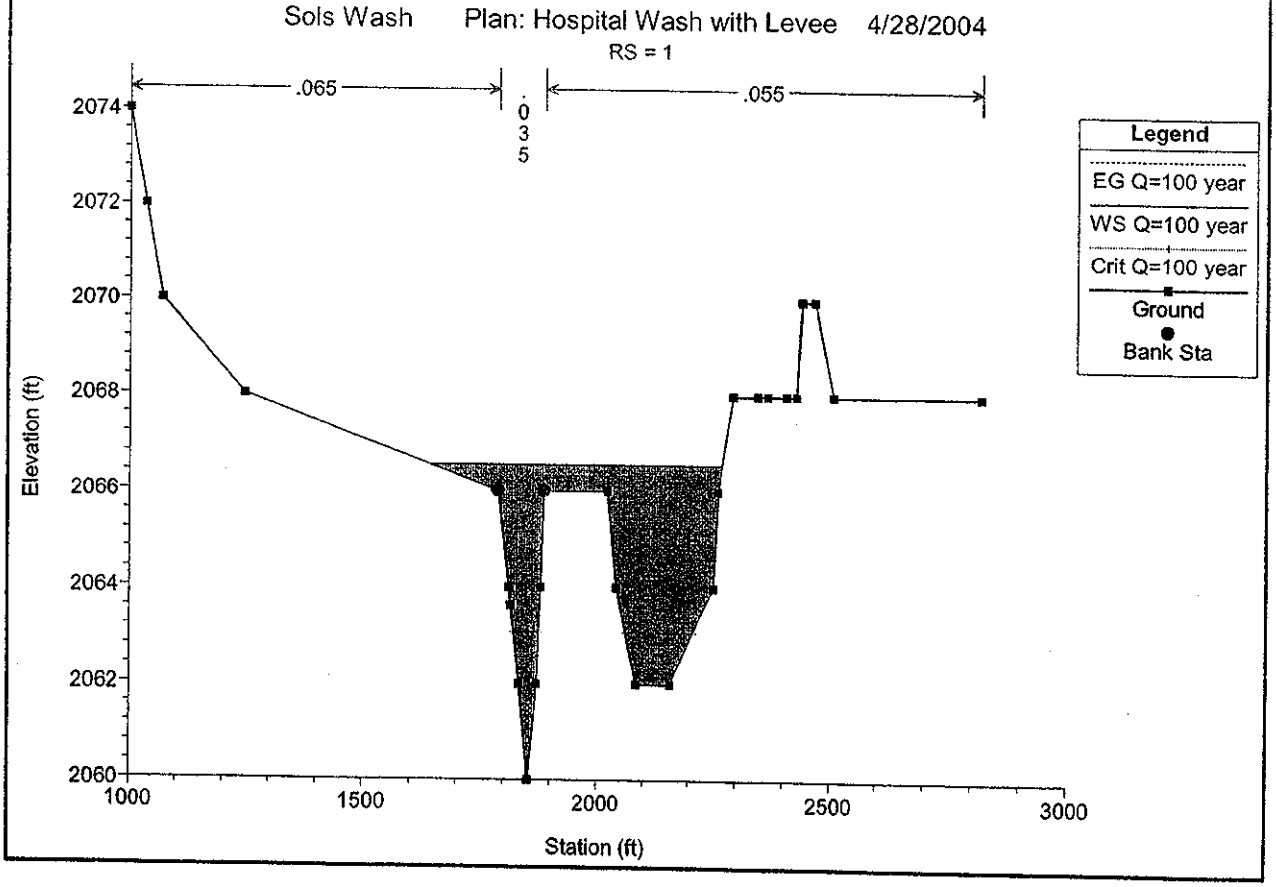

Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 6
.065
.035
.055
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 5
.065
.032
.05
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 4
.065
.035
.055
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash Plan: Hospital Wash with Levee 4/28/2004
RS = 3
.065
.032
.055
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

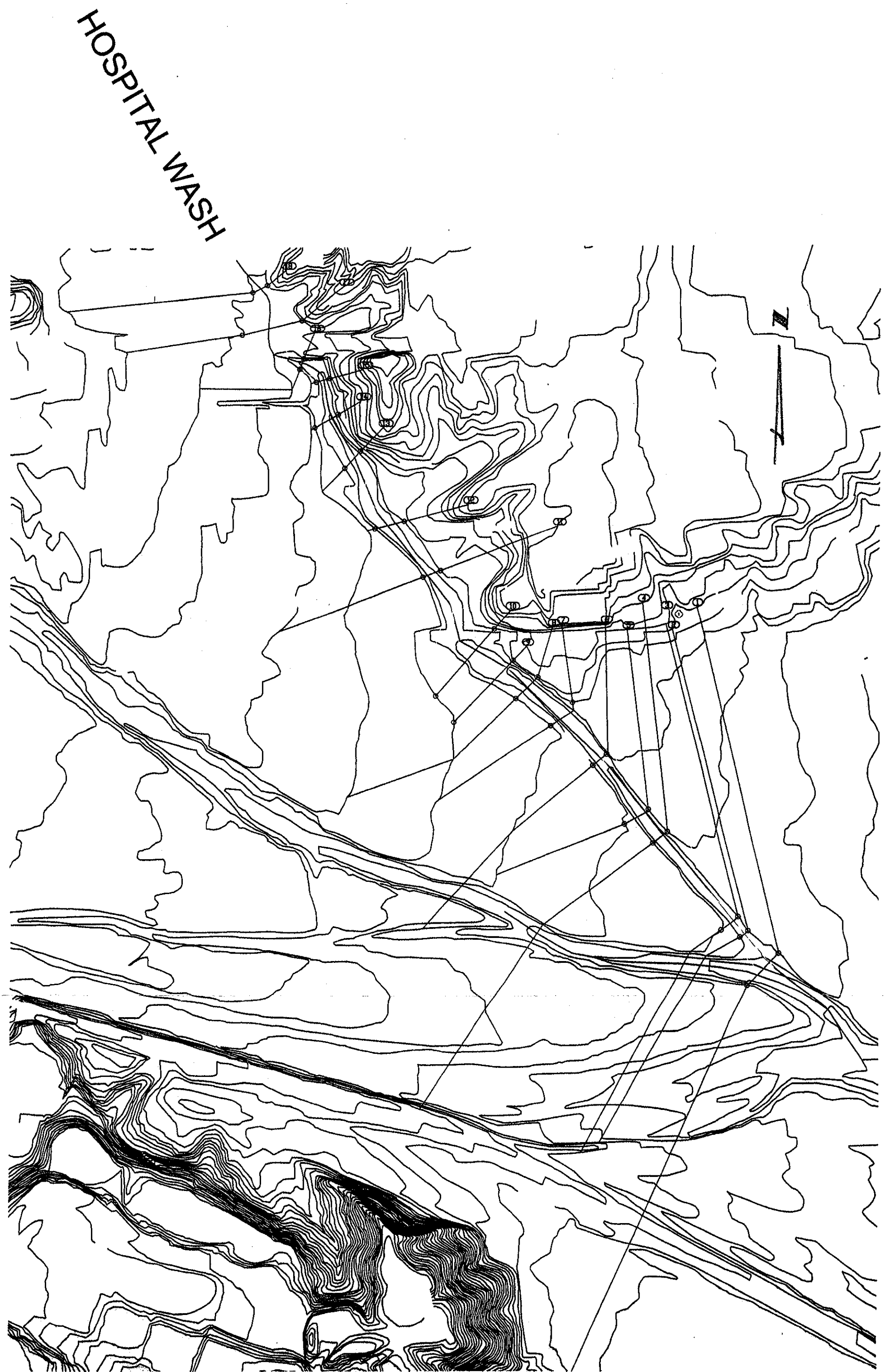

Sols Wash
Plan: Hospital Wash with Levee
4/28/2004
RS = 2
.065
.055
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash
Plan: Hospital Wash with Levee
4/28/2004
RS = 1
.065
.055
Legend
EG Q=100 year
WS Q=100 year
Crit Q=100 year
Ground
Bank Sta
Elevation (ft)
Station (ft)

HOSPITAL WASH LEVEE DESIGN

	sect	Q100 wselev	levee	grnd	
~~0.76~~	6	2070.5	2073.5	2070	3.5
~~0.71~~	5	2069.6	2072.6	2068	4.6
	4	2068.8	2073.8	2068	5.8
	3	2066.6	2069.6	2066	3.6
~~0.66~~	2	2066.6	2069.6	2066	3.6

MODEL IV - HOSPITAL WASH
LEVEE IMPROVEMENTS WEST OF
U.S. 93 - REVISED SEC 1 THRU 7



ATTACHMENT F:
COMPOSITE MODEL IX – SOLS WASH – COMPOSITE CHANNEL SECTION

Model IX - Sols Wash – Composite Channel Section

Model IX is a composite channel using concrete lining on the south bank and gabions on the north bank. The channel between the banks is left in its natural state allowing it to assume an equilibrium slope in time. This slope will be calculated during the sediment transport analysis and the toe down required for the bank protection will be calculated. As a preliminary analysis, the existing slope was used to determine bottom width, which would allow passage of the 100-year flood and not cause backwater over the bridge at Tegner Street. Beginning with a 70' bottom, it was found that the 90' bottom was the narrowest bottom width that didn't cause backwater. The velocity for flow in the channel is around 14 fps, which will be analyzed later for scour depths.

HEC-RAS Plan: Plan 23 River: Sols Wash Reach: Reach 1 Profile: PF 2

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.53	2088.53	2089.89	0.004281	12.06	2088.86	880.00	0.91
Reach 1	1.00	PF 2	14413.00	2078.10	2084.07	2084.07	2085.60	0.004798	12.86	1957.76	850.22	0.96
Reach 1	0.90	PF 2	14413.00	2073.10	2079.38	2079.38	2080.92	0.007230	12.89	1873.35	681.00	0.96
Reach 1	0.79	PF 2	14413.00	2067.42	2073.90	2073.90	2075.50	0.009363	13.32	1886.69	924.15	1.09
Reach 1	0.76	PF 2	14413.00	2065.84	2071.96	2071.96	2073.62	0.006730	12.15	1633.80	881.70	0.94
Reach 1	0.71	PF 2	14413.00	2063.89	2071.02	2070.12	2071.96	0.002965	9.37	2351.77	664.94	0.64
Reach 1	0.66	PF 2	14413.00	2061.79	2069.70	2068.75	2071.10	0.003460	10.59	1815.94	534.05	0.70
Reach 1	0.61	PF 2	14459.00	2059.91	2066.89	2066.89	2069.77	0.006845	13.67	1097.00	200.63	0.97
Reach 1	0.57	PF 2	14459.00	2057.69	2064.67	2064.53	2067.46	0.006832	13.41	1084.50	185.75	0.97
Reach 1	0.52	PF 2	14459.00	2055.50	2064.20	2062.80	2065.92	0.003375	10.60	1441.40	220.47	0.70
Reach 1	0.48	PF 2	15045.00	2053.51	2063.88	2060.38	2065.10	0.001702	8.85	1700.55	184.50	0.51
Reach 1	0.43	PF 2	15045.00	2051.27	2063.63	2058.29	2064.63	0.000959	8.00	1880.52	201.36	0.41
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2060.81	2056.56	2061.99	0.001319	8.72	1727.29	185.86	0.47
Reach 1	0.35	PF 2	15045.00	2047.68	2056.52	2056.52	2060.53	0.005861	16.08	941.71	117.91	0.99
Reach 1	0.27	PF 2	15045.00	2044.00	2054.66	2053.26	2057.81	0.003875	14.25	1056.04	107.49	0.80
Reach 1	0.22	PF 2	15045.00	2043.00	2052.04	2052.04	2056.06	0.006100	16.10	934.53	115.47	1.00
Reach 1	0.19	PF 2	15045.00	2040.69	2049.70	2049.70	2053.59	0.006242	15.82	950.73	121.19	1.00
Reach 1	.13	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2047.25	2047.25	2050.36	0.004473	15.08	1349.67	239.45	0.98
Reach 1	0.08	PF 2	15045.00	2036.99	2044.19		2044.79	0.002923	7.67	3305.61	818.56	0.55
Reach 1	.05	PF 2	15045.00	2038.00	2043.52	2042.38	2044.34	0.002757	9.09	3336.53	1079.12	0.72

MODEL IX COMPOSITE CHANNEL

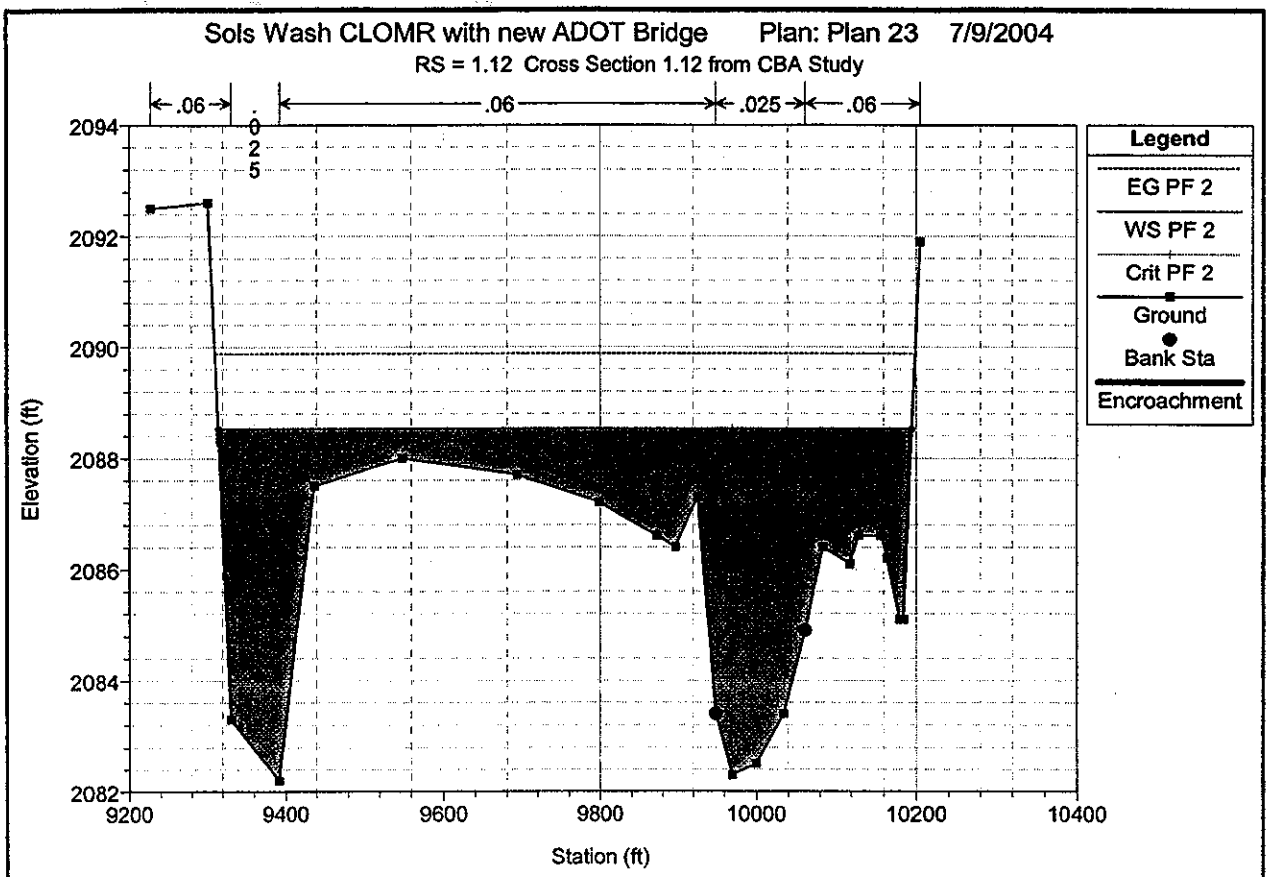
B=90' S= .00721

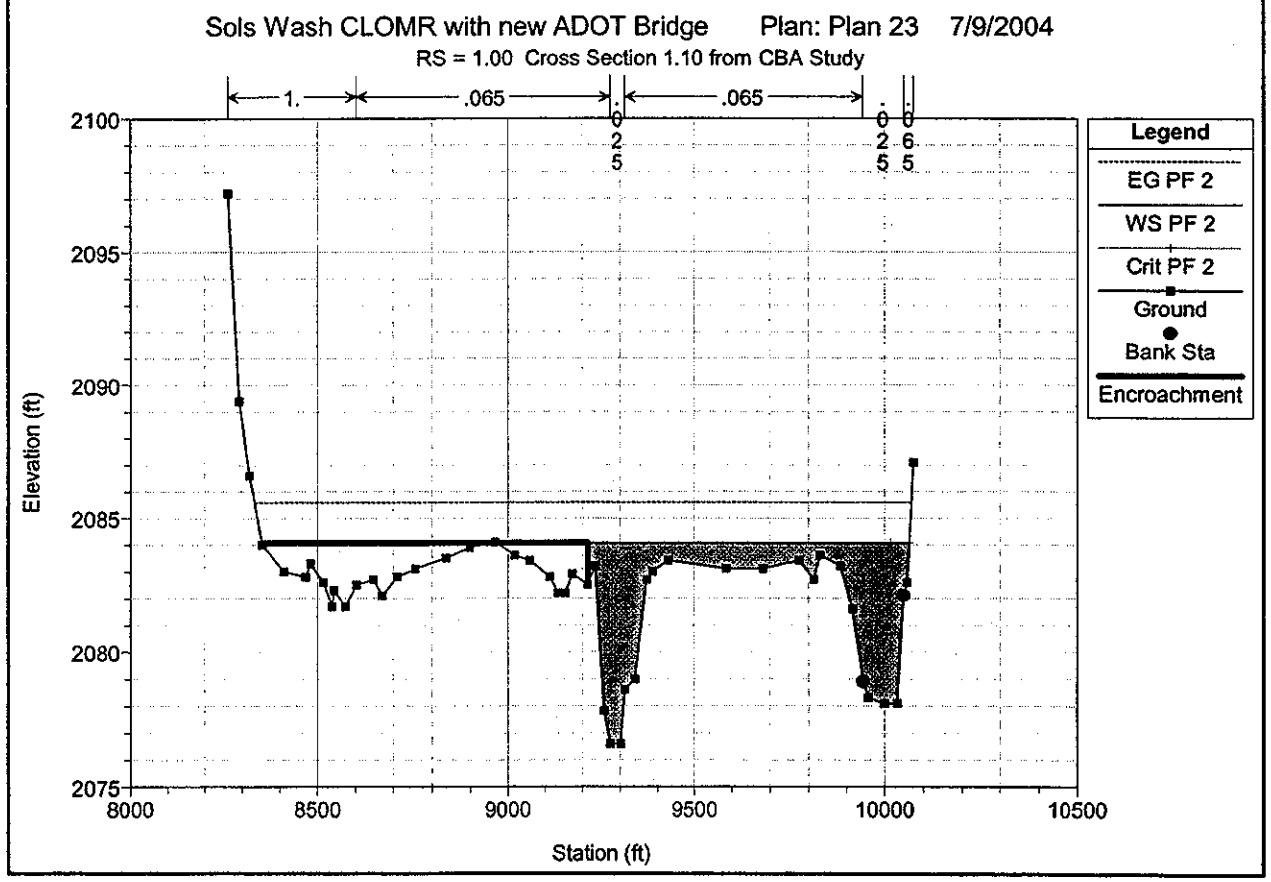
SUBCR

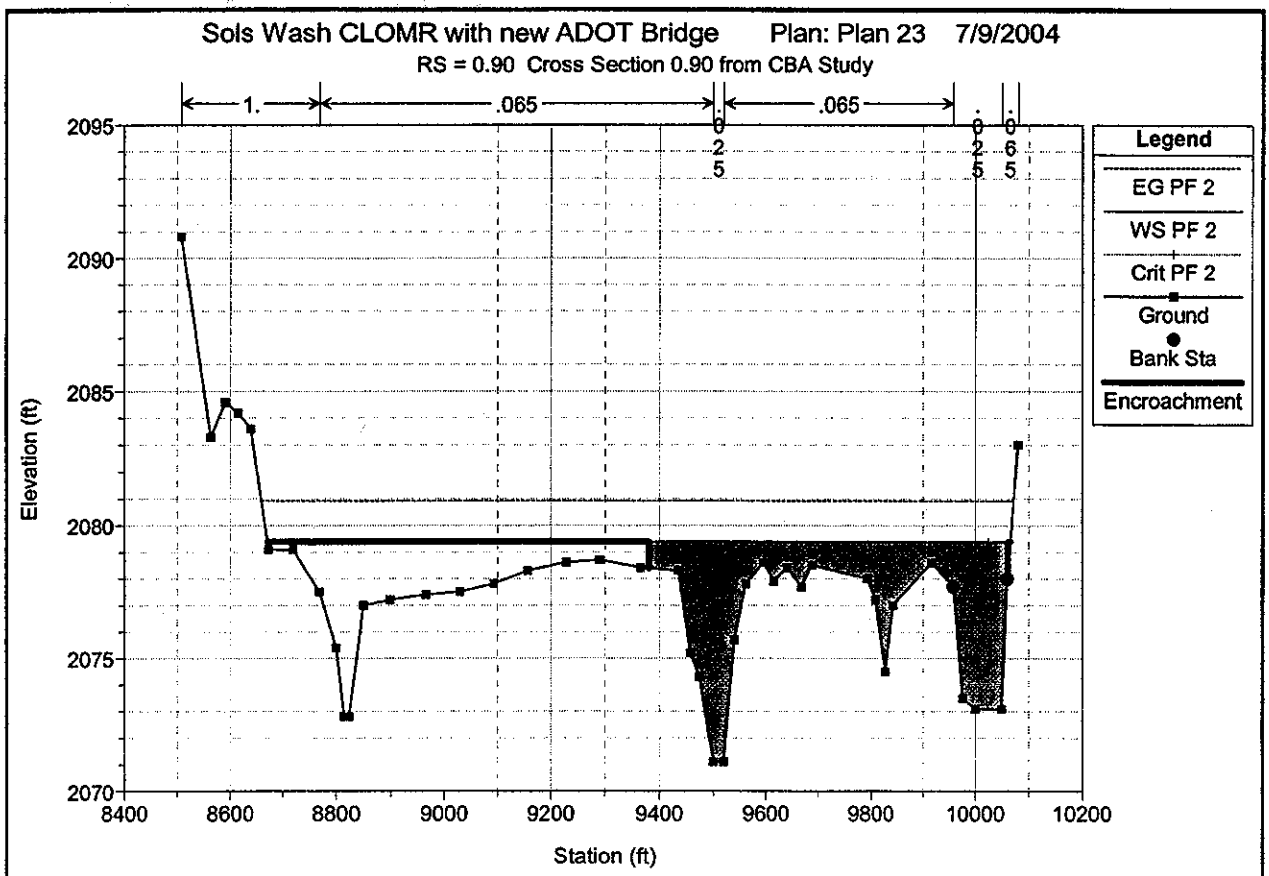
HEC-RAS Plan: Plan 23 River: Sols Wash Reach: Reach 1 Profile: PF 2

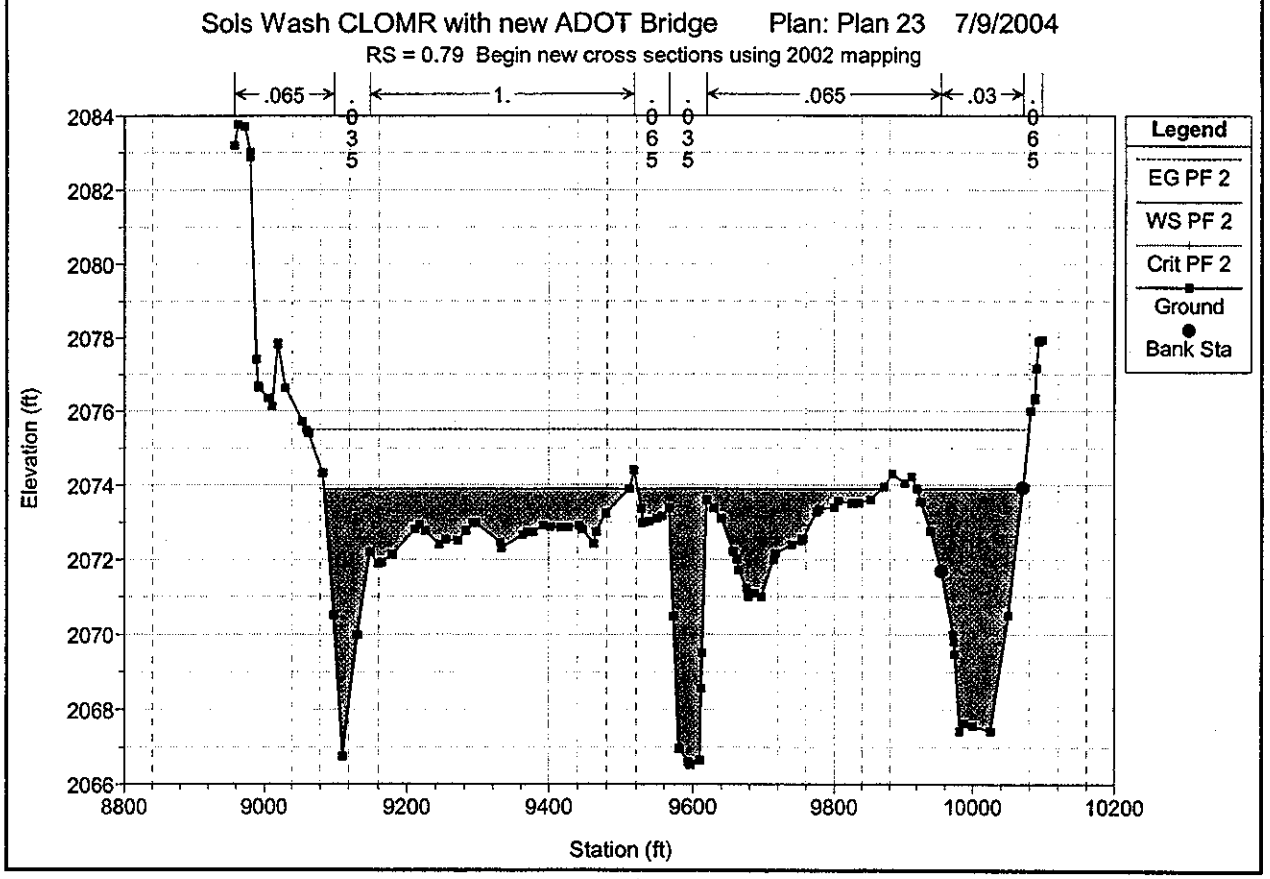
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.53	2088.53	2089.89	0.004281	12.06	2088.86	880.00	0.91
Reach 1	1.00	PF 2	14413.00	2078.10	2082.98	2084.07	2085.85	0.010136	16.15	1154.56	356.71	1.35
Reach 1	0.90	PF 2	14413.00	2073.10	2079.12	2079.38	2080.95	0.008989	13.90	1691.96	681.00	1.07
Reach 1	0.79	PF 2	14413.00	2067.42	2073.74	2073.90	2075.53	0.010654	13.96	1737.37	901.57	1.15
Reach 1	0.76	PF 2	14413.00	2065.84	2071.96	2071.96	2073.62	0.006730	12.15	1633.80	881.70	0.94
Reach 1	0.71	PF 2	14413.00	2063.89	2071.02	2070.12	2071.96	0.002965	9.37	2351.77	664.94	0.64
Reach 1	0.66	PF 2	14413.00	2061.79	2069.70	2068.75	2071.10	0.003460	10.59	1815.94	534.05	0.70
Reach 1	0.61	PF 2	14459.00	2059.91	2066.89	2066.89	2069.77	0.006845	13.67	1097.00	200.63	0.97
Reach 1	0.57	PF 2	14459.00	2057.69	2063.82	2064.53	2067.60	0.011173	15.61	928.21	184.03	1.21
Reach 1	0.52	PF 2	14459.00	2055.50	2064.20	2062.80	2065.92	0.003375	10.60	1441.40	220.47	0.70
Reach 1	0.48	PF 2	15045.00	2053.51	2063.88	2060.38	2065.10	0.001702	8.85	1700.55	184.50	0.51
Reach 1	0.43	PF 2	15045.00	2051.27	2063.63	2058.29	2064.63	0.000959	8.00	1880.52	201.36	0.41
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2060.81	2056.56	2061.99	0.001319	8.72	1727.29	185.86	0.47
Reach 1	0.35	PF 2	15045.00	2047.68	2056.52	2056.52	2060.53	0.005861	16.08	941.71	117.91	0.99
Reach 1	0.27	PF 2	15045.00	2044.00	2054.66	2053.26	2057.81	0.003875	14.25	1056.04	107.49	0.80
Reach 1	0.22	PF 2	15045.00	2043.00	2052.04	2052.04	2056.06	0.006100	16.10	934.53	115.47	1.00
Reach 1	0.19	PF 2	15045.00	2040.69	2047.94	2049.70	2054.31	0.013339	20.24	743.24	115.11	1.40
Reach 1	.13	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2046.27	2047.25	2050.55	0.007350	17.58	1133.13	214.56	1.22
Reach 1	0.08	PF 2	15045.00	2036.99	2044.19	2042.48	2044.79	0.002917	7.66	3307.91	818.58	0.55
Reach 1	.05	PF 2	15045.00	2038.00	2043.52	2042.39	2044.34	0.002757	9.09	3336.53	1079.12	0.72

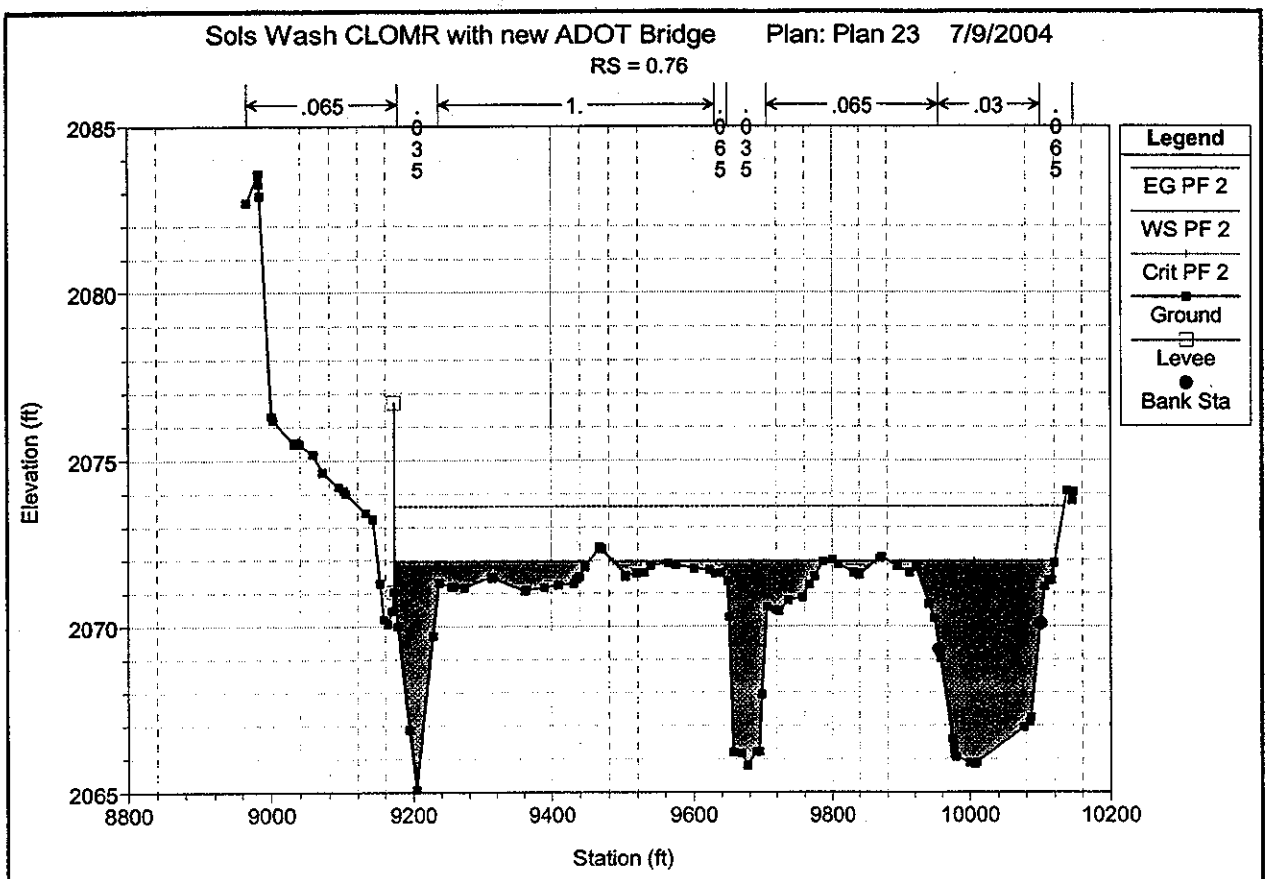
MODEL IX COMPOSITE CHANNEL
B=90' S: .00721
MIXED

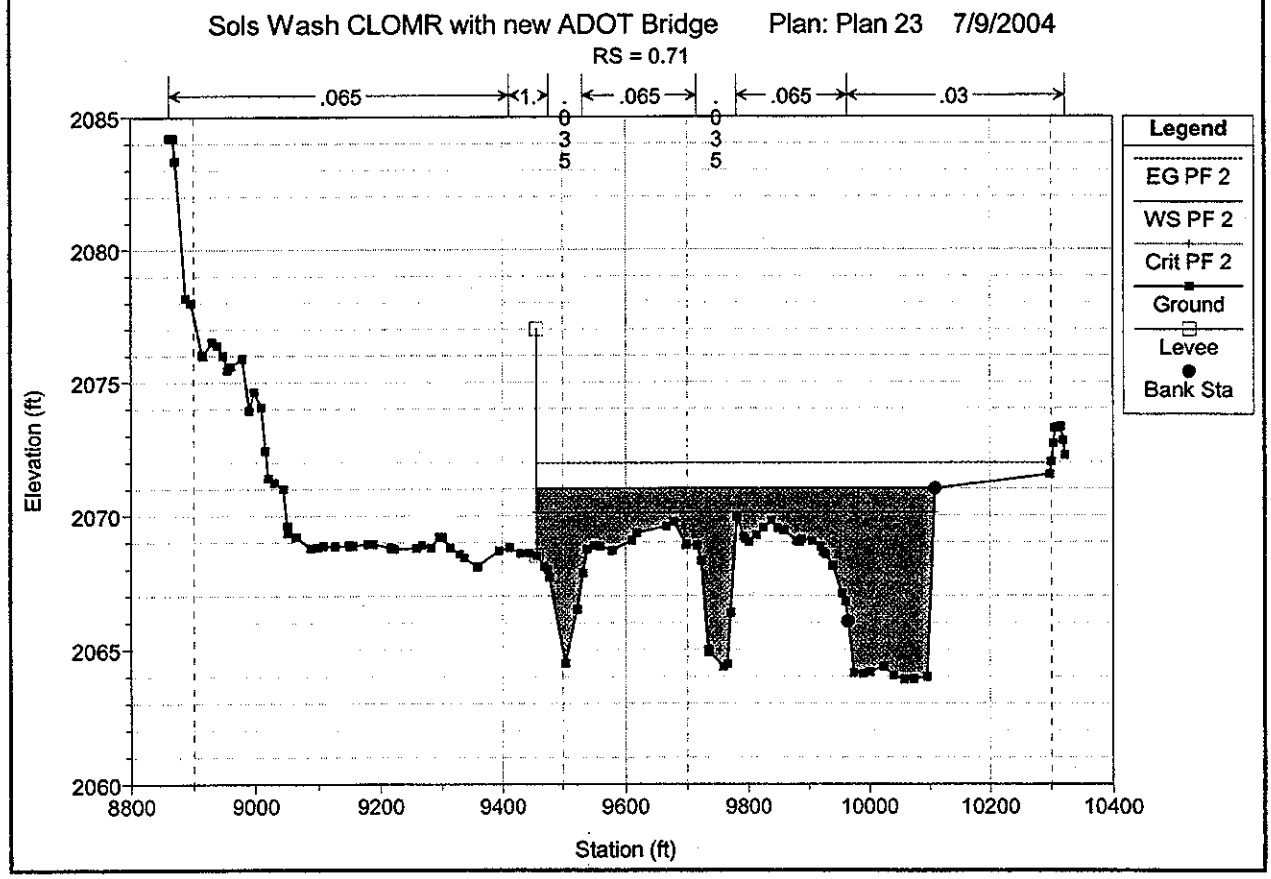

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 1.12 Cross Section 1.12 from CBA Study
.06
.025
.06
.025
.06
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2094
2092
2090
2088
2086
2084
2082
9200
9400
9600
9800
10000
10200
10400
Station (ft)

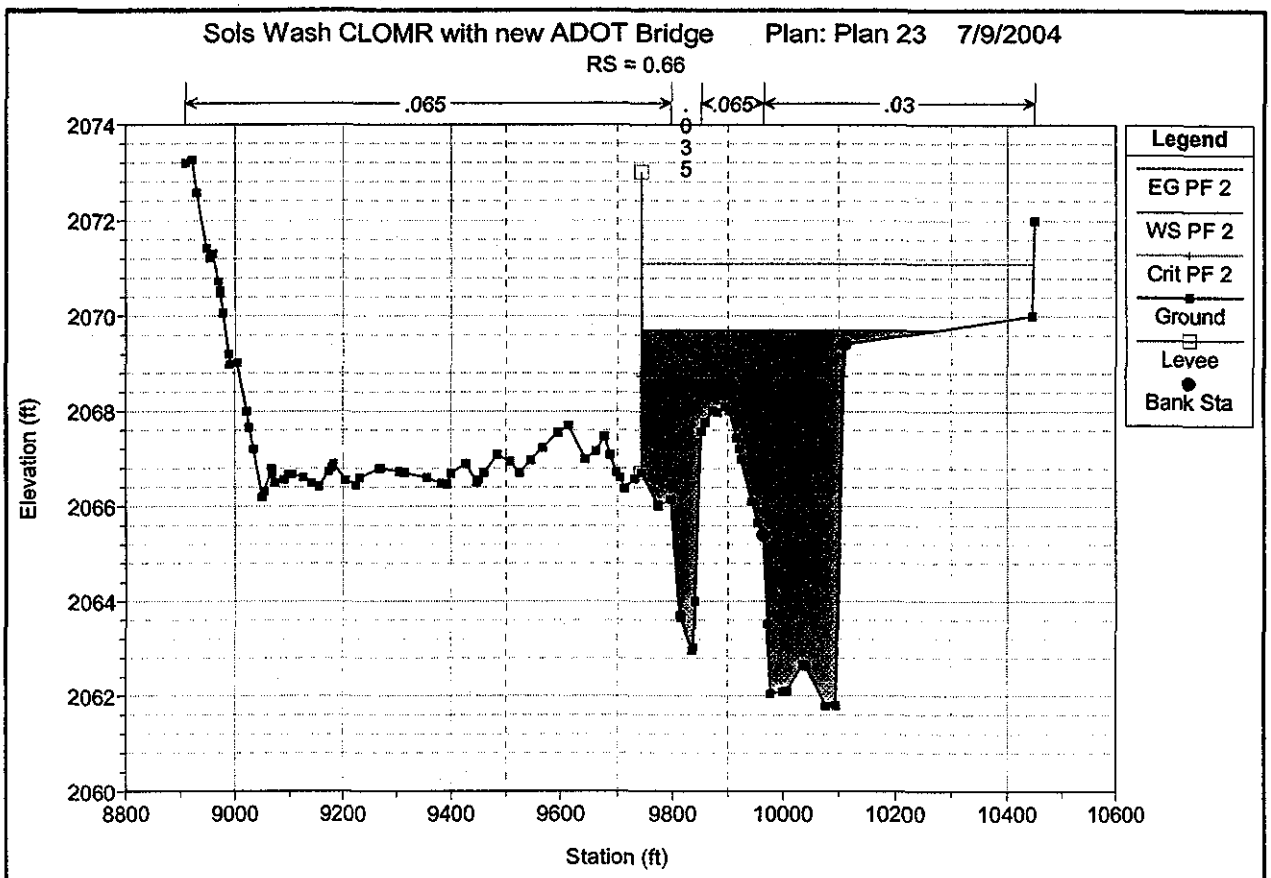

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 1.00 Cross Section 1.10 from CBA Study
1.
.065
.025
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2100
2095
2090
2085
2080
2075
8000
8500
9000
9500
10000
10500
Station (ft)

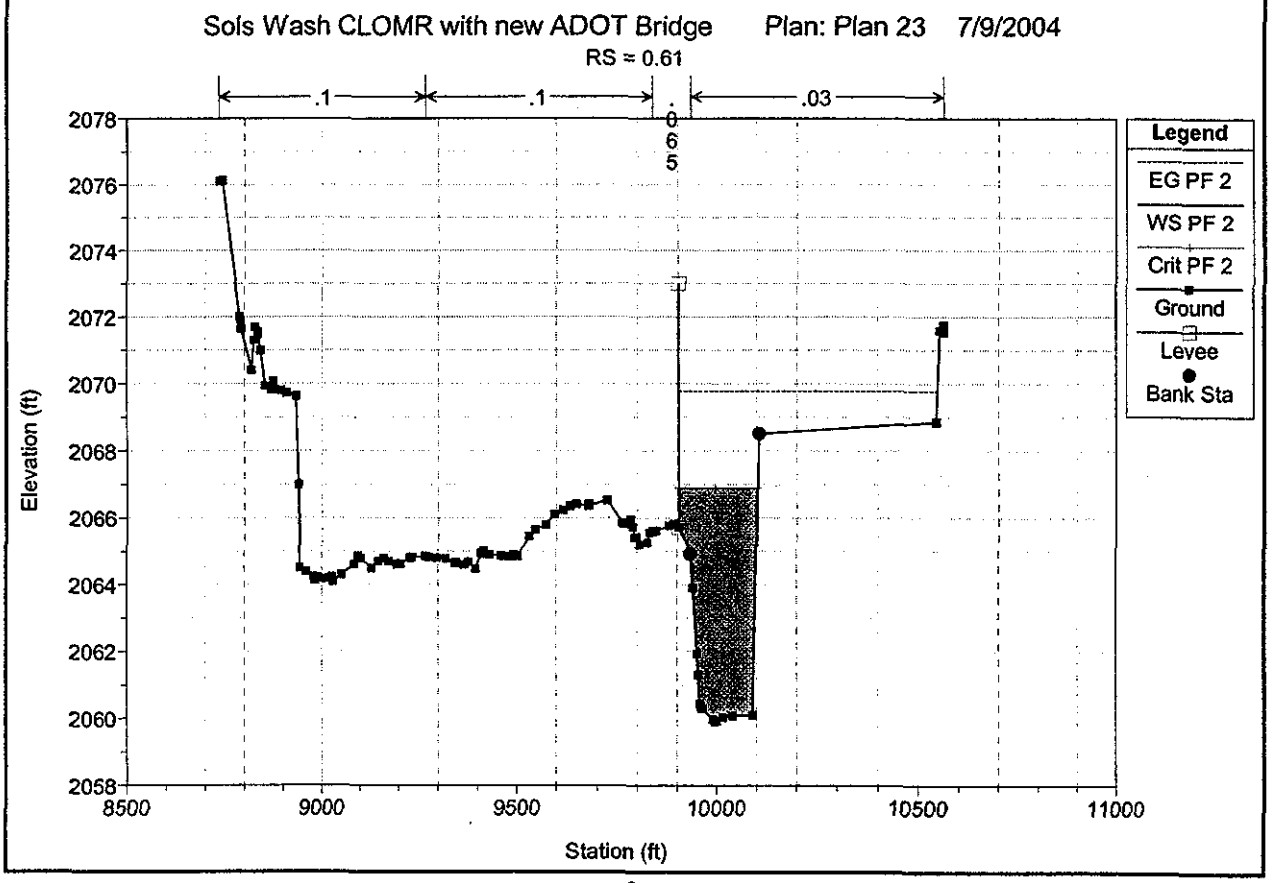

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.90 Cross Section 0.90 from CBA Study
1.
.065
.025
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
2095
2090
2085
2080
2075
2070
8400
8600
8800
9000
9200
9400
9600
9800
10000
10200

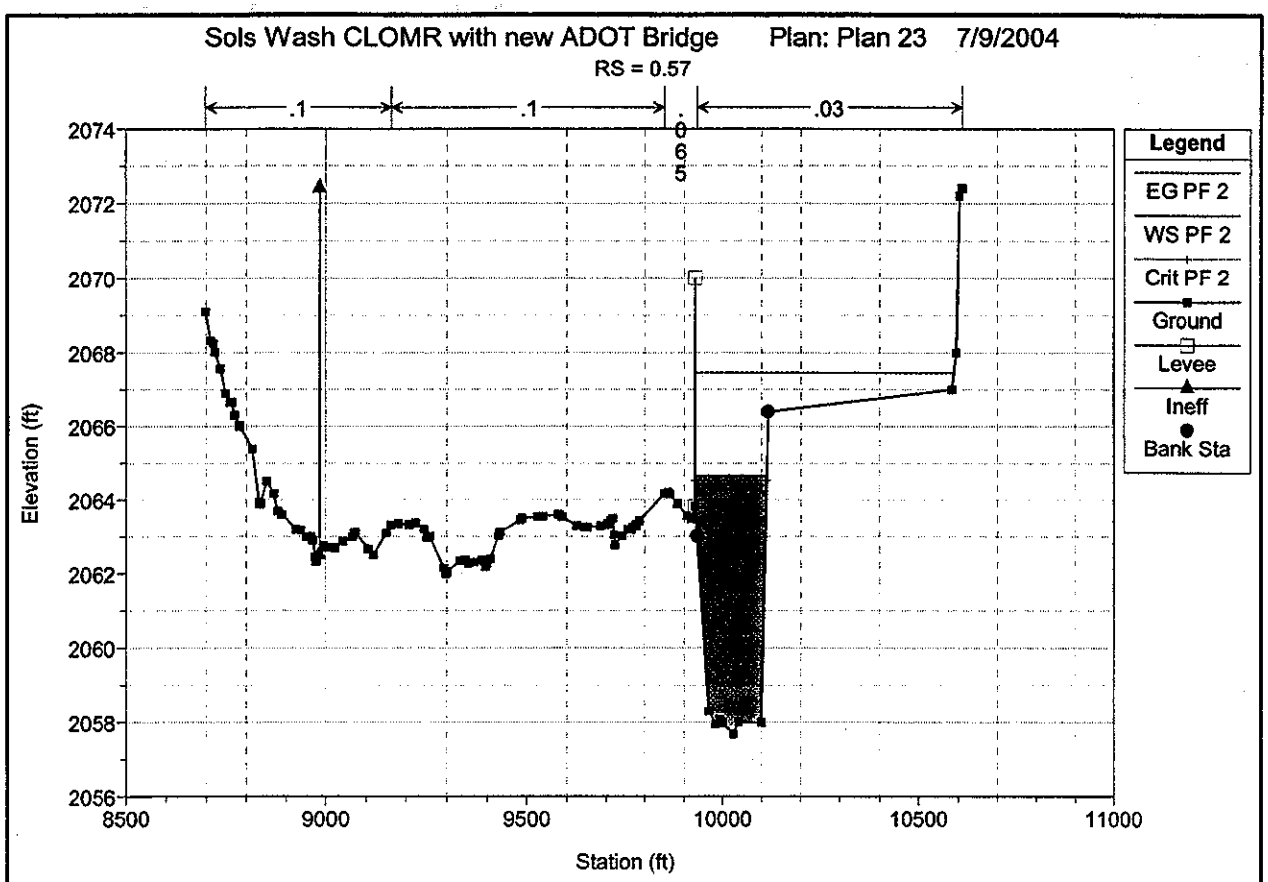

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.79 Begin new cross sections using 2002 mapping
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2084
2082
2080
2078
2076
2074
2072
2070
2068
2066
8800
9000
9200
9400
9600
9800
10000
10200

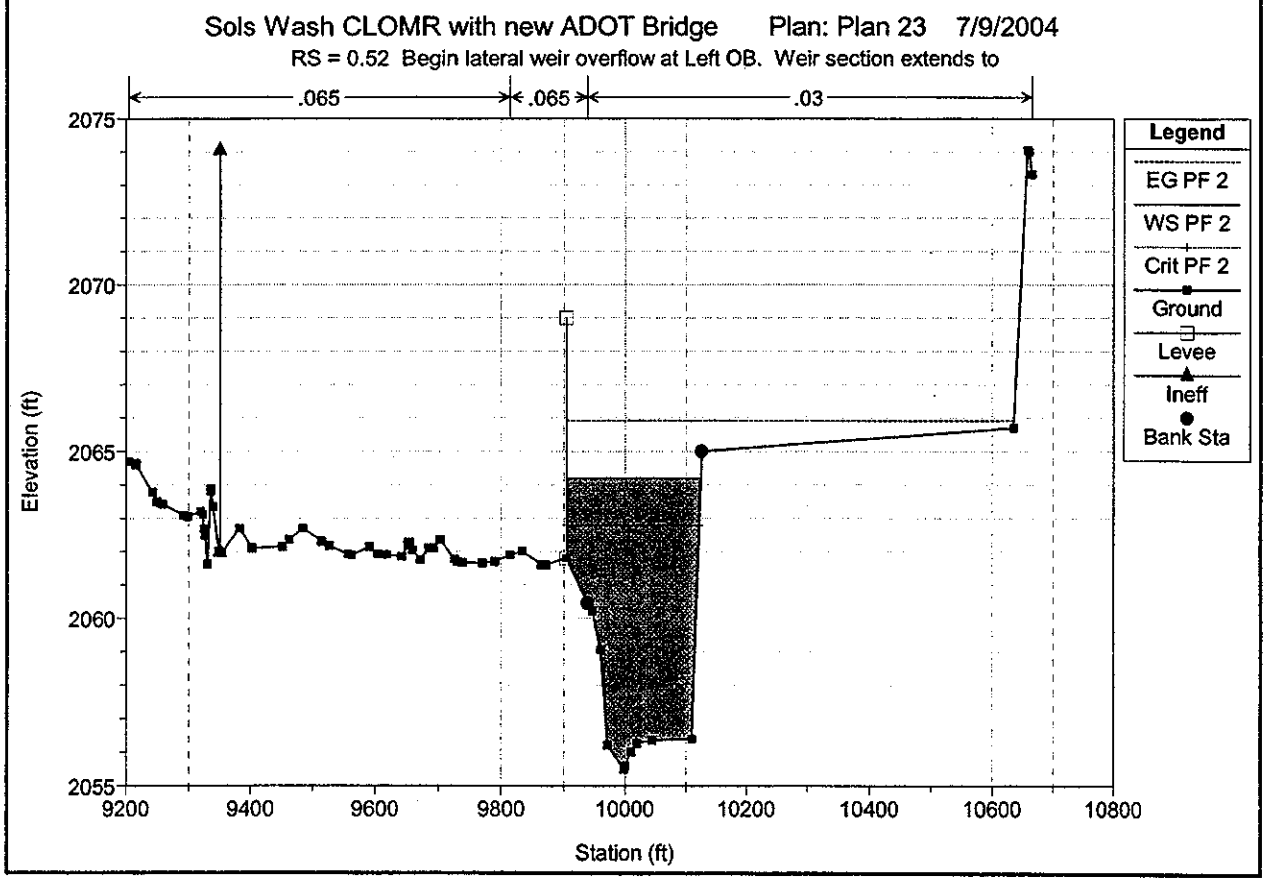

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.76
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

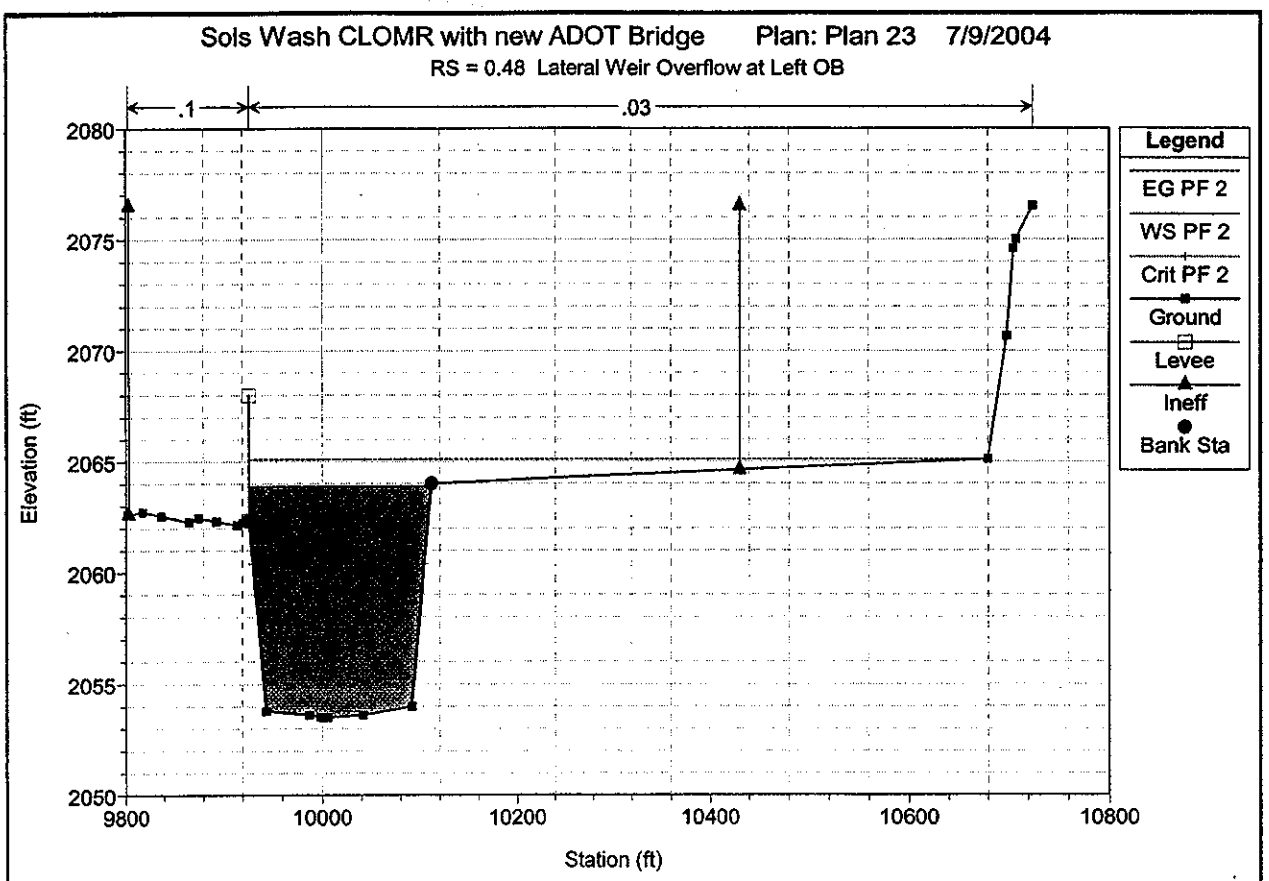

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.71
.065
1.
.035
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

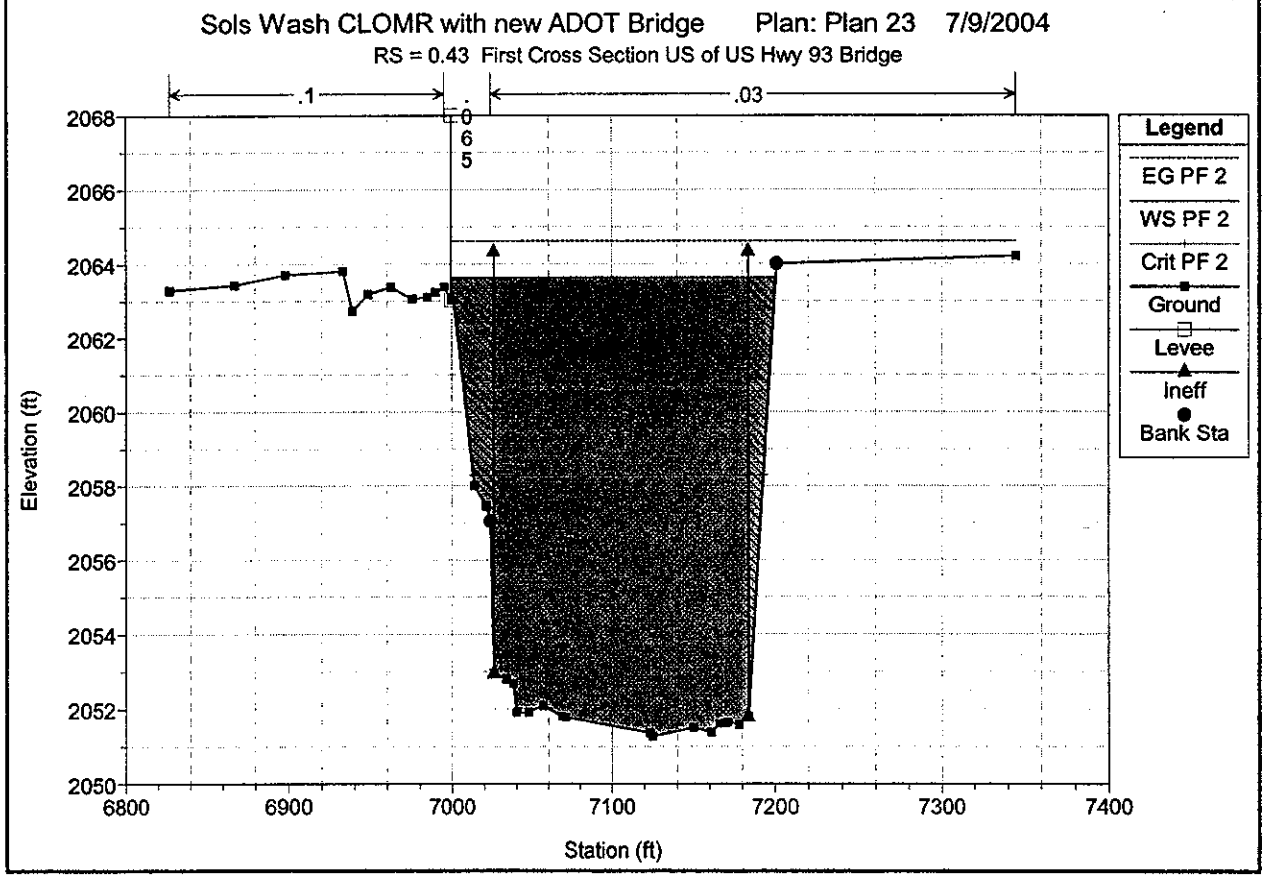

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.66
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
10600

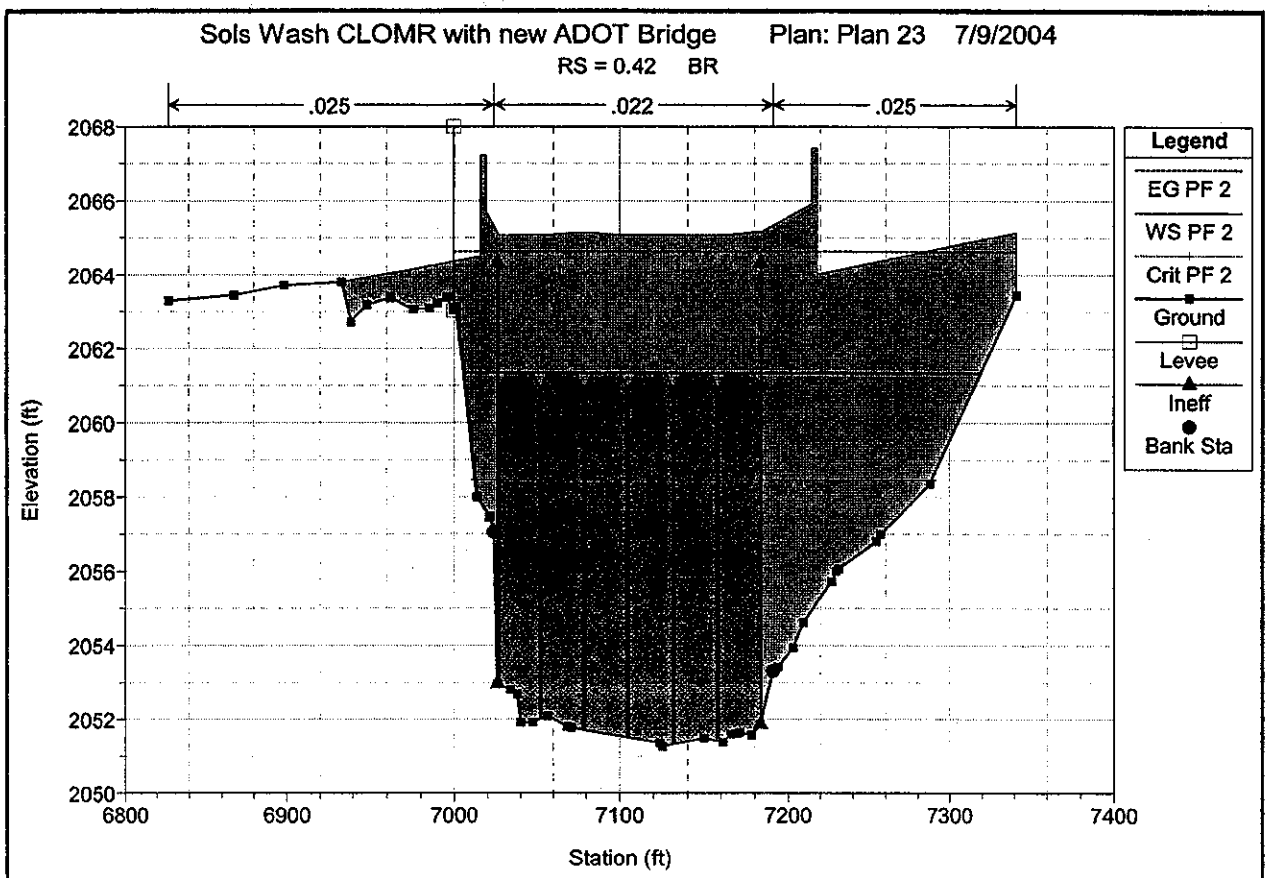

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.61
.1
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
2078
2076
2074
2072
2070
2068
2066
2064
2062
2060
2058
8500
9000
9500
10000
10500
11000

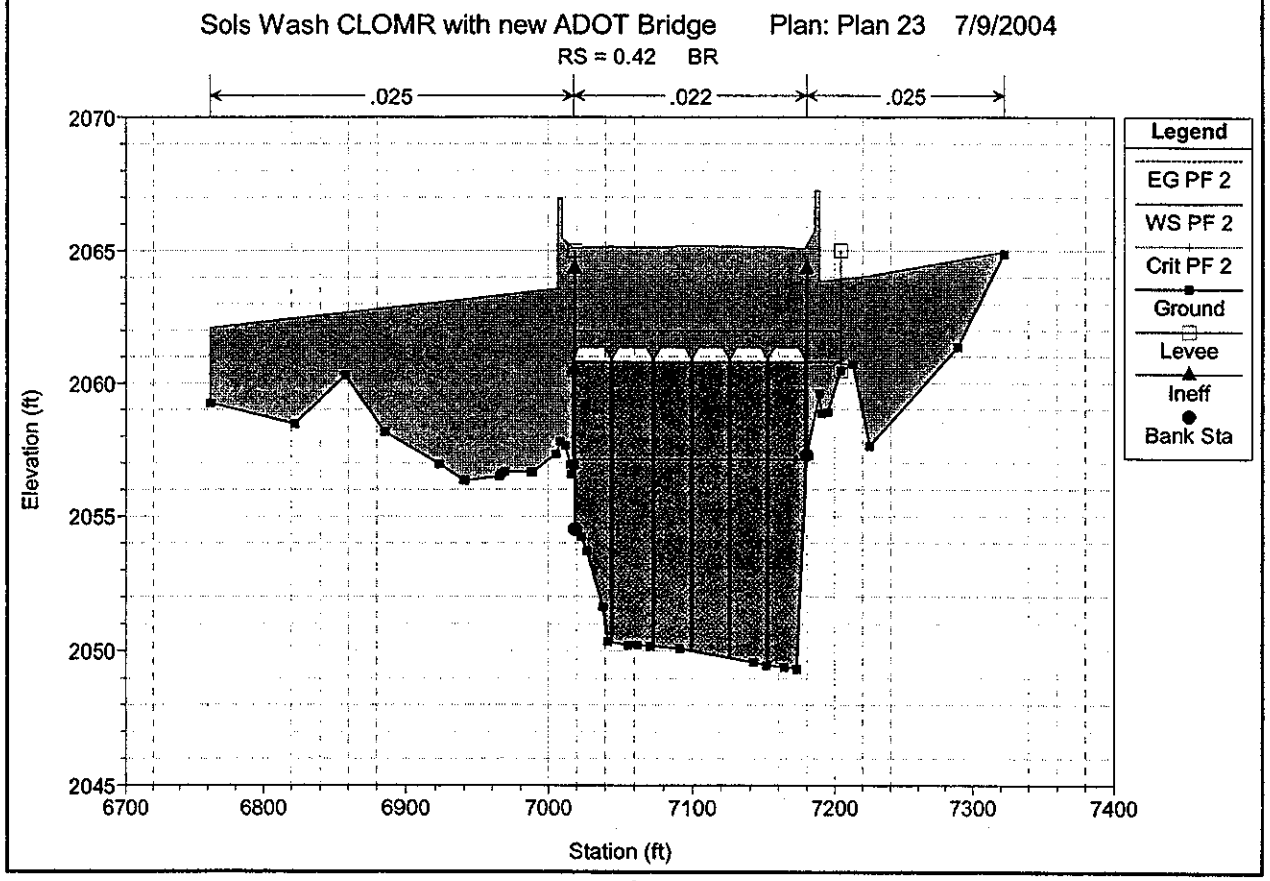

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.57
.1
.1
.065
.03
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta

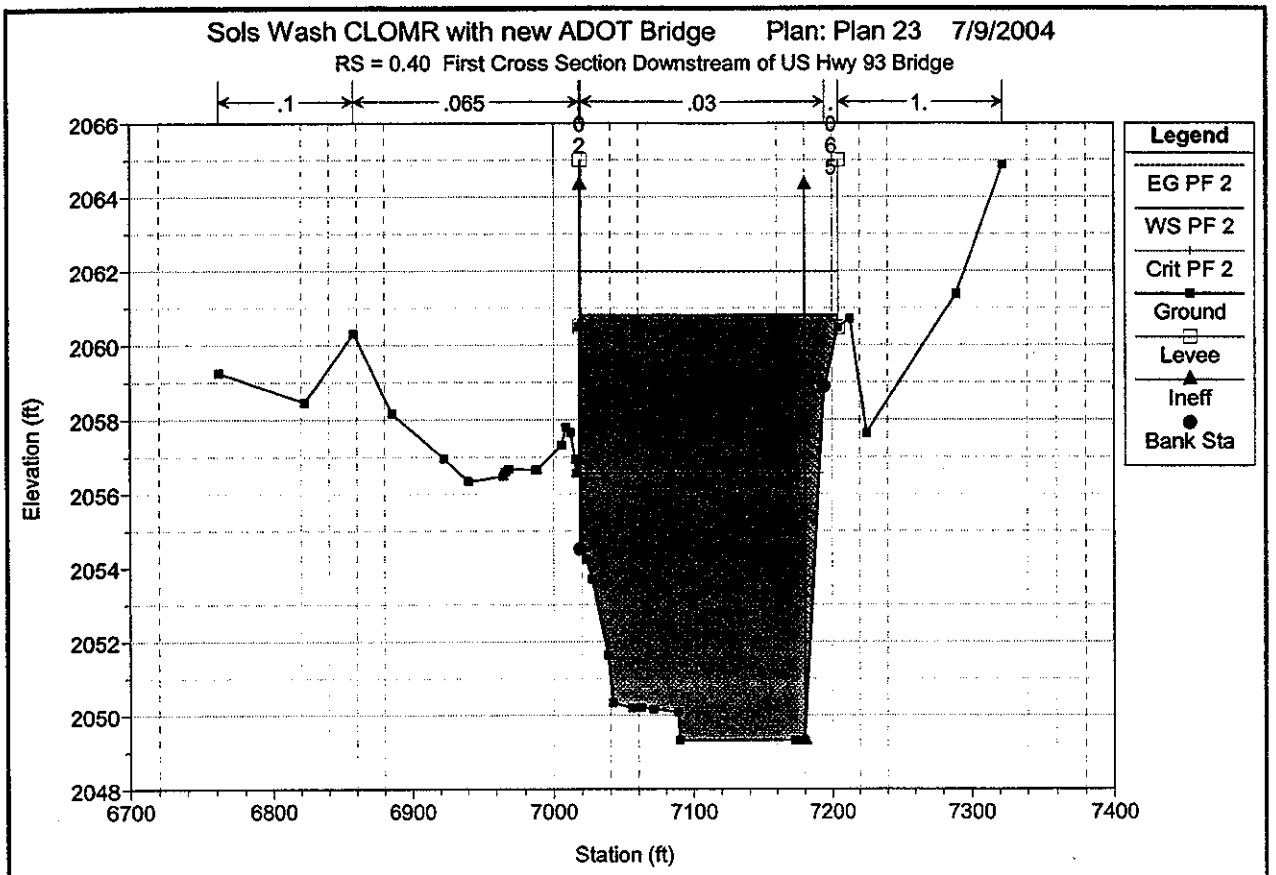

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.52 Begin lateral weir overflow at Left OB. Weir section extends to
.065
.065
.03
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta

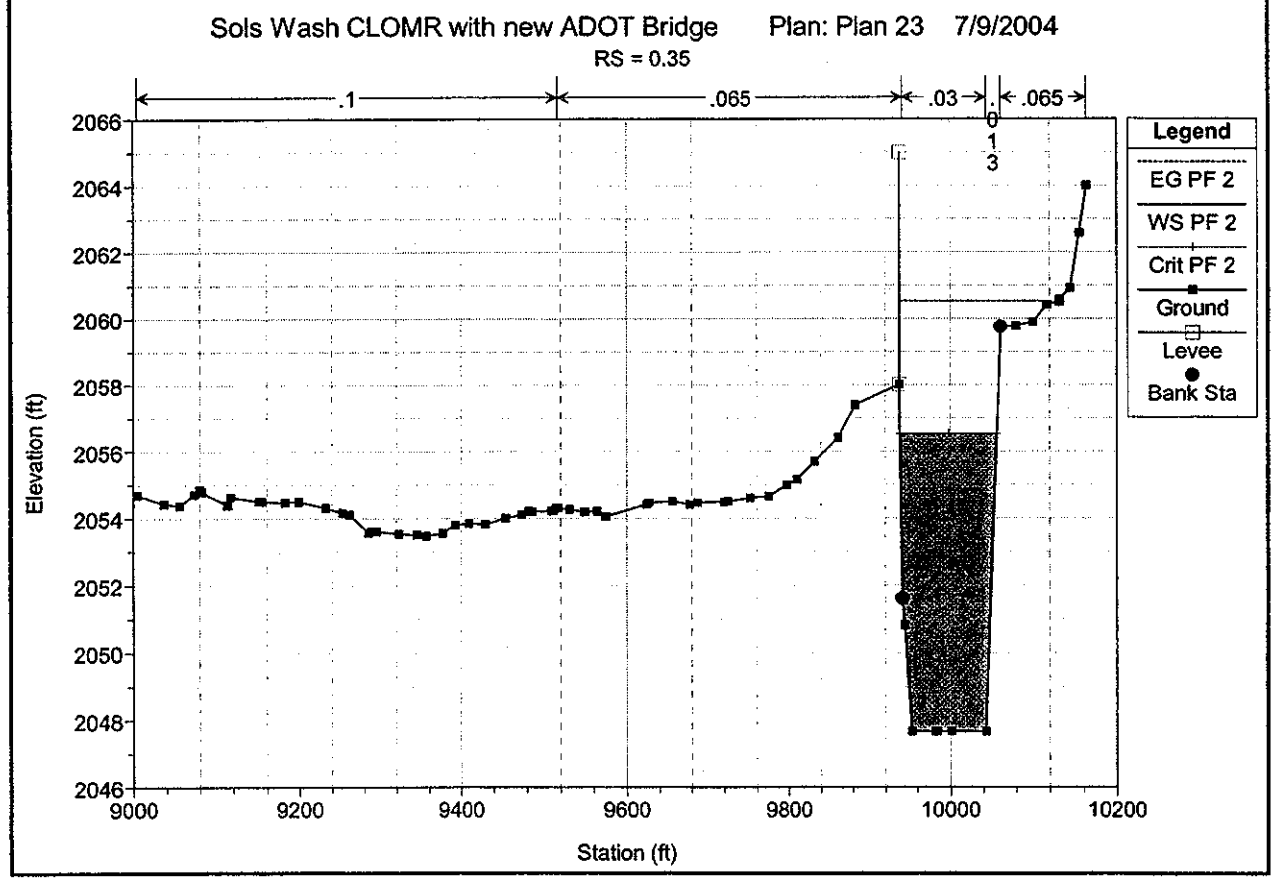

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.48 Lateral Weir Overflow at Left OB
.1
.03
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta

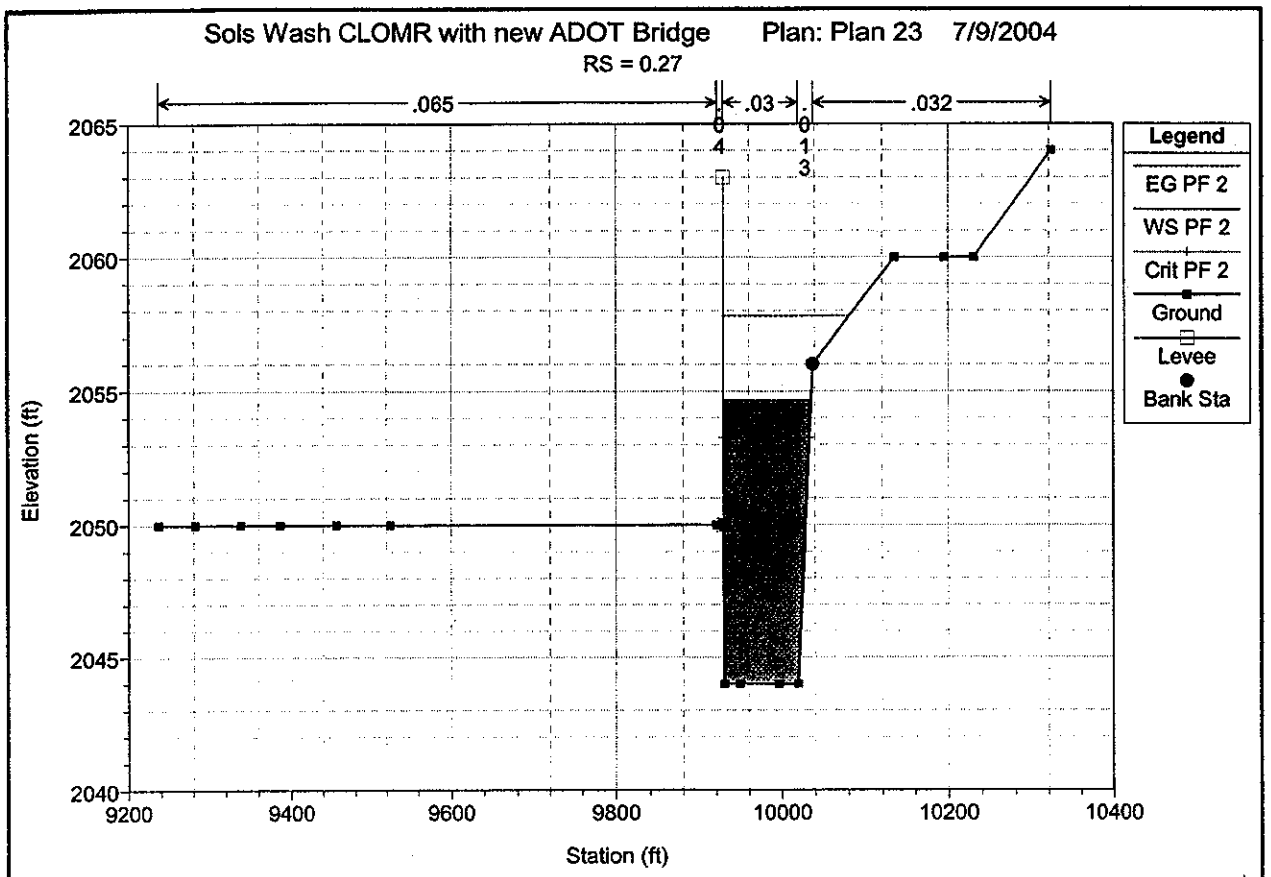

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.43 First Cross Section US of US Hwy 93 Bridge
.1
.03
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta

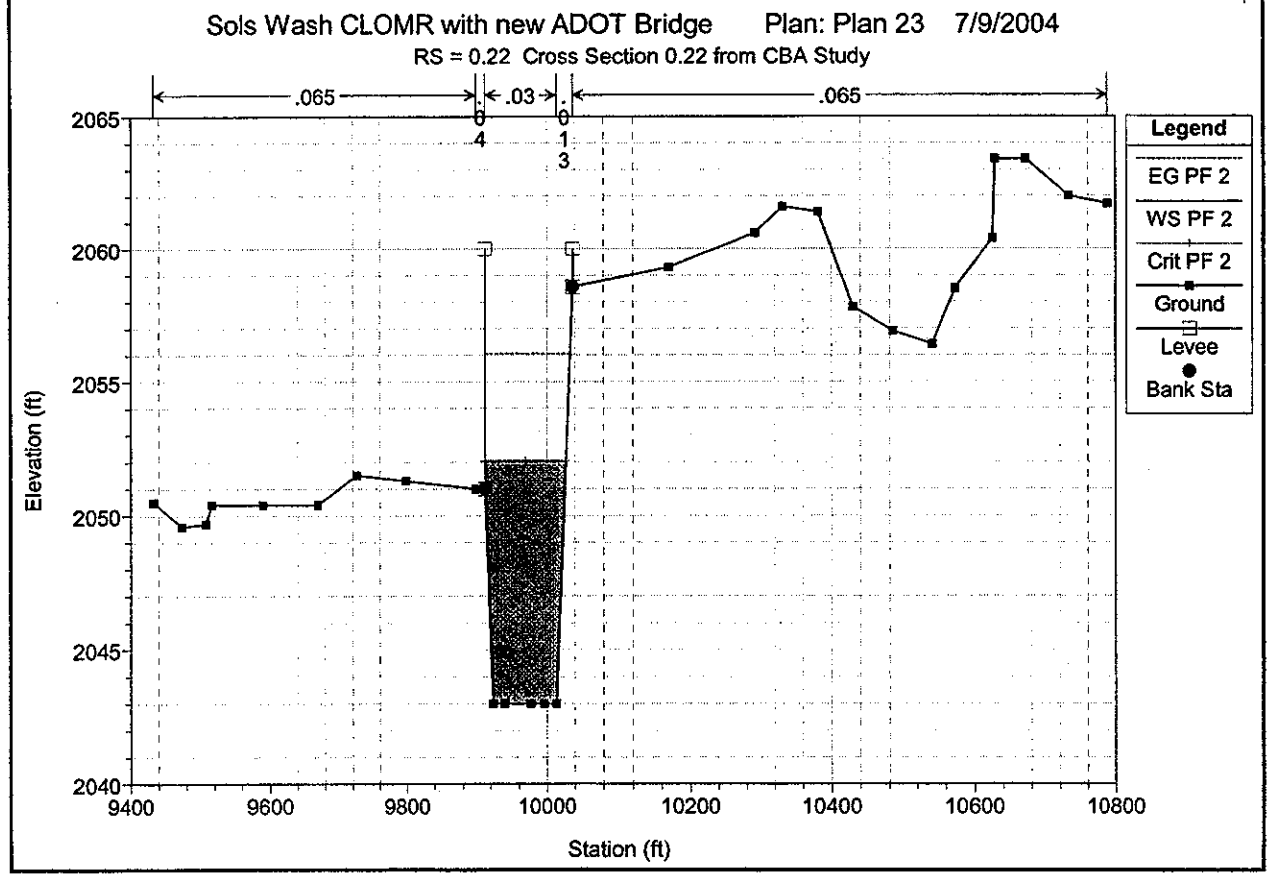

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.42 BR
.025
.022
.025
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta

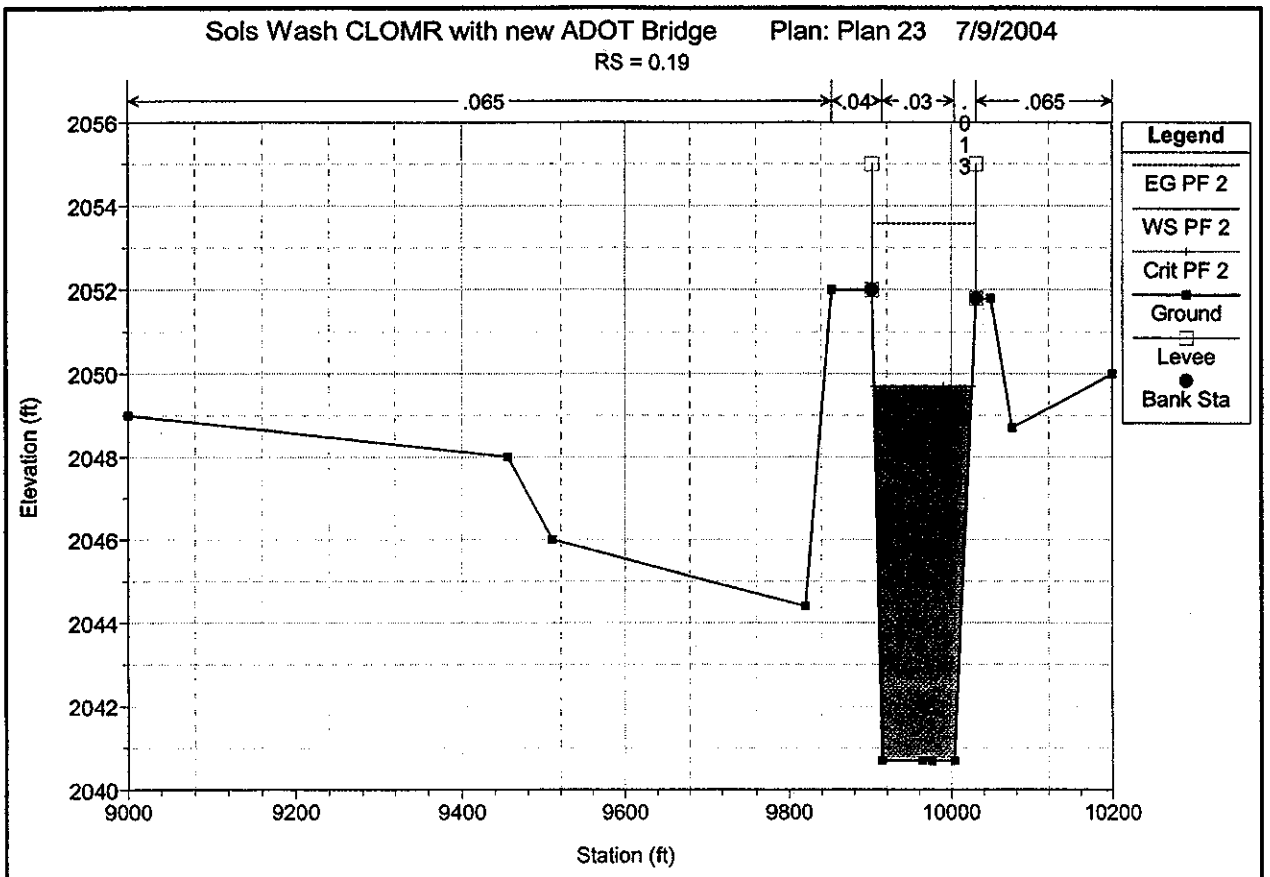

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.42 BR
.025
.022
.025
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta

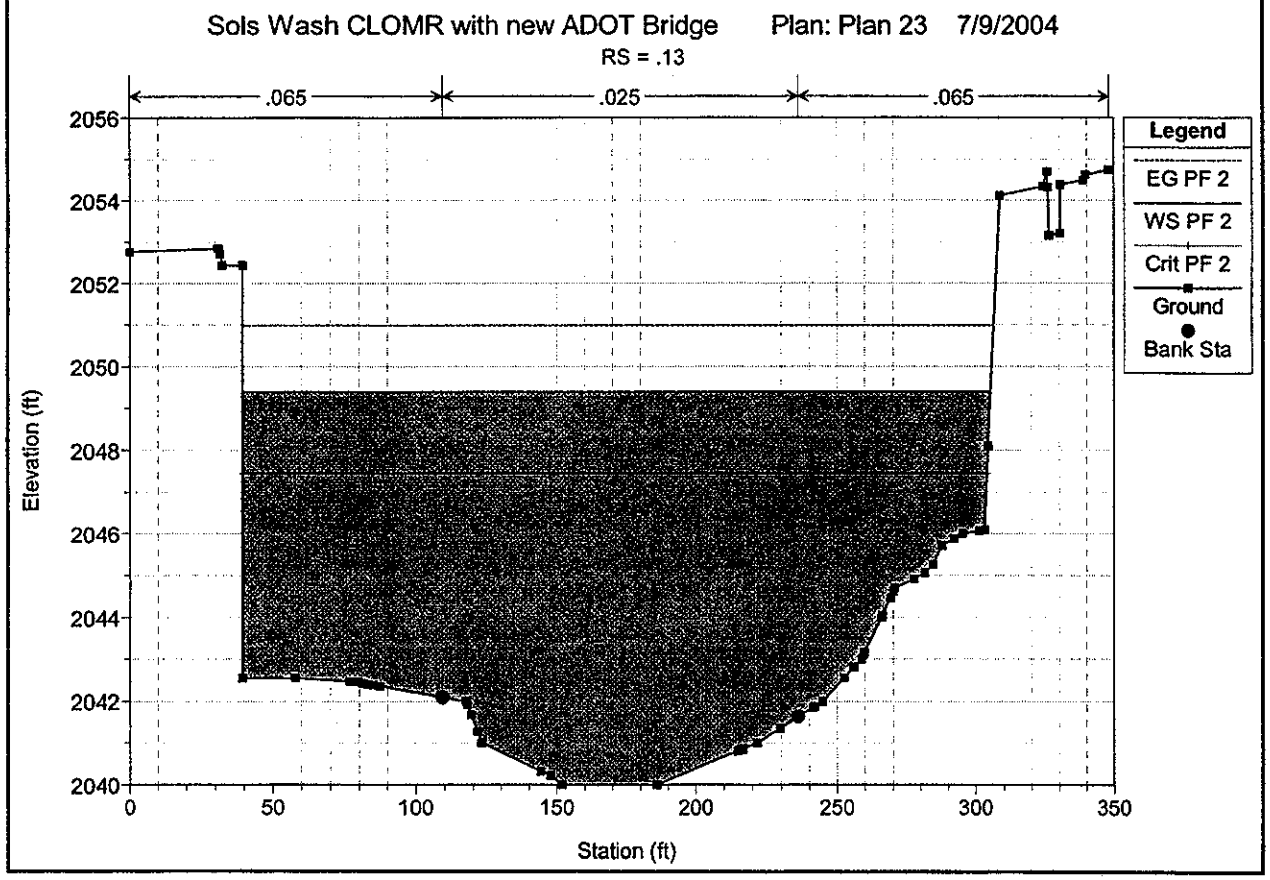

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.40 First Cross Section Downstream of US Hwy 93 Bridge
.1
.065
.03
1.
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

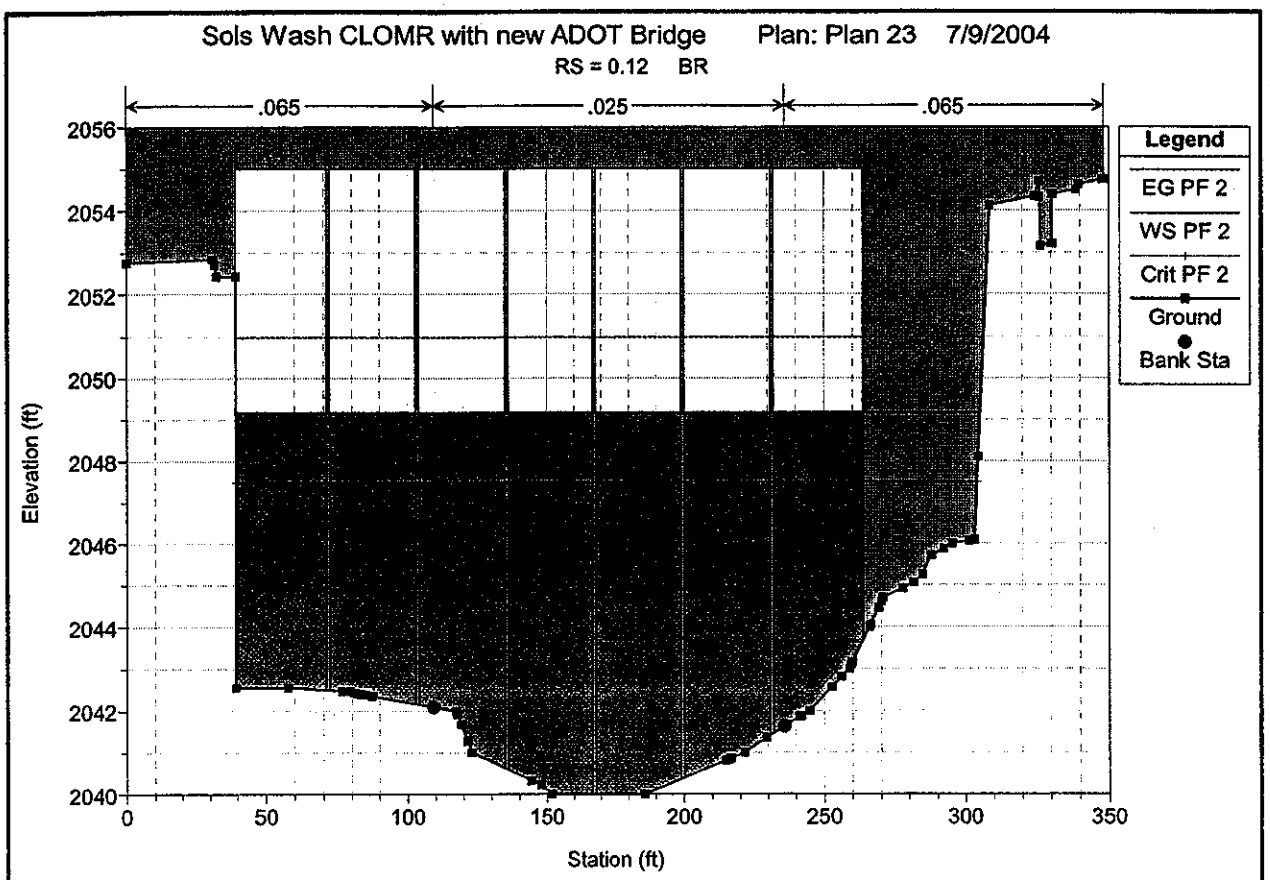

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.35
.1
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

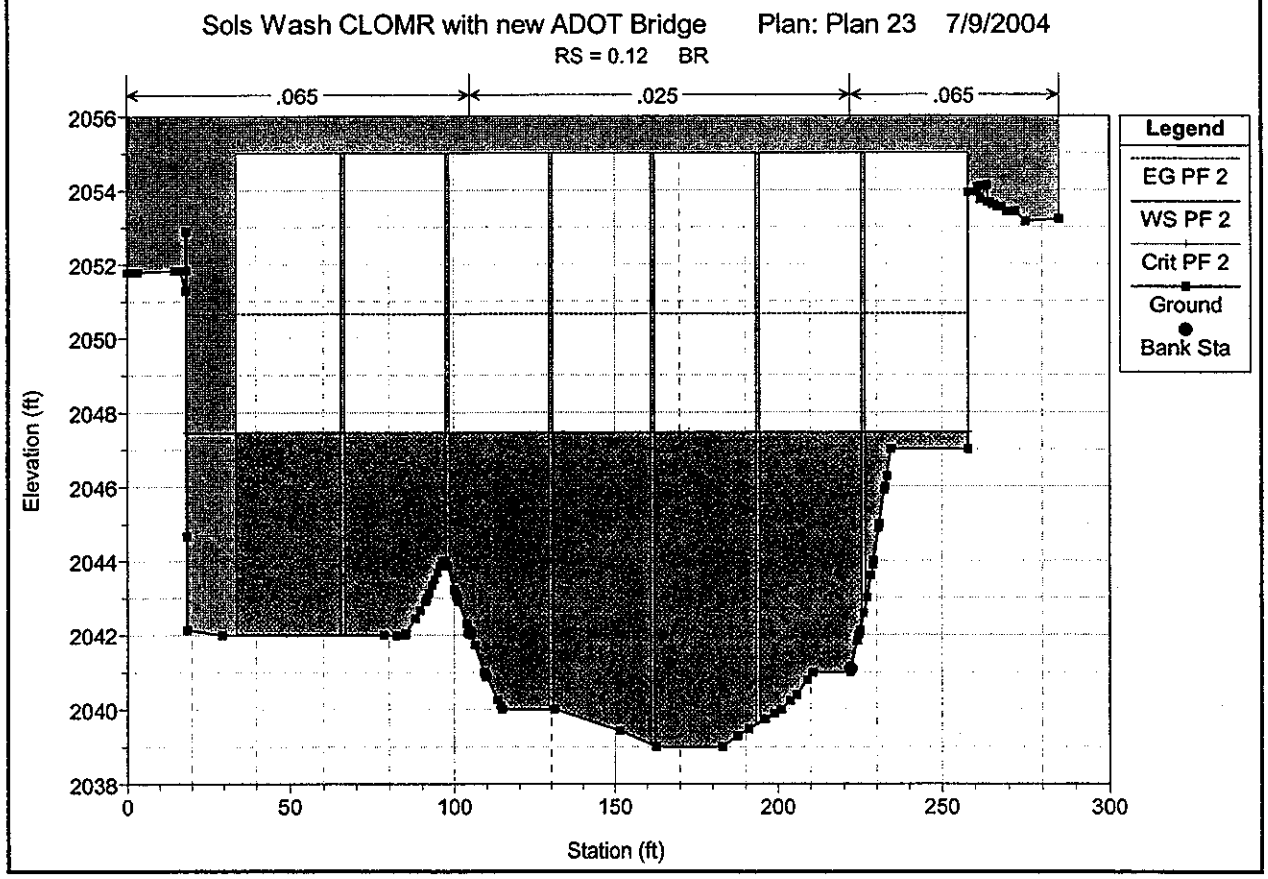

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.27
.065
.03
.032
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

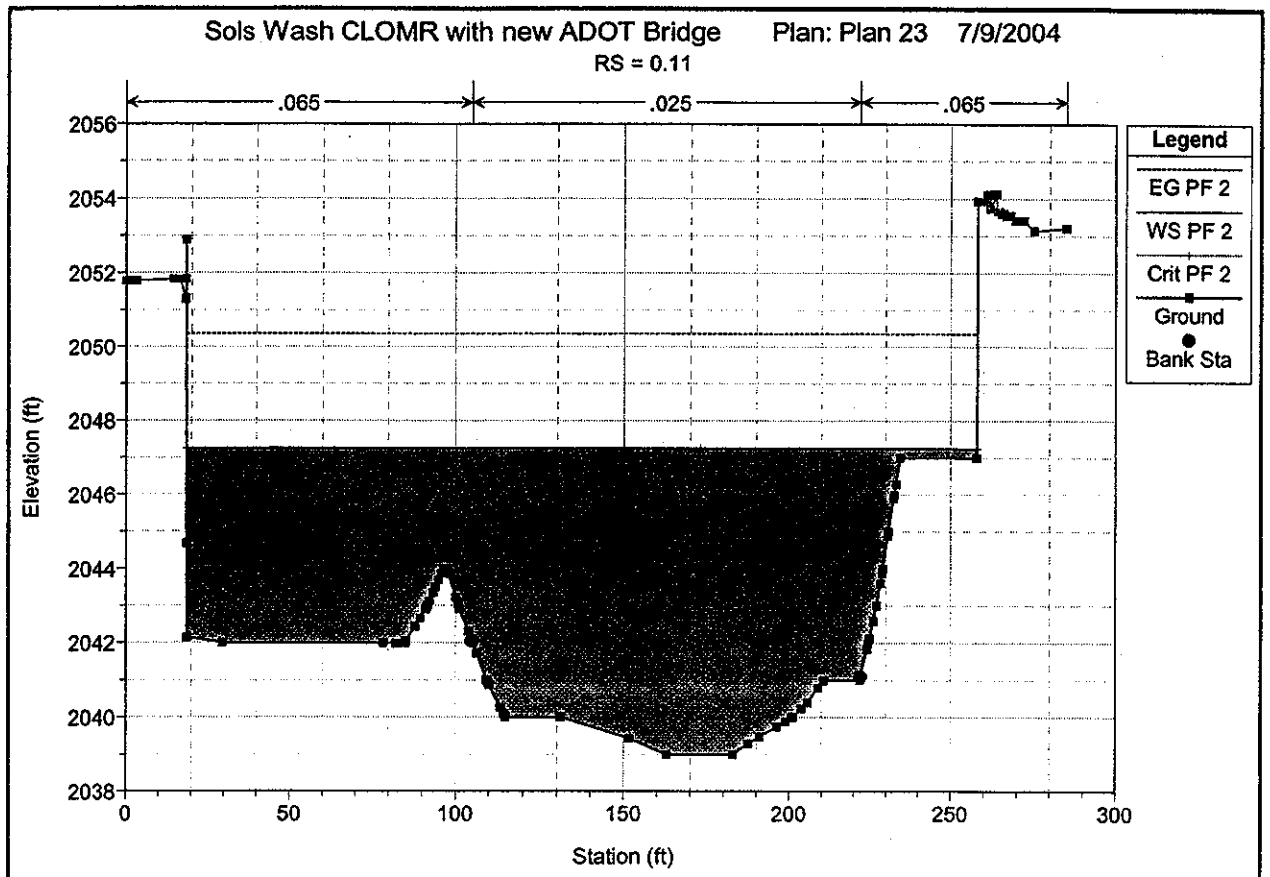

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.22 Cross Section 0.22 from CBA Study
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

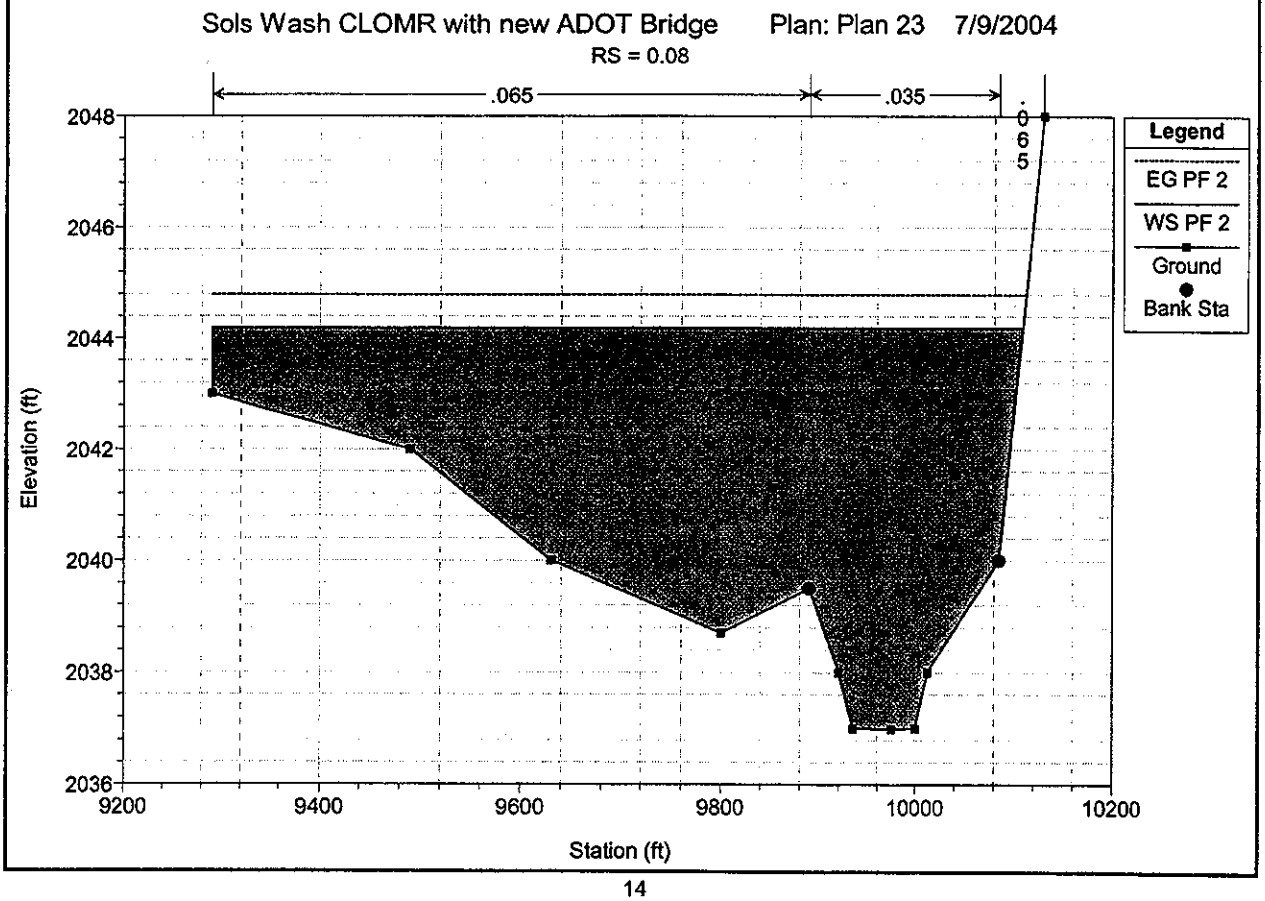

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.19
.065
.04
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

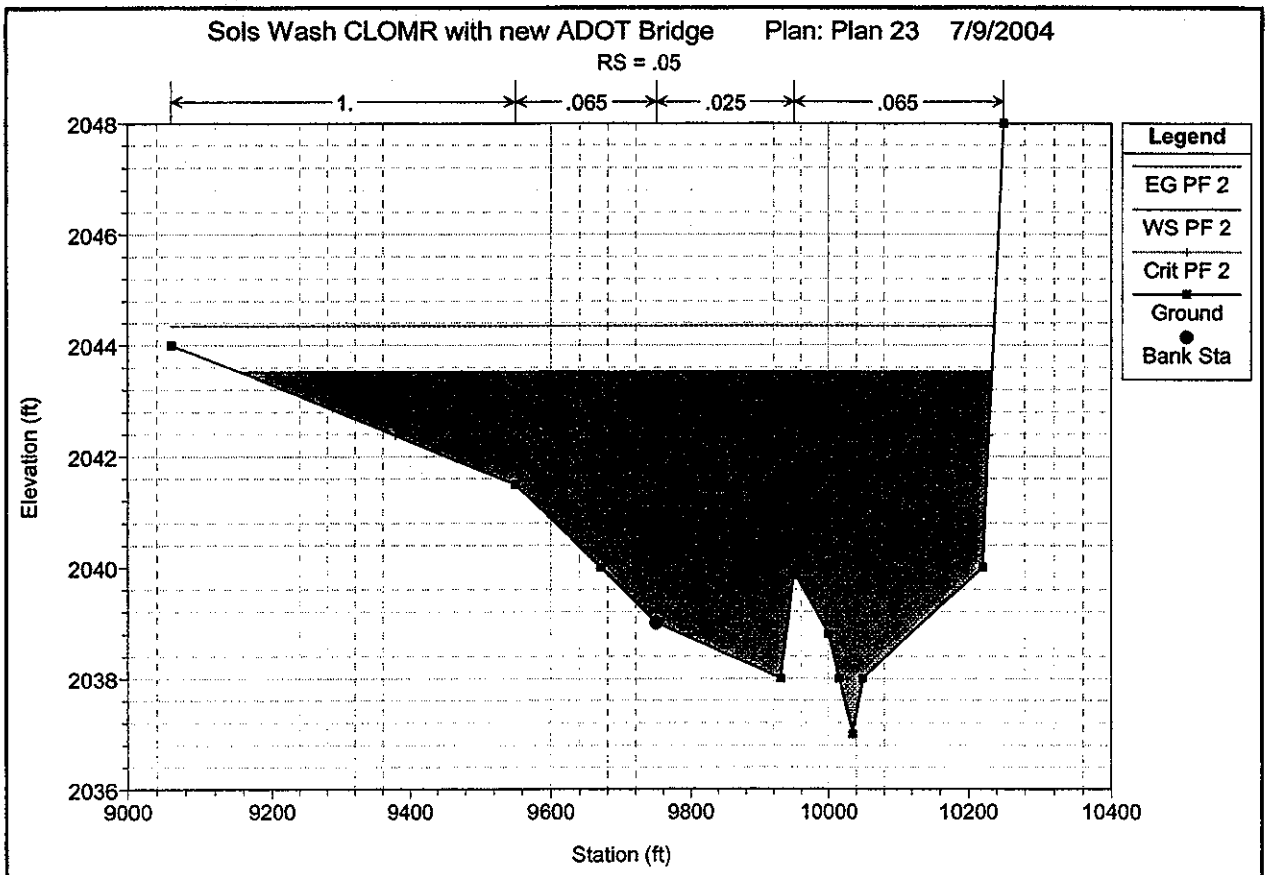

Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = .13
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.11
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = 0.08
.065
.035
.065
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Plan 23 7/9/2004
RS = .05
1.
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

ATTACHMENT G:
SEDIMENT TRANSPORT CALCULATIONS
AND LOCAL SCOUR

AZTEC ENGINEERING
3747 East Grove Street
Phoenix, AZ 85040-3982
Phone (602) 454-0402
Fax (602) 454-0403

Project: Sols Wash | Project No: 03152
Computed by: LS | Date: 7/02/04
Checked By: | Date:
Sheet Name: SEDIMENT ANALYSIS | Sheet: 1 Of: 5

I DEGRADATION LIMITED BY ARMORING

USE: MEYER-PETER, MULLER FORMULA

SHIELDS DIAGRAM.

M-P, M:

$$D_c = \frac{dS}{K\left(\frac{n_s}{D_{90}^{1/6}}\right)^{3/2}}$$

where $K = 0.19$
$D_{90} = 5.0\,mm$
AND $d = 4.50$
$S = .00725$
$n_s = .032 - .03$

$$D_c = \frac{4.50(.00725)}{.19\left(\frac{.032}{5.0^{1/6}}\right)^{3/2}}$$

$D_c = 48\,mm = 0.15' = 1.8''$

SHIELDS:

$$D_c = \frac{\gamma_w\, dS}{.06(\gamma_s - \gamma_w} = \frac{(62.4)(4.5)\,.00725}{.06(165 - 62.4)} = \frac{2.036}{6.16} = .33' = 3.96$$

FROM SPREADSHEET $D_c = 77.50 = .3'$

AVE $= 0.201' = 2.4''$

$\therefore D_c = 2.4''$ ARMORING SIZE

II DEGRADATION LIMITE BY STABLE SLOPE

USE: SCHOKLITSCH

MEYER-PETER, MULLER

SHIELDS

SCHOKLITSCH:

$$S_L = K\left(\frac{DS}{Q}\right)^{3/4}$$

$K = .00174$
$D_{50} = 1.2$
$W = 90'$

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Project No:
Date: 7/05/01
Date:
Sheet: 2 Of: 5

DEGREDATION LIMITED BY STABLE SLOPE (CONTINUED)

SCHOKLITSH:

$$S_L = .00174 \left(\frac{1.2 * 90}{7019}\right)^{3/K}$$

$$S_L = .000076 \ \%$$

M-P, M:

$$S_L = \frac{K\left(\frac{Q}{Q_B}\right)\left(\frac{n_s}{D_{90}^{1/6}}\right)^{3/2} D}{d}$$

$$S_L = \frac{0.19(1)\left(\frac{.03}{5^{1/6}}\right)^{3/2} 1.2}{4.5}$$

GIVEN
- $K = 0.19$
- $Q/Q_B = 1$
- $D_{90} = 5$ $D_{50} = 1.2$
- $n_s = .03$
- $d = 4.50'$

$$S_L = .00017 \ \% \quad [\text{OFF BY } .00003]$$

SHIELDS:

$Q = 7019$ CFS
$B = 90'$
$d = 4.50'$
$S = .005580$
D_{50} 1.2 mm & .0039
D_{90} 5 mm

$n_s = .03$
$V = 12.5$ FPS

$$R* = \frac{U* D}{\nu} \quad vs. \quad T* \frac{T_c}{(\gamma_s - \gamma_w) D}$$

1ST TRIAL

$$R* = \frac{(.005580 * 4.50 * 32.2)^{1/2} .0039}{.00001}$$

D_{50}(FT) * .00320
1.2

$R* = 350.7$

$$T* = \frac{T_c}{(\gamma_s - \gamma_w) D_c} = .06$$

$$T* = \frac{.038}{(165.4 - 62.4)}$$

$$S_L = \frac{.038(165.4 - 62.4)(.0039)}{62.4(4.50)}$$

$S_L = .000054$

SCHOKLITSCH	.000076
M-P, M	.00017
SHIELD DIAG.	.000054
AVERAGE	.0001 %

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Checked By: Date:
Sheet Name DEGRADED CHAN. PROF Sheet: 3 Of: 9

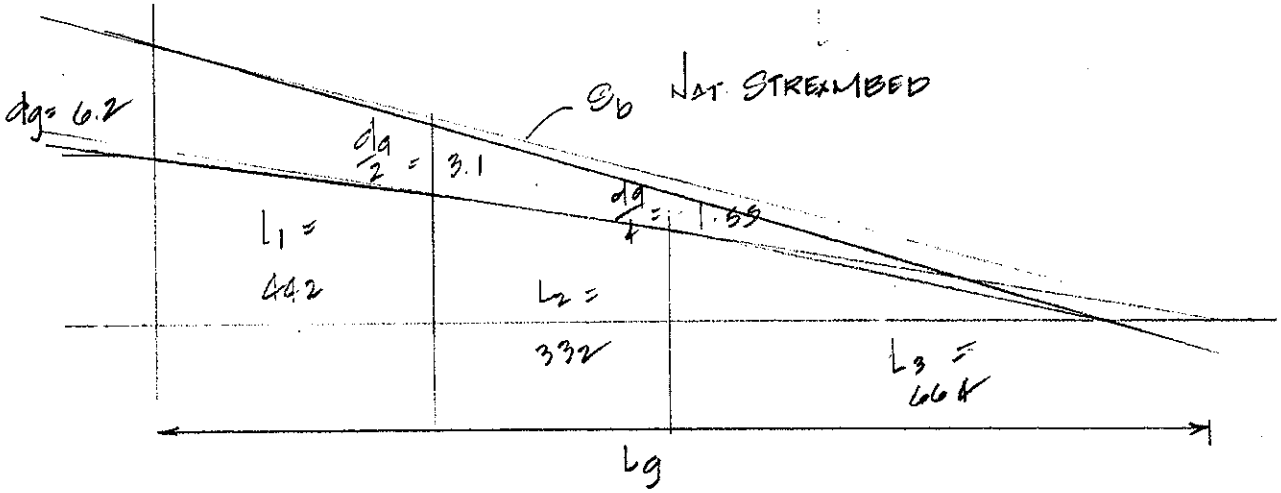
SEDIMENT TRANSPORT ANALYSIS

DEPTH OF DEGRADATION AT SEC 0.40

$L_g = 1450$

$S_g = S_b - S_L$

$S_g = .00721 - .0001 = .007$



$$a_1 = \frac{3d_g^2}{8\Delta S_g} = a_1 \frac{3d_g^2}{8(.007)}$$

$$L_g = 1450 = \frac{13 d_g}{8(.007)} = \frac{1450(8)(.007)}{13} = 6.2$$

$$d_g = 1.28\sqrt{.007\, a_g} = \frac{6.2}{1.28} = \sqrt{.007 a_g} = 4.92$$

$$= \frac{24.22}{.007} = a_g = 3460$$

$a_1 = \frac{3d_g^2}{8(.007)} = 2059$

$a_2 = 786$ 772

$a_3 = 524$ 514

$L_1 = \frac{6.2}{2(.007)} = 442$

$L_2 = \frac{3(6.2)}{8(.007)} = 332$

$L_3 = \frac{3(6.2)}{4(.007)} = 664$

1440 ≈ 1450

$V_g = a_g B d = 3345(90)$

301,400 cf = 11,150 cy DEG

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Computed by: DS | Date: 7/03/04
Checked By: | Date:
Sheet Name: EQUILIBRIUM SLOPES | Sheet: 4 Of: 5

UNIT DISCHARGE FOR SEDIMENT

$G = \frac{1}{2}\left(\frac{D_{84.1}}{D_{50}} + \frac{D_{50}}{D_{15.9}}\right)$ [5.4]

FOR THE GREENWAY RD. SAMPLES

$G = \frac{1}{2}\left(\frac{28}{2.1} + \frac{2.1}{.5}\right) = 8$

$$q_s = .0064 \frac{n^{1.77} V^{4.32} G^{0.45}}{Y_h^{0.30} D_{50}}$$

$$= .0064 \frac{(.03)^{1.77} (12.01)^{4.32} (2)^{0.45}}{(4.5)^{0.30} (2.1)^{0.51}}$$

$.001 \leq S_o \leq .01$

$G = 8$ $q_s = 95.$

$G = 2$ $q_s = 51.4$

$G = 4$ $q_s = 70.23$ $a = 4.31$ $b = 0.324$ $c = 3.70$

$$q_s = 4.31 (4.5)^{.324} (12.01)^{3.70}$$

$$q_s = 1.48 \times 10^{-5} (4.5)^{.0501} (12.01)^{4.31}$$

$q_{s_{1.1}} = .72$

$Q_{S_{IN}}$ $.72(90)$ 64.6 CFS

S=	Y	V	q_s	B	Q_s
.016152	4.5	16.1	2.54	90	228.4
.011	5.0	14.4	1.57	90	141.9
.06	7	24.8	16.	90	1440 X
.006	6.0	11.8	.67	90	60.7

USE EQUILIBRIUM SLOPE = .006

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Computed by: LS | Date: 7/25/04
Checked By: | Date:
Sheet Name | Sheet: 9 | Of: 5

CONCLUSIONS

A. DEGRADATION LIMITED BY ARMORING

ARMORING SIZE CALC. USING ADOT VALUES: $D_c = 2.4'$

B. DEGRADATION LIMITED BY STABLE SLOPE

AVERAGE SLOPE = .0001
DEGRADATION FOR L = 1450 = 6.2'

C. EQUILIBRIUM SLOPE = .000007 (SEE ATTACHED SPREADSHEET)

UPSTREAM CHANNEL WAS CALCULATED USING SPREADSHEET. RESULTS WERE CLOSE TO CALCS FOR THE D.S. REACH ∴ CONCLUDED RESULTS WOULD BE SIMILAR FOR A REACH 1500' LONG AS FOR STUDY REACH (1450') BETWEEN 2 BRIDGES

LOCAL SCOUR:

FOR SOLS $d_s = K\left(\frac{q_{UNIT}}{q}\right)^{.24}$

$d_s = 2.45\left(\frac{7190}{90}\right)^{.24} = 7.0'$

FOR HOSPITAL WASH

$d_s = 2.45\left(\frac{900}{80}\right)^{.24} = 4.4'$

Depths of Long-Term Degradation Associated with
Armoring Size and Equilibrium Slope Calculations
Sols Wash, Wickenburg, AZ.
Throughout COMPOSITE SECTION

DATA:

Parameters	Symbol	Values	Parameters	Symbol	Values
(a) Dominant Discharge (cfs)	Q	7019.00	(j) Critical Tractive Force (psf)	T_c	0.065
(b) Energy Gradient (ft/ft)	S	0.005580	(k) Fall Velocity (fps)	ω	0.377
(c) Mean Channel Depth (ft)	d	4.50	(l) Critical Average Velocity (fps)	V_c	0.773
(d) Channel Velocity (fps)	V_m	12.000	(m) Kinematic Viscosity (sq.ft/sec)	ν_k	0.00001059
(e) Channel Width (ft)	B	90.00	(n) Shear Velocity (fps)	U*	0.899
(f) Specific Weight of Particle (pcf)	S_p	165	(o) Boundary Reynold No.	R*	34
(g) Specific Weight of Water (pcf)	S_w	62.4	(p) Dimensionless Shear Stress	τ*	0.038
(h) Manning's n for stream bed	n_s	0.026	(q) Channel Bed Slope (ft/ft)	S_c	0.00721
(i) Sediment Data (mm):	D_{50}	1.20			
	D_{90}	5.00			

Iterative Analysis for Shield's Diagram

		Iter = 1	Iter = 2	Iter = 3
(a) Shear Velocity (fps)	U_*	0.899	0.112	0.091
(b) Boundary Reynold No.	R_*	334	41.6	33.9
(c) Dimensionless Shear Stress	τ_*	0.060	0.040	0.038
(d) Equilibrium Slope	S_{eq}	0.00009	0.00006	0.00005

A. ARMORING SIZE:

Armoring Size Approach (1)	Equation No. (2)	Armor Size (mm) (3)
Meyer-Peter and Muller	1	47.14
Competent Bottom Velocity	2	~~270.72~~
Lane's Tractive Force	3	~~100.00~~
Shield's Diagram	4	77.58
Yang's Incipient Motion	5	~~1.20~~
Average		~~99.33~~

62.36mm or 2"

Items	Unit	Values
Armoring Layer Thickness	ft	0.98
Percent Larger than Dc	%	0.01
Depth of Degradation	ft	Inf

B. EQUILIBRIUM SLOPE:

Stable Slope Approach (1)	Equation No. (2)	Stable Slope (ft/ft) (3)
Schoklitsch	1	0.0002048
Meyer-Peter Muller	2	0.0001420
Shield's Diagram	3	0.0000547
Lane's Tractive Force	4	~~0.0002315~~
Average		~~0.0001583~~

.000134

Items	Unit	Values
Depth of Degradation	ft	0.705

Reference: Pemberton, E. L. and Lara, J. M., 1984, "Computing Degradation and Local Scour", Technical Guideline for Bureau of Reclamation, Denver, Colorado, January 1984, pp. 1-29.

Plan: B=90 n=02 Sols Wash Reach 1 RS: 0.22 Profile: PF 3

E.G. Elev (ft)	2050.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.24	Wt. n-Val.		0.025	
W.S. Elev (ft)	2048.36	Reach Len. (ft)	170.00	175.00	180.00
Crit W.S. (ft)	2048.36	Flow Area (sq ft)		584.26	
E.G. Slope (ft/ft)	0.005580	Area (sq ft)		584.26	
Q Total (cfs)	7019.00	Flow (cfs)		7019.00	
Top Width (ft)	129.95	Top Width (ft)		129.95	
Vel Total (ft/s)	12.01	Avg. Vel. (ft/s)		12.01	
Max Chl Dpth (ft)	5.36	Hydr. Depth (ft)		4.50	
Conv. Total (cfs)	93961.2	Conv. (cfs)		93961.2	
Length Wtd. (ft)	175.00	Wetted Per. (ft)		132.23	
Min Ch El (ft)	2043.00	Shear (lb/sq ft)		1.54	
Alpha	1.00	Stream Power (lb/ft s)		18.49	
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)	10.13	15.01	3.11
C & E Loss (ft)	0.03	Cum SA (acres)	3.86	2.88	0.89

.00328

FIGURE 4

Depths of Long-Term Degradation Associated with
Armoring Size and Equilibrium Slope Calculations
Sols Wash, Wickenburg, AZ.
U.S. OF TEGNER BR.

DATA:

Parameters	Symbol	Values	Parameters	Symbol	Values
(a) Dominant Discharge (cfs)	Q	6725.00	(j) Critical Tractive Force (psf)	T_c	0.065
(b) Energy Gradient (ft/ft)	S	0.006243	(k) Fall Velocity (fps)	ω	0.377
(c) Mean Channel Depth (ft)	d	4.17	(l) Critical Average Velocity (fps)	V_c	0.773
(d) Channel Velocity (fps)	V_m	10.060	(m) Kinematic Viscosity (sq.ft/sec)	ν_k	0.00001059
(e) Channel Width (ft)	B	140.00	(n) Shear Velocity (fps)	U*	0.916
(f) Specific Weight of Particle (pcf)	S_p	165	(o) Boundary Reynold No.	R*	34
(g) Specific Weight of Water (pcf)	S_w	62.4	(p) Dimensionless Shear Stress	τ^*	0.038
(h) Manning's n for stream bed	n_s	0.026	(q) Channel Bed Slope (ft/ft)	S_c	0.0076
(i) Sediment Data (mm):	D_{50}	1.20			
	D_{90}	5.00			

A. ARMORING SIZE:

Armoring Size Approach (1)	Equation No. (2)	Armor Size (mm) (3)
Meyer-Peter and Muller	1	48.87
Competent Bottom Velocity	2	~~190.26~~
Lane's Tractive Force	3	~~100.00~~
Shield's Diagram	4	80.43
Yang's Incipient Motion	5	~~1.20~~ 64.69
Average		~~84.15~~

Items	Unit	Values
Armoring Layer Thickness	ft	0.83
Percent Larger than Dc	%	0.01
Depth of Degradation	ft	Inf

B. STABLE SLOPE

Stable Slope Approach (1)	Equation No. (2)	Stable Slope (ft/ft) (3)
Schoklitsch	1	0.0002783
Meyer-Peter Muller	2	0.0001533
Shield's Diagram	3	0.0000590
Lane's Tractive Force	4	~~0.0002498~~
Average		~~0.0001851~~ .00017

Items	Unit	Values
Depth of Degradation	ft	0.741

C. EQUILIBRIUM SLOPE

Iterative Analysis for Shield's Diagram

		Iter = 1	Iter = 2	Iter = 3
(a) Shear Velocity (fps)	U_*	0.916	0.112	0.091
(b) Boundary Reynold No.	R_*	340	41.6	33.9
(c) Dimensionless Shear Stress	τ_*	0.060	0.040	0.038
(d) Equilibrium Slope	S_{eq}	0.00009	0.00006	0.00006

Reference: Pemberton, E. L. and Lara, J. M., 1984, "Computing Degradation and Local Scour", Technical Guideline for Bureau of Reclamation, Denver, Colorado, January 1984, pp. 1-29.

Plan: Plan 22 Sols Wash Reach 1 RS: 0.66 Profile: PF 1

E.G. Elev (ft)	2068.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.42	Wt. n-Val.	0.037	0.030	
W.S. Elev (ft)	2066.62	Reach Len. (ft)	256.00	248.00	245.00
Crit W.S. (ft)	2066.46	Flow Area (sq ft)	173.63	584.05	
E.G. Slope (ft/ft)	0.006243	Area (sq ft)	173.63	584.05	
Q Total (cfs)	6725.00	Flow (cfs)	849.51	5875.49	
Top Width (ft)	274.92	Top Width (ft)	134.76	140.16	
Vel Total (ft/s)	8.88	Avg. Vel. (ft/s)	4.89	10.06	
Max Chl Dpth (ft)	4.83	Hydr. Depth (ft)	1.29	4.17	
Conv. Total (cfs)	85110.0	Conv. (cfs)	10751.2	74358.8	
Length Wtd. (ft)	248.50	Wetted Per. (ft)	135.54	141.72	
Min Ch El (ft)	2061.79	Shear (lb/sq ft)	0.50	1.61	
Alpha	1.16	Stream Power (lb/ft s)	2.44	16.16	
Frctn Loss (ft)	1.82	Cum Volume (acre ft)	10.66	52.38	3.11
C & E Loss (ft)	0.05	Cum SA (acres)	4.29	10.52	0.89

$\frac{248}{5991-61.79} = .0076$

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Sheet Name: Sediment Analysis Sheet: 1 Of: 9

PROBLEM:

CHANNEL REACH BETWEEN PROPOSED & EXISTING U.S. 93 BRIDGE (TEANER ST.) TO BE CHANNELIZED USING COMPOSITE SECTION, CONCRETE LINING ON SOUTH BANK & RENO MATTRESS ON NORTH BANK.

REQUIRED:

ARMORING SIZE TO LIMIT DEGRADATION

STABLE SLOPE

EQUILIBRIUM SLOPE

GIVEN: USE BANKFULL DISCHARGE OR Q_{10} YEAR

Q = 7109

S = .00725

d = 4.64

USE:

1 MEYER-PETER, MULLER

2 SHIELDS DIAGRAM

TRY ns = .02

1. $D_c = \dfrac{dS}{K\left(\dfrac{n_s}{D_{90}^{1/6}}\right)^{3/2}}$ WHERE K = 0.19

$D_c = \dfrac{4.64(4.64)(.00725)}{.19\left(\dfrac{.02}{32^{1/6}}\right)^{3/2}} = \dfrac{.034}{.00046} = 73.6\ MM = 0.24' = 2.9$

.0326

.0000226

~~143.4~~ .5'

144.4 .5'

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2. (SHIELDS DIAGRAM)

$$D_c = \frac{\gamma_w \, d \, S}{.06(\gamma_s - \gamma_w)} = \frac{(62.4)(4.64)(.00725)}{.06(165 - 62.4)} = \frac{2.099}{6.16} \quad 0.34' =$$

D_c 103 MM = 4"

AVE = 3.5" = 6"

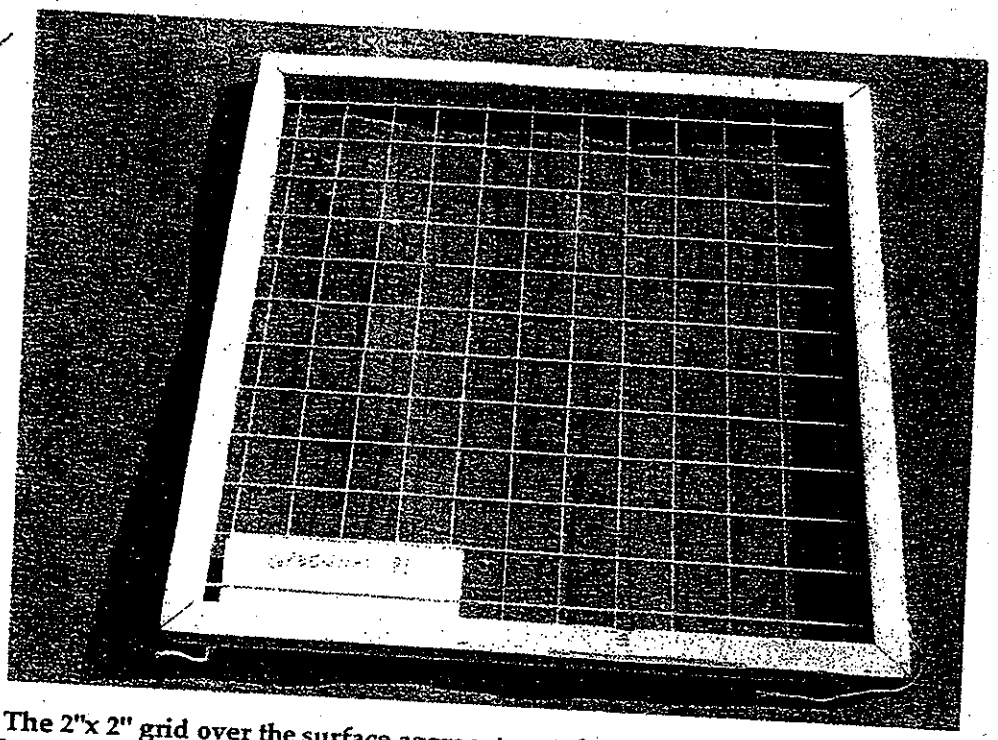

Fig. H-34 - The 2"x 2" grid over the surface aggregates at the sampling site.
[Location: GreenwayRoad; Mile Designation: 17.76; Photo taken: Jan. 18, 1992]

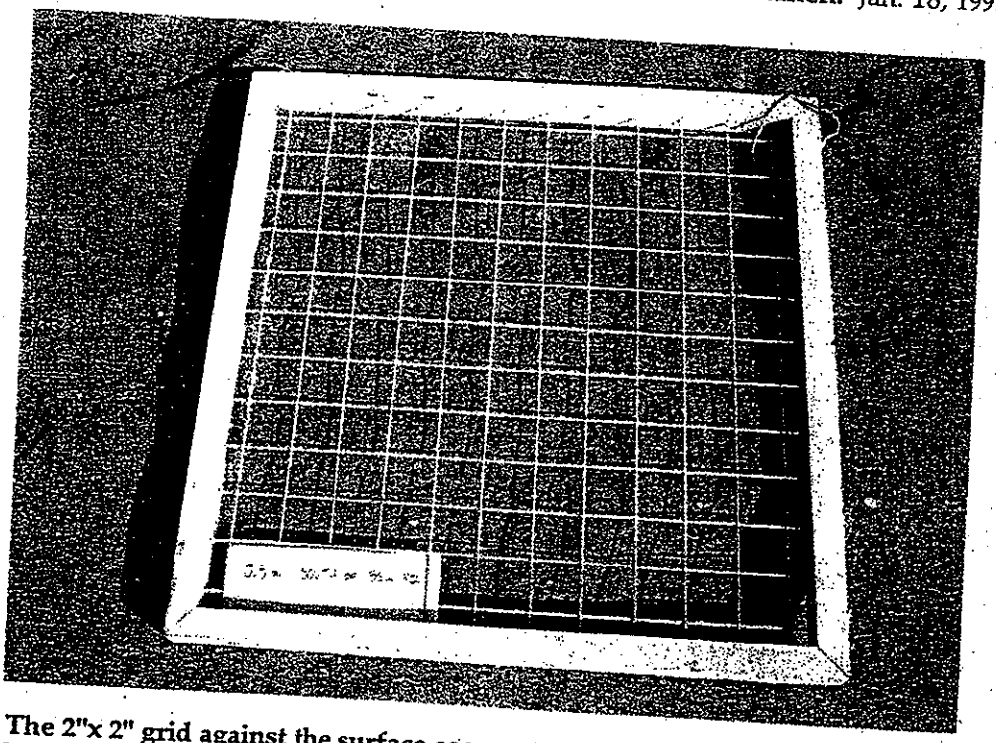

Fig. H-35 - The 2"x 2" grid against the surface aggregates at the sampling site.
[Location: 0.5 mile south of Bell Road; Mile Designation: 18.42;
Photo taken: January.18, 1992]

FIGURE 1

Table B-2-44 - Gradation data collected at Station 17.760

No.	*Sediment Size (mm)*	*Percent Finer by Weight (%)*	*Fraction by Weight**
0	0.062	0.093	0.00093
1	0.125	0.530	0.00437
2	0.250	3.110	0.02580
3	0.500	14.831	0.11721
4	1.000	27.221	0.12390
5	2.000	47.150	0.19929
6	4.000	55.899	0.08749
7	8.000	67.699	0.11800
8	16.000	74.590	0.06891
9	32.000	87.083	0.12493
10	64.000	100.000	0.12917

Note: * These values are used in the N record.

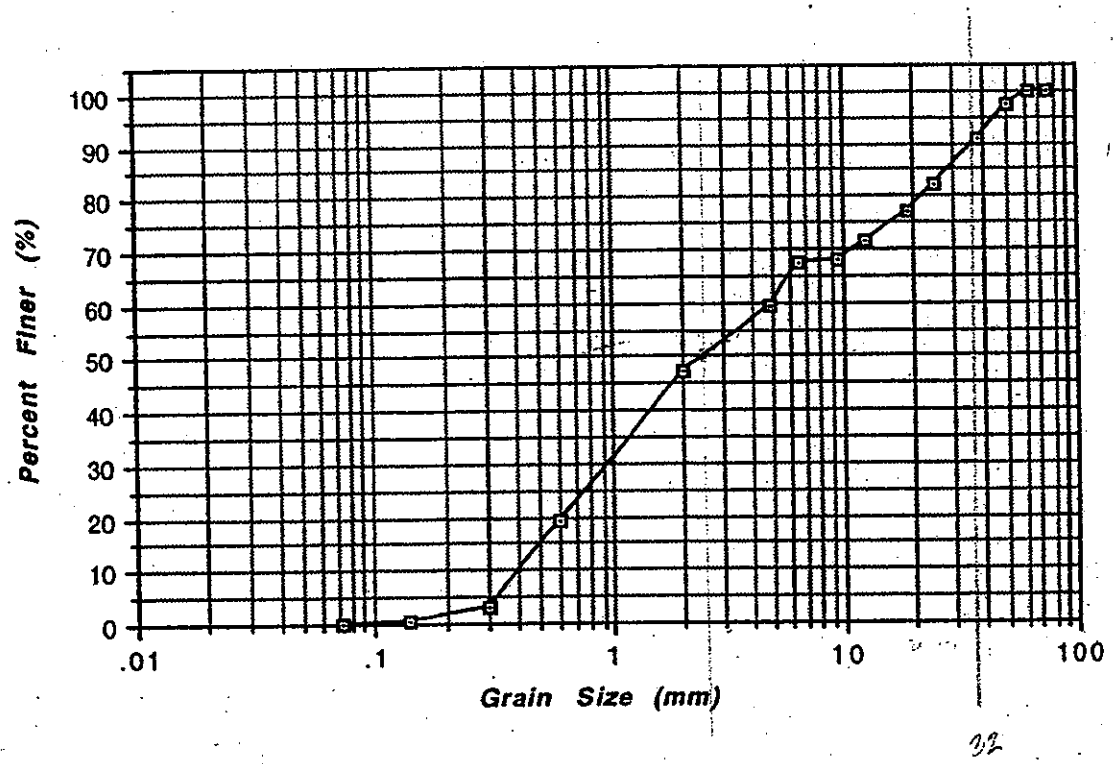

Fig. B-2-44 - Gradation Curve at Mile No. 17.760

FIGURE 2

HEC-RAS Plan: Comp 90' River: Sols Wash Reach: Reach 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 1	14413.00	2082.30	2088.50	2088.50	2089.89	0.004414	12.19	2057.58	880.77	0.92
Reach 1	1.12	PF 2	14413.00	2082.30	2088.50	2088.50	2089.89	0.004414	12.19	2057.58	880.77	0.92
Reach 1	1.12	PF 3	6725.00	2082.30	2086.30	2086.30	2087.78	0.006762	10.66	726.03	308.47	1.05
Reach 1	1.00	PF 1	14413.00	2078.10	2084.10	2084.10	2085.33	0.004281	12.19	2886.35	1711.00	0.91
Reach 1	1.00	PF 2	14413.00	2078.10	2084.10	2084.10	2085.33	0.004281	12.19	2886.35	1711.00	0.91
Reach 1	1.00	PF 3	6725.00	2078.10	2081.34	2081.34	2082.87	0.008385	11.09	695.29	245.86	1.14
Reach 1	0.90	PF 1	14413.00	2073.10	2079.13	2079.13	2080.20	0.006360	11.72	2697.71	1392.79	0.90
Reach 1	0.90	PF 2	14413.00	2073.10	2079.13	2079.13	2080.20	0.006360	11.72	2697.71	1392.79	0.90
Reach 1	0.90	PF 3	6725.00	2073.10	2077.01		2078.04	0.007628	9.76	884.16	316.36	0.94
Reach 1	0.79	PF 1	14413.00	2067.42	2073.90	2073.90	2075.50	0.009363	13.32	1886.69	924.15	1.09
Reach 1	0.79	PF 2	14413.00	2067.42	2073.90	2073.90	2075.50	0.009363	13.32	1886.69	924.15	1.09
Reach 1	0.79	PF 3	6725.00	2067.42	2072.09	2072.09	2073.45	0.008969	10.24	729.59	293.31	1.00
Reach 1	0.76	PF 1	14413.00	2065.84	2071.96	2071.96	2073.62	0.006730	12.15	1633.80	881.70	0.94
Reach 1	0.76	PF 2	14413.00	2065.84	2071.96	2071.96	2073.62	0.006730	12.15	1633.80	881.70	0.94
Reach 1	0.76	PF 3	6725.00	2065.84	2069.84	2069.71	2071.18	0.008952	9.93	736.81	251.47	0.99
Reach 1	0.71	PF 1	14413.00	2063.89	2071.02	2070.12	2071.96	0.002965	9.37	2351.77	664.94	0.64
Reach 1	0.71	PF 2	14413.00	2063.89	2071.02	2070.12	2071.96	0.002965	9.37	2351.77	664.94	0.64
Reach 1	0.71	PF 3	6725.00	2063.89	2068.48	2067.87	2069.43	0.004455	8.56	930.17	312.26	0.74
Reach 1	0.66	PF 1	14413.00	2061.79	2069.70	2068.75	2071.10	0.003460	10.59	1815.94	534.05	0.70
Reach 1	0.66	PF 2	14413.00	2061.79	2069.70	2068.75	2071.10	0.003460	10.59	1815.94	534.05	0.70
Reach 1	0.66	PF 3	6725.00	2061.79	2066.62	2066.46	2068.04	0.006243	10.06	757.68	274.92	0.87
Reach 1	0.61	PF 1	14459.00	2059.91	2066.89	2066.89	2069.77	0.006845	13.67	1097.00	200.63	0.97
Reach 1	0.61	PF 2	14459.00	2059.91	2066.89	2066.89	2069.77	0.006845	13.67	1097.00	200.63	0.97
Reach 1	0.61	PF 3	6758.00	2059.91	2064.24	2064.24	2066.17	0.008711	11.14	606.48	160.68	1.01
Reach 1	0.57	PF 1	14459.00	2057.69	2064.53	2064.53	2067.45	0.007354	13.72	1059.57	185.48	1.00
Reach 1	0.57	PF 2	14459.00	2057.69	2064.67	2064.53	2067.46	0.006821	13.40	1085.09	185.76	0.96
Reach 1	0.57	PF 3	6758.00	2057.69	2062.14	2062.08	2063.92	0.008076	10.68	632.91	169.06	0.97
Reach 1	0.52	PF 1	14459.00	2055.50	2063.43	2062.80	2065.61	0.004933	11.94	1270.49	218.97	0.83
Reach 1	0.52	PF 2	14459.00	2055.50	2064.21	2062.80	2065.92	0.003367	10.59	1442.53	220.48	0.70
Reach 1	0.52	PF 3	6758.00	2055.50	2060.35	2060.35	2062.12	0.008572	10.69	632.23	176.24	0.99
Reach 1	0.48	PF 1	13553.00	2053.51	2063.27	2059.96	2064.40	0.001716	8.53	1588.55	183.27	0.51
Reach 1	0.48	PF 2	15045.00	2053.51	2063.89	2060.38	2065.10	0.001699	8.84	1701.64	184.51	0.51
Reach 1	0.48	PF 3	7019.00	2053.51	2058.26	2057.75	2059.77	0.005720	9.86	712.09	164.80	0.84
Reach 1	0.43	PF 1	13553.00	2051.27	2063.03	2057.85	2063.93	0.000925	7.59	1785.68	208.79	0.40
Reach 1	0.43	PF 2	15045.00	2051.27	2063.64	2058.29	2064.63	0.000958	8.00	1881.52	330.08	0.41
Reach 1	0.43	PF 3	7019.00	2051.27	2057.60	2055.68	2058.48	0.002199	7.56	928.04	173.25	0.55
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 1	13553.00	2049.33	2058.44	2056.14	2060.02	0.002439	10.09	1343.71	191.99	0.62
Reach 1	0.40	PF 2	15045.00	2049.33	2059.00	2056.60	2060.71	0.002417	10.49	1435.15	205.96	0.62
Reach 1	0.40	PF 3	7019.00	2049.33	2055.41	2053.94	2056.45	0.002888	8.20	855.69	170.29	0.63
Reach 1	0.35	PF 1	13553.00	2047.68	2055.57	2055.57	2058.75	0.004145	14.41	1024.77	186.62	0.95
Reach 1	0.35	PF 2	15045.00	2047.68	2056.07	2056.07	2059.43	0.004041	14.86	1118.54	187.41	0.95
Reach 1	0.35	PF 3	7019.00	2047.68	2052.87	2052.87	2055.12	0.005283	12.05	590.46	139.27	0.99
Reach 1	0.27	PF 1	13553.00	2044.00	2054.19	2052.30	2056.42	0.003410	12.01	1128.87	126.77	0.71
Reach 1	0.27	PF 2	15045.00	2044.00	2053.46	2052.84	2056.73	0.005496	14.51	1036.82	125.67	0.89
Reach 1	0.27	PF 3	7019.00	2044.00	2050.77	2049.60	2052.31	0.004087	9.96	705.05	121.65	0.73
Reach 1	0.22	PF 1	15045.00	2043.00	2051.45	2051.45	2054.82	0.005494	14.72	1021.89	150.68	1.00
Reach 1	0.22	PF 2	15045.00	2043.00	2051.45	2051.45	2054.82	0.005494	14.72	1021.89	150.68	1.00
Reach 1	0.22	PF 3	7019.00	2043.00	2048.36	2048.36	2050.60	0.005580	12.01	584.26	129.95	1.00
Reach 1	0.19	PF 1	15045.00	2040.69	2049.70	2049.70	2053.59	0.003507	15.82	950.82	121.19	1.00
Reach 1	0.19	PF 2	15045.00	2040.69	2049.70	2049.70	2053.59	0.003507	15.82	950.82	121.19	1.00
Reach 1	0.19	PF 3	7019.00	2040.69	2046.25	2046.25	2048.75	0.003823	12.69	553.10	109.24	0.99
Reach 1	0.13	PF 1	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.13	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.13	PF 3	7019.00	2040.00	2046.29	2044.90	2047.27	0.002011	8.48	1138.56	263.96	0.63
Reach 1	0.12		Bridge									

Sols Wash
Q_{10} WATER SURFACE
PROFILE

FIGURE 3

HEC-RAS Plan: Comp 90' River: Sols Wash Reach: Reach 1 (Continued)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1 [illegible]	PF 1	15045.00	2039.00	2047.25	2047.25	2050.36	0.004473	15.08	1349.67	239.45	0.98
Reach 1 [illegible]	PF 2	15045.00	2039.00	2047.25	2047.25	2050.36	0.004473	15.08	1349.67	239.45	0.98
Reach 1 [illegible]	PF 3	7019.00	2039.00	2044.52	2044.52	2046.50	0.005008	11.74	760.35	211.42	0.96
[illegible]											
Reach 1 [illegible]	PF 1	15045.00	2036.99	2044.19		2044.79	0.002920	7.67	3306.91	818.57	0.55
Reach 1 [illegible]	PF 2	15045.00	2036.99	2044.19		2044.79	0.002923	7.67	3305.61	818.56	0.55
Reach 1 [illegible]	PF 3	7019.00	2036.99	2043.63		2043.81	0.000970	4.14	2850.14	815.42	0.31
[illegible]											
Reach 1 [illegible]	PF 1	15045.00	2038.00	2043.52	2042.38	2044.34	0.002757	9.09	3336.53	1079.12	0.72
Reach 1 [illegible]	PF 2	15045.00	2038.00	2043.52	2042.38	2044.34	0.002757	9.09	3336.53	1079.12	0.72
Reach 1 [illegible]	PF 3	7019.00	2038.00	2043.52	2040.99	2043.70	0.000600	4.24	3336.53	1079.12	0.34

FIGURE 3 c01

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Checked By: | Date:
Sheet Name | Sheet: 3 Of: 9

DEGRADATION LIMITED BY STABLE SLOPE

DOMINANT

SCHOKLITSCH

$$S_L = K\left(\frac{DB}{Q}\right)^{3/4}$$

K = .00174
D_{50} = 2.1
W = 90'

$$S_L = .00174\left(\frac{2.1 * 90}{7019}\right)^{3/4}$$

S_L = [redacted]

M-P

$$S_L = \frac{K\left(\frac{Q}{Q_B}\right)\left(\frac{n_s}{D_{90}^{1/6}}\right)^{3/2} D}{d}$$

K = 0.19
$\frac{Q}{Q_B}$ = 1
D_{90} = 32
n_s = .026
D_{50} = 2.1
d = 5.36

$$S_L = \frac{0.19(1)\left(\frac{.026}{32^{1/6}}\right)^{3/2} 2.1}{5.36}$$

S_L [redacted]

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DEGRADATION LIMITED BY STABLE SLOPE

SHIELDS

$Q = 7019$

$B = 90'$

$d = 5.36'$

$S = .00558$

$D = D_{50} = 2.1\ mm = .00689'$ $\quad .00328\ F/mm \quad 2.1\ mm$

$D_{90} = 32\ mm$

$n_s = .026$

$V = 12.5\ FPS$

$$R_* = \frac{U_* D}{\nu}$$

$$R_* = \frac{(.00558 * 5.36 * 32.2)^{1/2}(.00688)}{.00001} = 67.52$$

$$T_* = .4 \cdot \frac{T_o}{(\gamma_s - \gamma_w) D}$$

$$S_L = \frac{.4(165.4 - 62.4)(.00688)}{(62.4)(5.36)} = .00085$$

Recomp $R_* = 67.52\left(\frac{.00085}{.00688}\right)^{1/2} = 23.73$

$T_* = .035$

$$S_L = \frac{(.035)(103)\ .00689}{62.4\ (5.36} =$$

$S_L = .00007$

$$S_L = \frac{.000124 + .000124 + .00011}{3}$$

$S_L = .000107\ \%$

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DEGRADATION LIMITED BY STABLE SLOPE

$\Delta S_g = S_b - S_i$

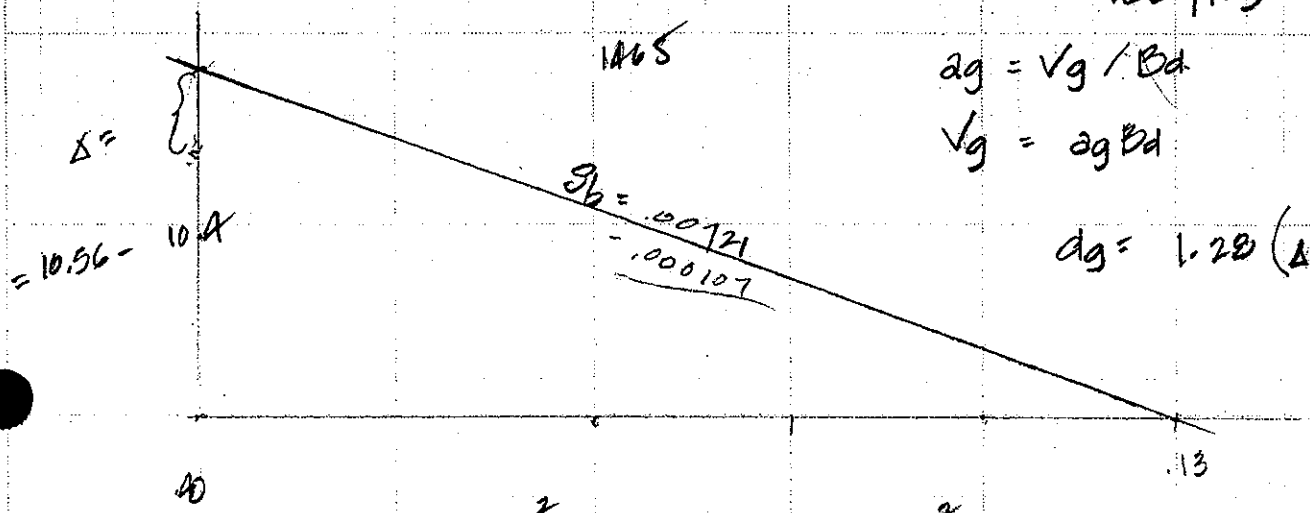
$= .00721 - .000107$

$= .007103$

$a_g = V_g / B_d$

$V_g = a_g B_d$

$d_g = 1.28 (\Delta S_g a_g)^{0.5}$



$a_1 = \frac{3 d_g^2}{8 \Delta S_g} = a_1 \frac{3 d_g^2}{8(.007103)}$

$L_g = 1450 = \frac{13 d_g}{8 \Delta S_g} = d_g = \frac{1450 (8)(.007103)}{13} = 6.3'$

$d_g = 1.28 \sqrt{.007103 a_g}$

$\frac{6.3}{1.28} = \sqrt{.007103 a_g} =$

$4.92 = \sqrt{.007103 a_g}$

$a_g = \frac{39 (6.3)^2}{64 (.007103)} = 3405$ ok

$\frac{24.22 =}{.007103} = a_g = 3410$ ok

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$$q_1 = \frac{3(6.3)^2}{8(.007103)} = 2095 \qquad L_1 = \frac{6.3}{2(.007103)} = 443.5'$$

$$q_2 = \frac{9(6.3)^2}{64(.007103)} = 785.8 \qquad L_2 = \frac{3(6.3)}{8(.007103)} = 332.6'$$

$$q_3 = \frac{3(6.3)^2}{32(.007103)} = 523.85 \qquad L_3 = \frac{3(6.3)}{4(.007103)} = 665.2$$

1441

$V_g = 2gBd$

$V_g = 3405(90) = 306{,}450$ CF $= 11{,}350$ CY

BOTH BANKS PROTECTED

∴ NO LATERAL DEGRADATION

Plan: B=90 n=02 Sols Wash Reach 1 RS: 0.22 Profile: PF 3

			Left OB	Channel	Right OB
Flow (cfs)	2050.60	Elevation (ft)			
Vel Head (ft)	2.24	Vel Total (ft/s)		0.025	
Water Elev (ft)	2048.36	Reach Length (ft)	170.00	175.00	180.00
Crit W.S. (ft)	2048.36	Flow Area (sq ft)		584.26	
E.G. Slope (ft/ft)	0.005580	Area (sq ft)		584.26	
Q Total (cfs)	7019.00	Flow (cfs)		7019.00	
Top Width (ft)	129.95	Top Width (ft)		129.95	
Vel Total (ft/s)	12.01	Avg Vel (ft/s)		12.01	
Max Chl Dpth (ft)	5.36	Hyd Depth (ft)		4.50	
Total Cond (cfs)	93961.2	Conv (cfs)		93961.2	
Length Wtd (ft)	175.00	Wetted Per (ft)		132.23	
Min Ch El (ft)	2043.00	Shear (lb/sq ft)		1.54	
Alpha	1.00	Stream Pwr (lb/ft s)		18.49	
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)	10.13	15.01	3.11
C & E Loss (ft)	0.03	Cum SA (acres)	3.86	2.88	0.89

FIGURE 4

HEC-RAS Plan: B=90 n=02 River: Sols Wash Reach: Reach 1

[illegible]	[illegible]	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top width (ft)	Froude # Chl
[illegible]	[illegible]	7019.00	2043.00	2048.36	2048.36	2050.60	0.005580	12.01	584.26	129.95	1.00

FIGURE 4(ON.

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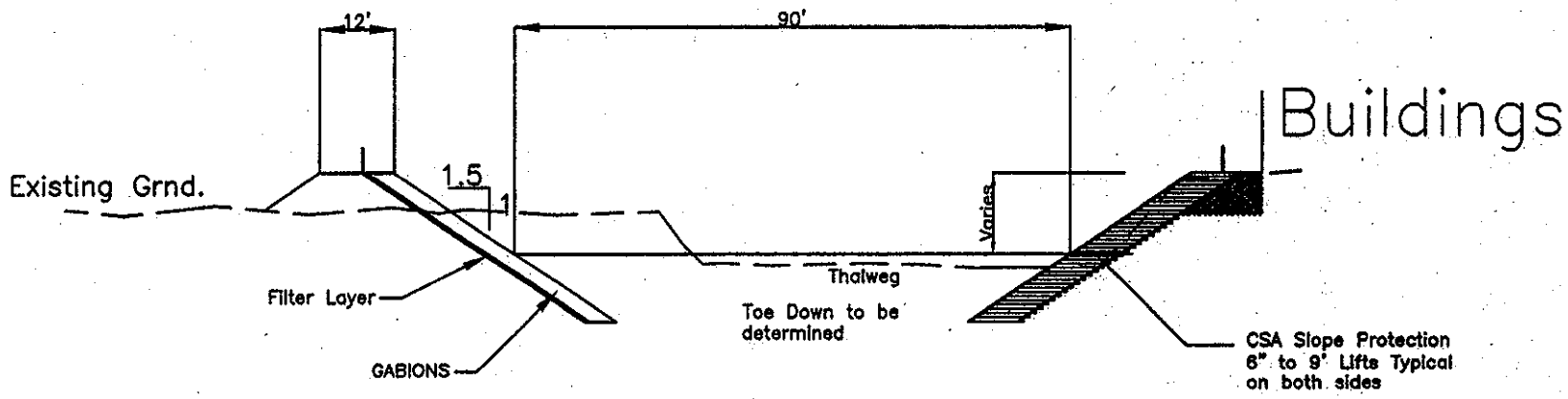
UNIT DISCHARGE FOR SEDIMENT

ZELLER

$$q_s = .0064 \frac{n^{1.77} V^{4.32} G^{0.45}}{Y_h^{0.30} D_{50}^{0.61}}$$ = bed material discharge (cfs)

$$.0064 \frac{(.026)^{1.77} (12.01)^{4.37} (2.0)^{0.45}}{(4.5)^{0.30} (2.1)^{0.61}} = = 0.26$$



COMPOSITE OF GABIONS
AND CSA BANK PROTECTION

FIGURE 5

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EQUILIBRIUM SLOPE

$$S = \left(\frac{a}{q_s}\right)^{\frac{10}{3(b-c)}} q^{\frac{2(2c+3b)}{3(b-c)}} \left(\frac{n}{1.49}\right)^{2}$$

$$q_s = 1.48 * 10^{-5} * Y_h^{(0.0501)} V^{4.31}$$

n = .026
b = 90'
S = .00721
Q = 7019 CFS
V = 9.4
Y_h = 6.11

$$q_s = 1.48 * .00001 * 6.11^{(.0501)} (9.4)^{4.31}$$

q_s = 0.25 cfs/ft
$Q_{s\,IN}$ = .25(90) = 23 cfs

TRANSP. CAP. USING n = .026
b = 90'
SS = 1.5 : 1

SLOPE	Y_h	V	q_s	FLOW WIDTH	Q_s
.0001	18.24	3.28			.26
.004328	6.11	11.58	.62	90	56
.006	5.55	12.87	.97		87
.00001	34.2	1.45			
.005	5.85	12.14			6.8
.00315	6.71	10.45		40	36

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EQUILIBRIUM SLOPE

EXISTING CHANNEL

n = .03
b = 120'
S = .00721
Q_{10} = 7019

d = 5.25'
V = 13.65

q_{10} = 0.89
Q = 7745

n = .03
b = 90
Q_{10} = 7019 cfs

	.003	.01	.005	.0055
d	6.81	4.77	5.85	5.69
V	10.29	15.16	12.14	12.32
Q	33	68	87	78

.00721
.0055

Δ = .0017 * 1450' = 2.5' DROP @ U.S.SEC @ TEGNER CO.

ATTACHMENT H
MOBILE HOME PARK
LEVEE IMPROVEMENTS MODEL

SUBC.

HEC-RAS Plan: Trl Crt Dike River: Sols Wash Reach: Reach 1 Profile: PF 2

River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	PF 2	14413.00	2082.30	2090.17	2090.17	2092.94	0.004457	14.65	1449.46	273.91	0.97
Reach 1	PF 2	14413.00	2078.10	2084.07	2084.07	2085.59	0.004743	12.79	1936.04	830.23	0.96
Reach 1	PF 2	14413.00	2073.10	2079.28	2079.28	2080.89	0.007645	13.08	1750.47	630.10	0.99
Reach 1	PF 2	14413.00	2067.42	2074.78	2074.78	2076.52	0.007051	12.97	1684.23	558.45	0.97
Reach 1	PF 2	14413.00	2066.84	2072.56	2072.56	2074.48	0.006136	12.48	1492.57	486.66	0.91
Reach 1	PF 2	14413.00	2063.89	2070.52	2070.52	2072.49	0.005846	12.54	1521.86	430.80	0.89
Reach 1	PF 2	14413.00	2061.79	2069.70	2068.75	2071.10	0.003460	10.59	1815.94	534.05	0.70
Reach 1	PF 2	14459.00	2059.91	2066.89	2066.89	2069.77	0.006845	13.67	1097.00	200.63	0.97
Reach 1	PF 2	14459.00	2057.69	2064.67	2064.53	2067.46	0.006822	13.41	1085.00	185.75	0.96
Reach 1	PF 2	14459.00	2055.50	2064.21	2062.80	2065.92	0.003368	10.59	1442.37	220.48	0.70
Reach 1	PF 2	15045.00	2053.51	2063.89	2060.38	2065.10	0.001699	8.84	1701.50	184.51	0.51
Reach 1	PF 2	15045.00	2051.27	2063.64	2058.29	2064.63	0.000958	8.00	1881.40	330.00	0.41
Reach 1		Bridge									
Reach 1	PF 2	15045.00	2049.33	2059.15	2056.60	2060.80	0.002310	10.31	1459.71	210.06	0.60
Reach 1	PF 2	15045.00	2047.68	2056.04	2056.04	2059.38	0.006490	14.84	1113.10	187.35	0.95
Reach 1	PF 2	15045.00	2044.00	2053.86	2052.84	2056.83	0.004725	13.83	1087.60	126.28	0.83
Reach 1	PF 2	15045.00	2043.00	2051.72	2051.45	2054.84	0.007085	14.16	1062.48	151.08	0.94
Reach 1	PF 2	15045.00	2040.69	2049.70	2049.70	2053.59	0.006239	15.82	950.82	121.19	1.00
Reach 1	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1		Bridge									
Reach 1	PF 2	15045.00	2039.00	2047.25	2047.25	2050.36	0.004473	15.08	1349.67	239.45	0.98
Reach 1	PF 2	15045.00	2036.99	2044.19		2044.79	0.002915	7.66	3308.61	818.58	0.55
Reach 1	PF 2	15045.00	2038.00	2043.52	2042.38	2044.34	0.002757	9.09	3336.53	1079.12	0.72

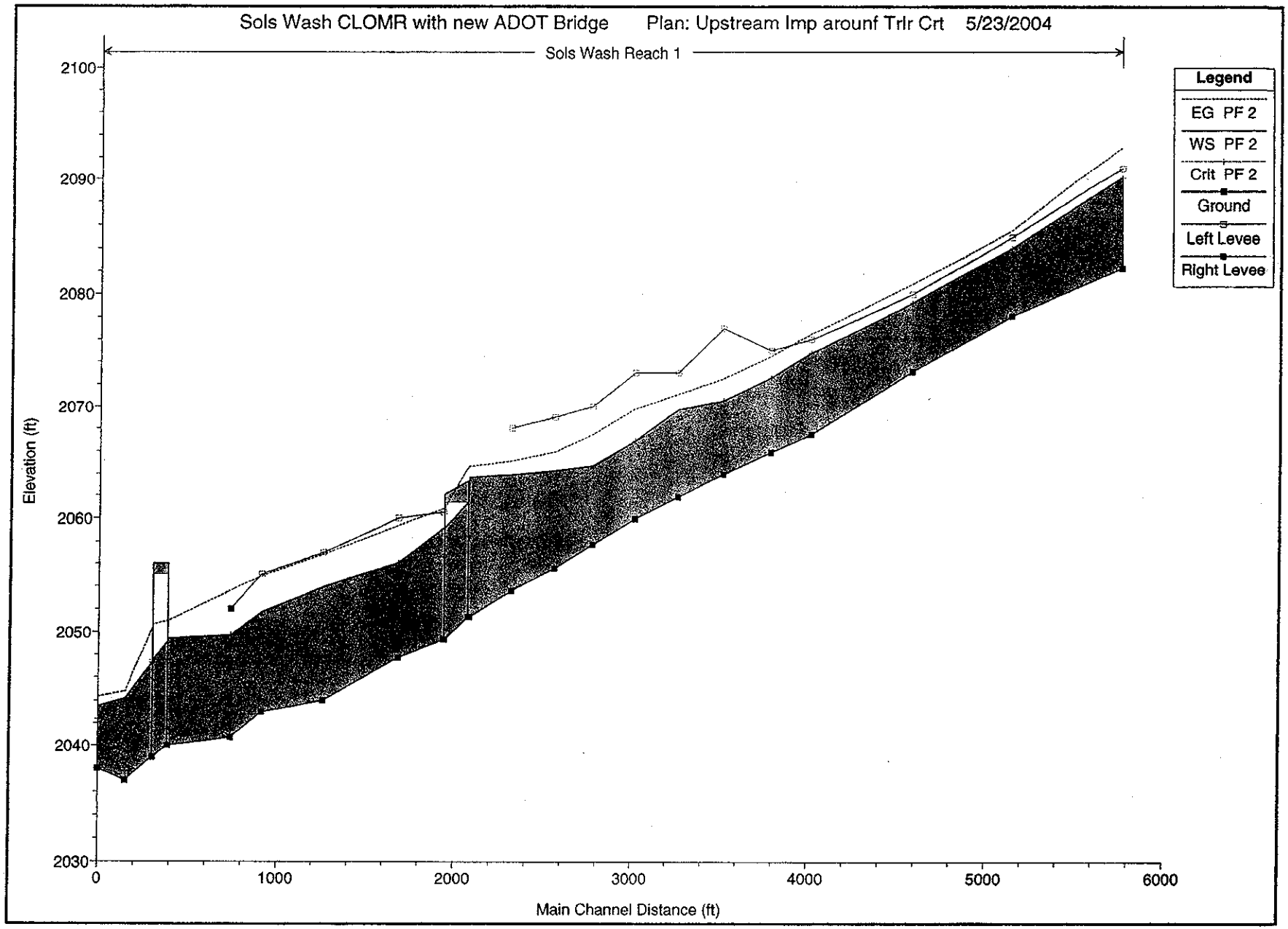
MODEL
IMPROVEMENTS (LEVEE)
INCLUDED TO PROTECT
TRAILER COURT

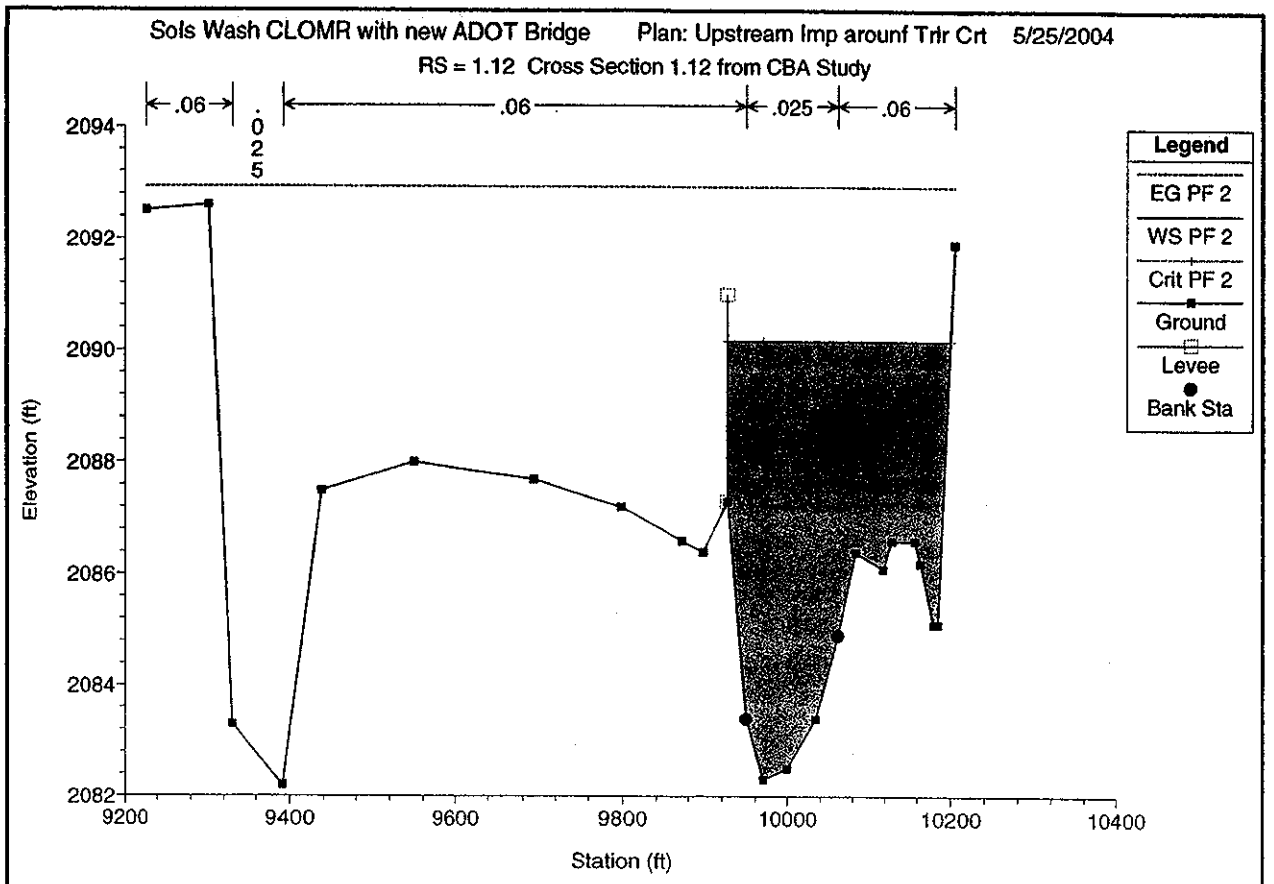
MIXED

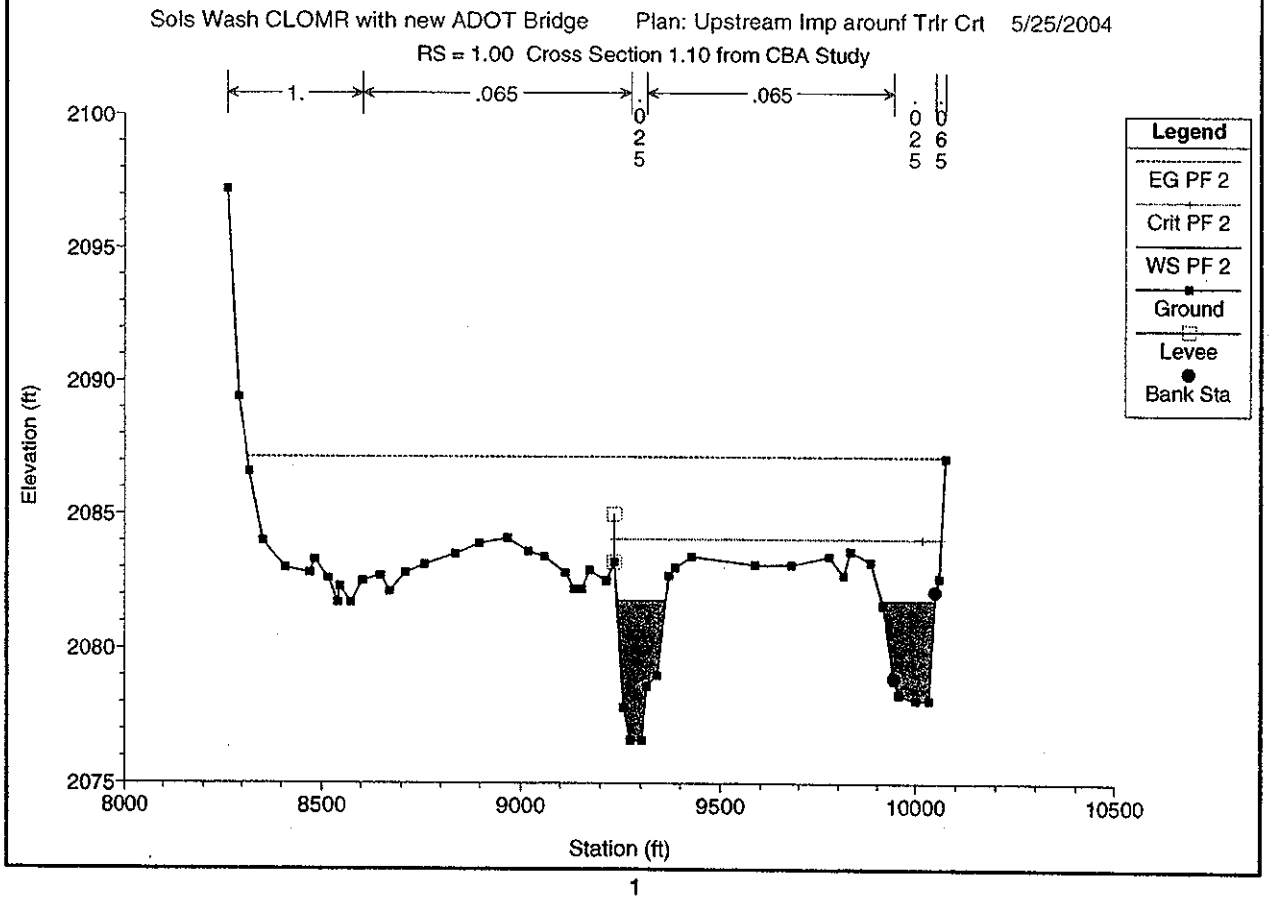
HEC-RAS Plan: Tri Crt Dike River: Sols Wash Reach: Reach 1 Profile: PF 2

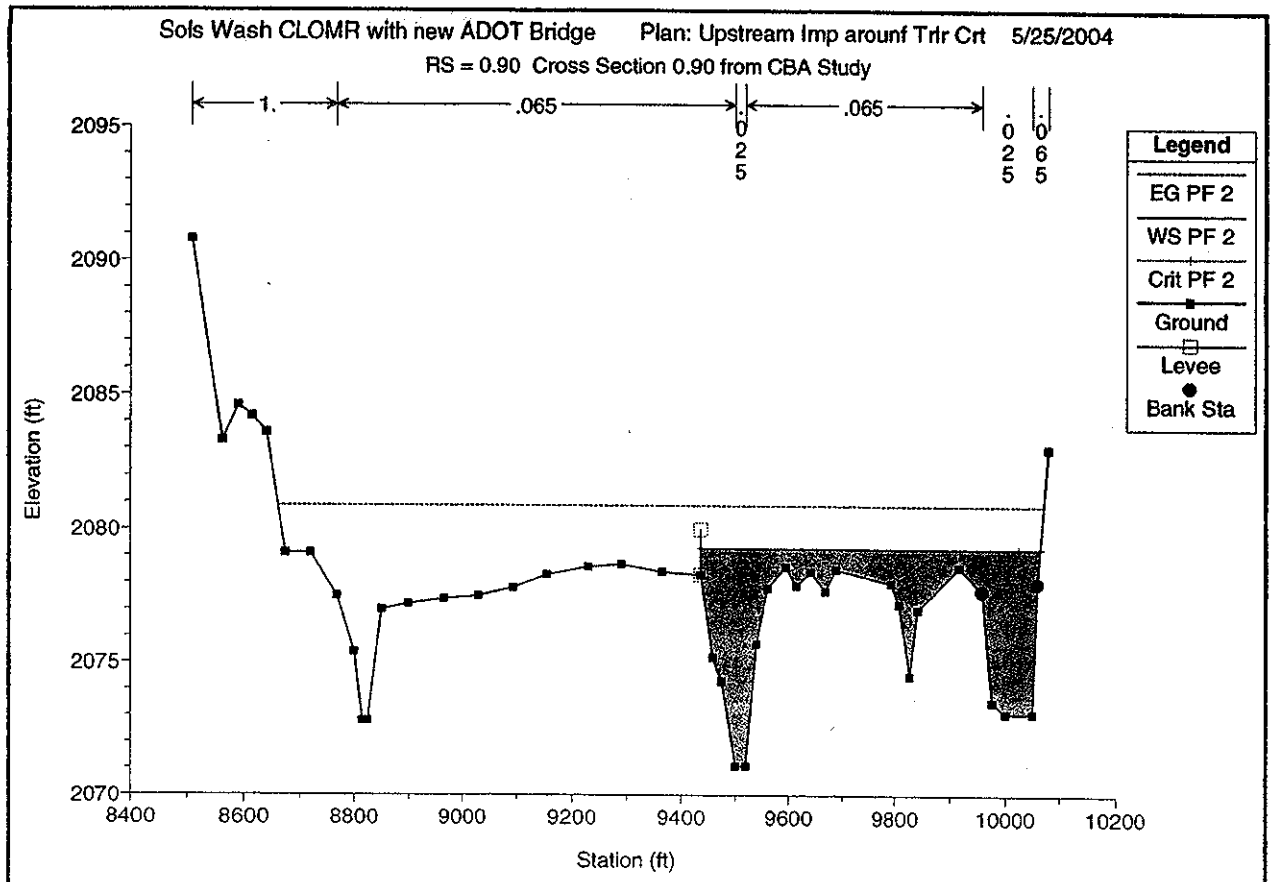
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2090.17	2090.17	2092.94	0.004457	14.65	1449.46	273.91	0.97
Reach 1	1.00	PF 2	14413.00	2078.10	2081.77	2084.07	2087.15	0.026069	21.17	802.02	259.02	2.06
Reach 1	0.90	PF 2	14413.00	2073.10	2079.28	2079.28	2080.89	0.007645	13.08	1750.47	630.10	0.99
Reach 1	0.79	PF 2	14413.00	2067.42	2074.62	2074.78	2076.53	0.007997	13.53	1591.45	557.59	1.03
Reach 1	0.74	PF 2	14413.00	2065.84	2072.05	2072.56	2074.58	0.008844	14.07	1241.20	474.57	1.08
Reach 1	0.71	PF 2	14413.00	2063.89	2070.46	2070.52	2072.49	0.006065	12.70	1497.67	430.69	0.81
Reach 1	0.66	PF 2	14413.00	2061.79	2069.70	2068.75	2071.10	0.003460	10.59	1815.94	534.05	0.70
Reach 1	0.61	PF 2	14459.00	2059.91	2066.89	2066.89	2069.77	0.006845	13.67	1097.00	200.63	0.97
Reach 1	0.57	PF 2	14459.00	2057.69	2063.82	2064.53	2067.60	0.011173	15.61	926.21	184.03	1.21
Reach 1	0.52	PF 2	14459.00	2055.50	2064.21	2062.80	2065.92	0.003368	10.59	1442.37	220.48	0.70
Reach 1	0.48	PF 2	15045.00	2053.51	2063.89	2060.38	2065.10	0.001699	8.84	1701.50	184.51	0.51
Reach 1	0.43	PF 2	15045.00	2051.27	2063.64	2058.29	2064.63	0.000958	8.00	1881.40	330.00	0.41
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2059.15	2056.60	2060.80	0.002310	10.31	1459.71	210.06	0.60
Reach 1	0.35	PF 2	15045.00	2047.68	2056.04	2056.04	2059.38	0.006490	14.84	1113.10	187.35	0.95
Reach 1	0.27	PF 2	15045.00	2044.00	2053.86	2052.84	2056.83	0.004725	13.83	1087.60	126.28	0.83
Reach 1	0.22	PF 2	15045.00	2043.00	2051.72	2051.45	2054.84	0.007085	14.16	1062.48	151.08	0.94
Reach 1	0.19	PF 2	15045.00	2040.69	2049.70	2049.70	2053.59	0.006239	15.82	950.82	121.19	1.00
Reach 1	.13	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2046.27	2047.25	2050.55	0.007350	17.58	1133.13	214.56	1.22
Reach 1	0.08	PF 2	15045.00	2036.99	2044.19	2042.48	2044.79	0.002917	7.66	3307.91	818.58	0.55
Reach 1	.05	PF 2	15045.00	2038.00	2043.52	2042.39	2044.34	0.002757	9.09	3336.53	1079.12	0.72

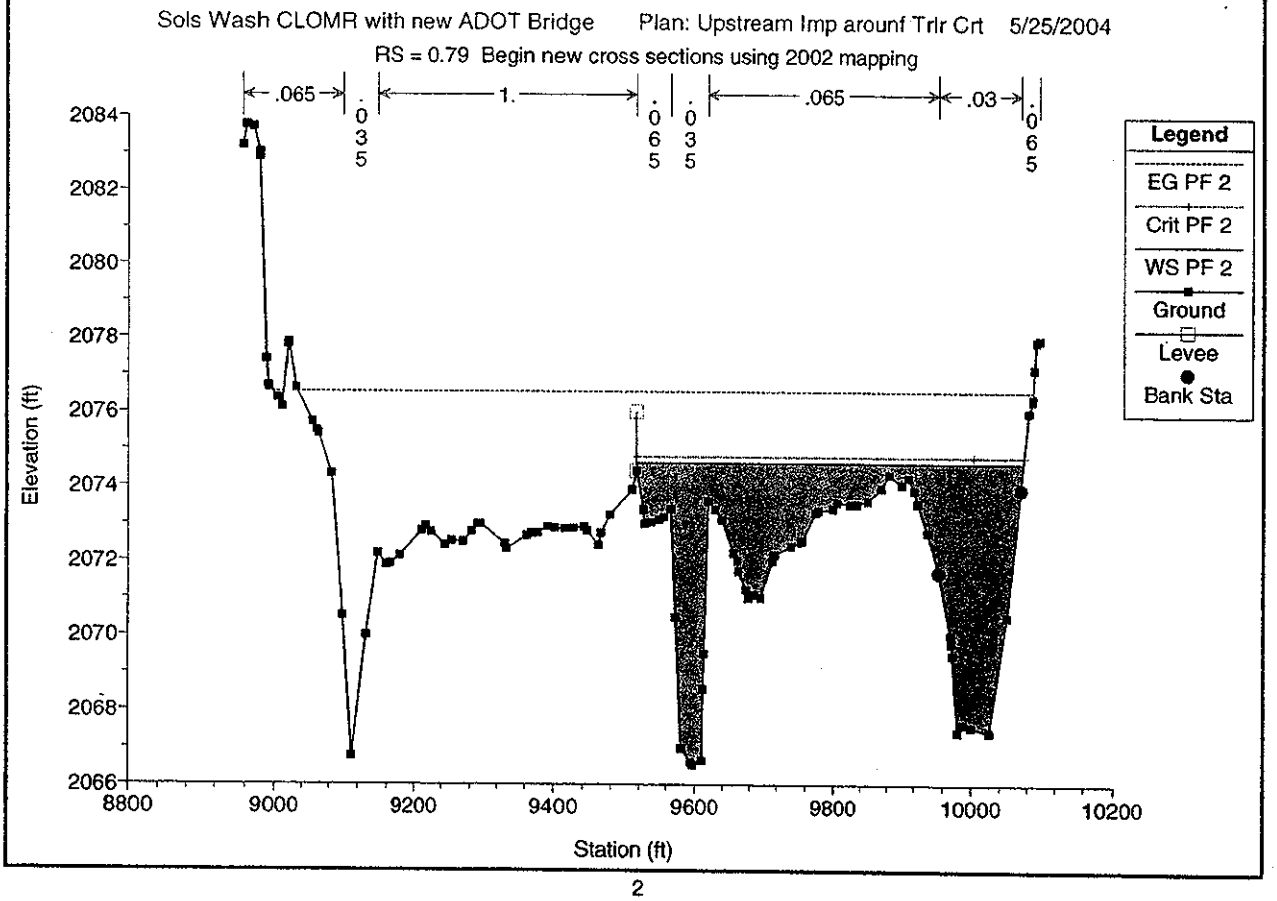
MODEL
IMPROVEMENTS (LEVEE)
INCLUDED TO PROTECT
TRAILER COURT

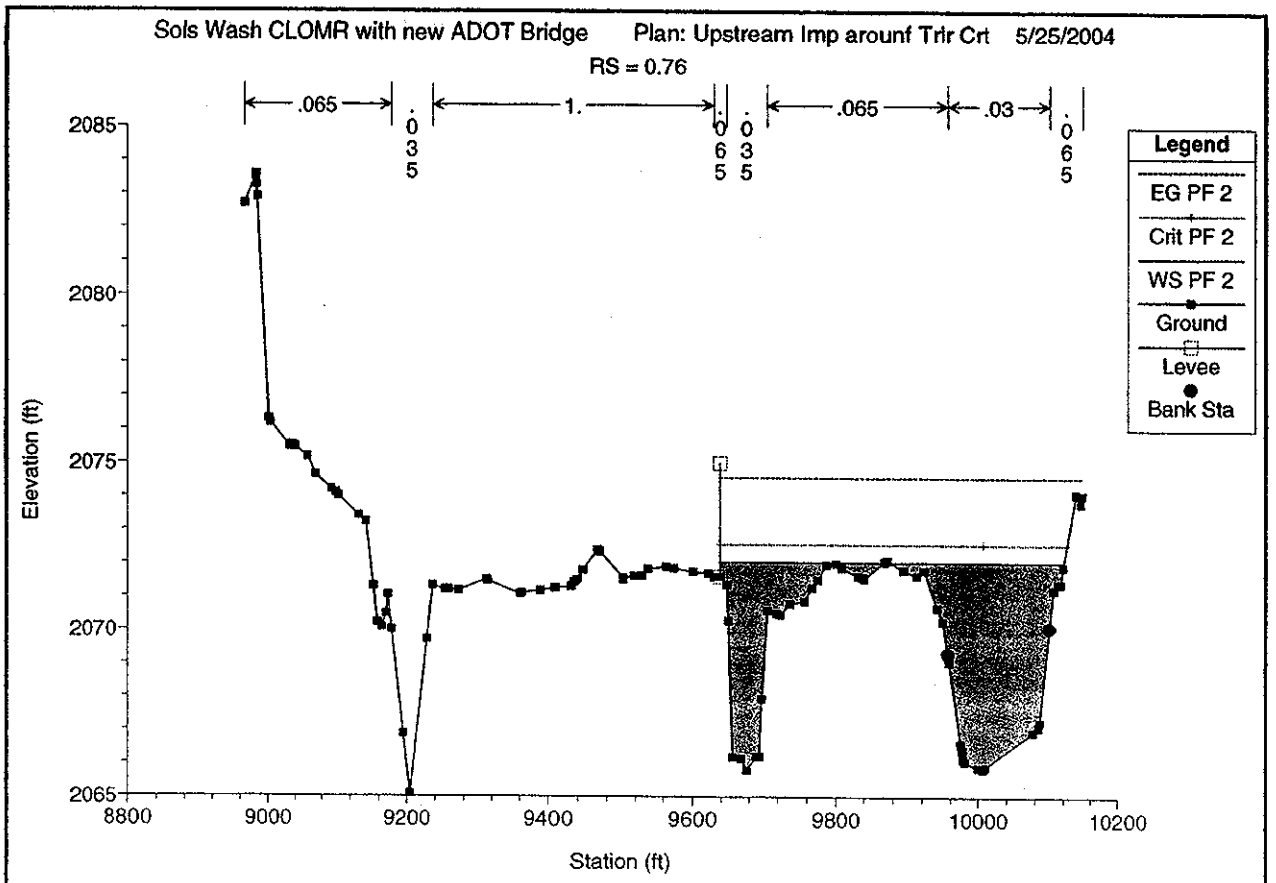

Sols Wash CLOMR with new ADOT Bridge
Plan: Upstream Imp arounf Trlr Crt 5/23/2004
Sols Wash Reach 1
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Left Levee
Right Levee
Elevation (ft)
2100
2090
2080
2070
2060
2050
2040
2030
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)

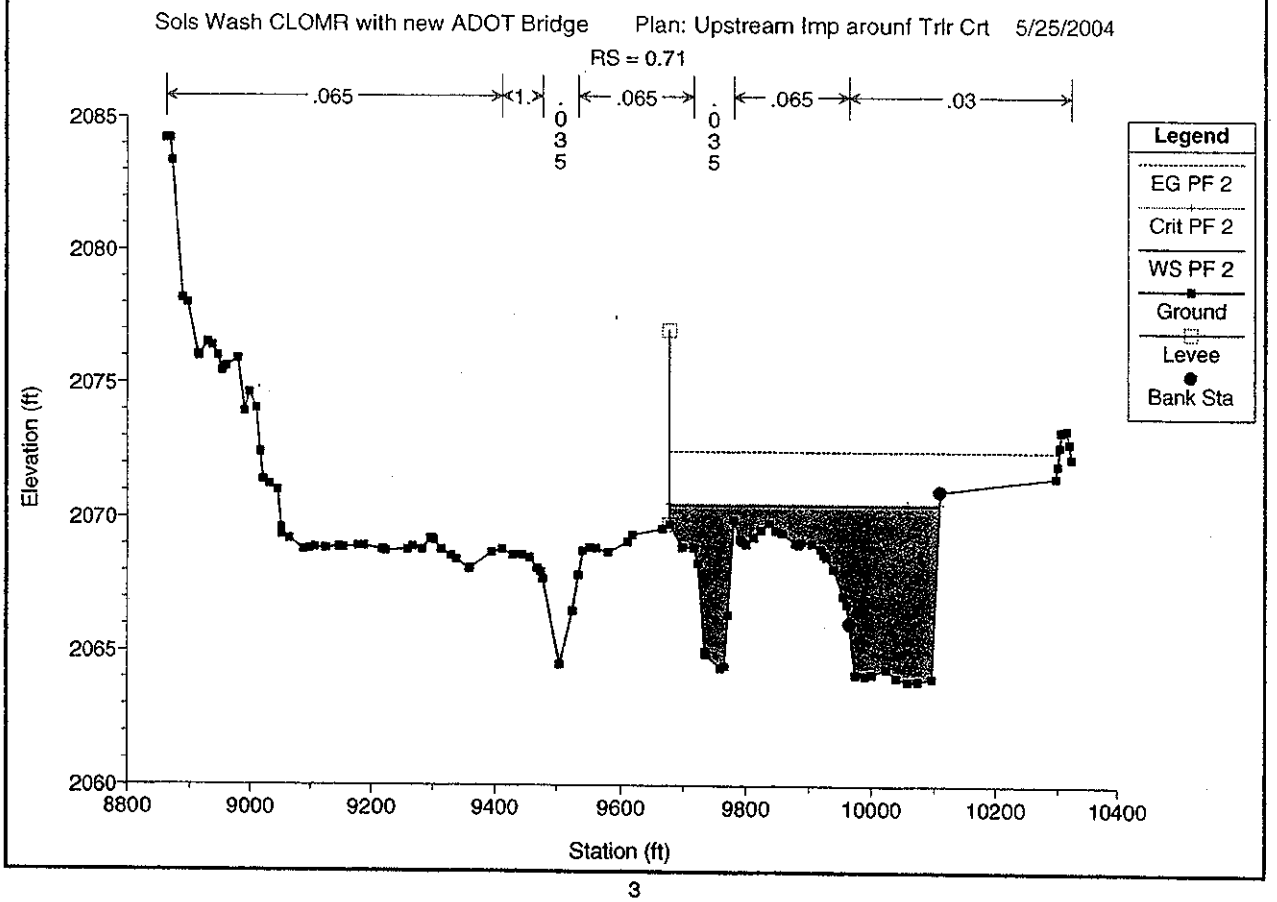

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 1.12 Cross Section 1.12 from CBA Study
.06
.025
.06
.025
.06
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2094
2092
2090
2088
2086
2084
2082
9200
9400
9600
9800
10000
10200
10400
Station (ft)

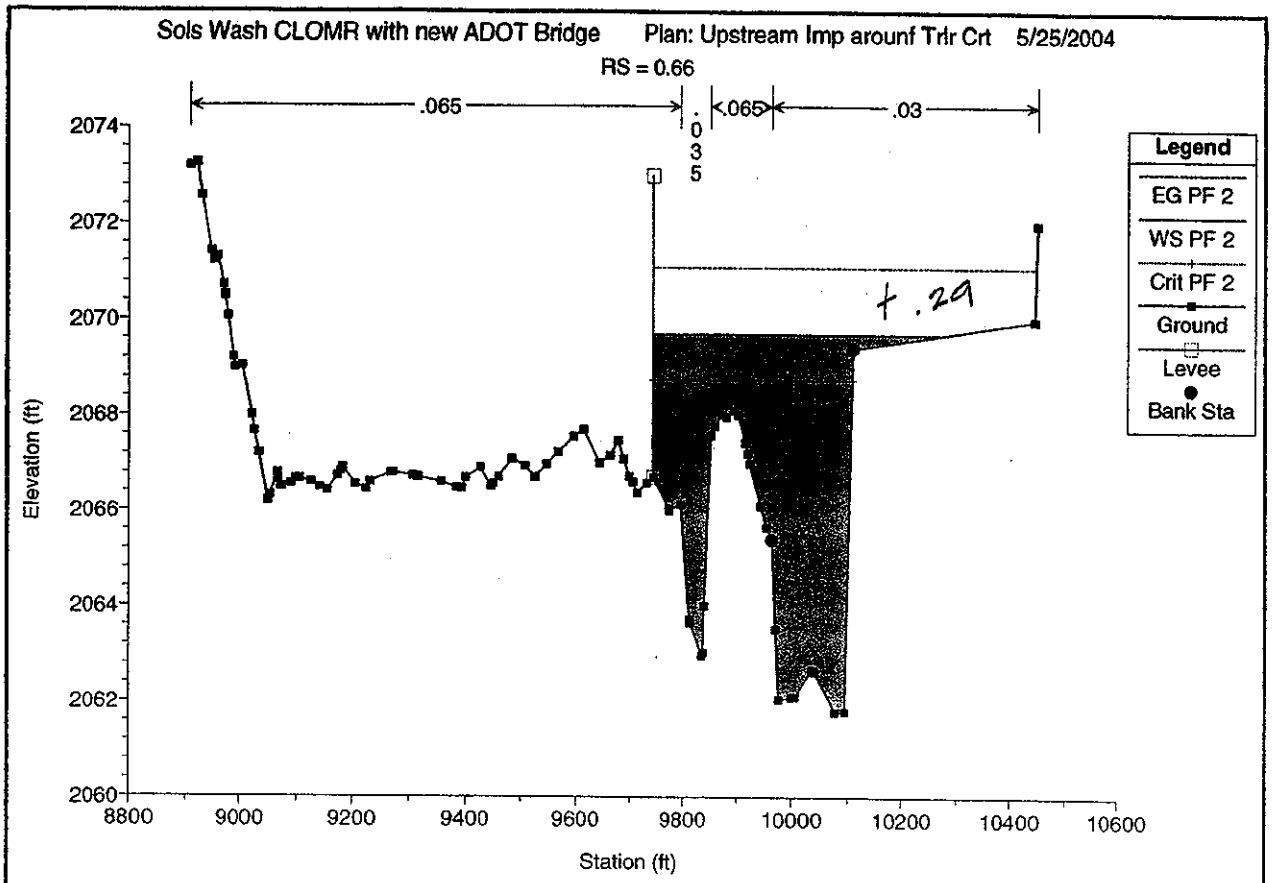

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 1.00 Cross Section 1.10 from CBA Study
1.
.065
.025
.065
.025
.065
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2100
2095
2090
2085
2080
2075
8000
8500
9000
9500
10000
10500
Station (ft)

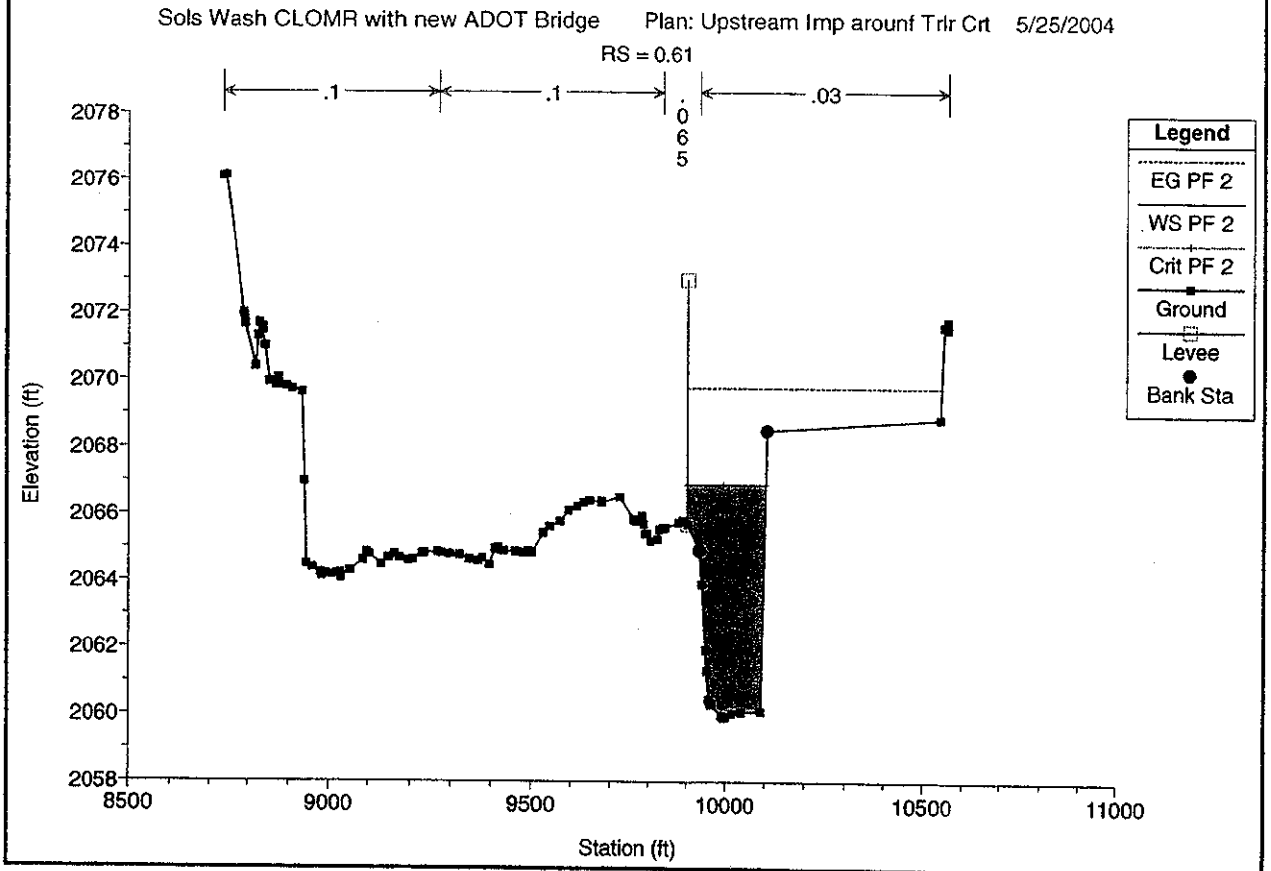

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.90 Cross Section 0.90 from CBA Study
1.
.065
.025
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2095
2090
2085
2080
2075
2070
8400
8600
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

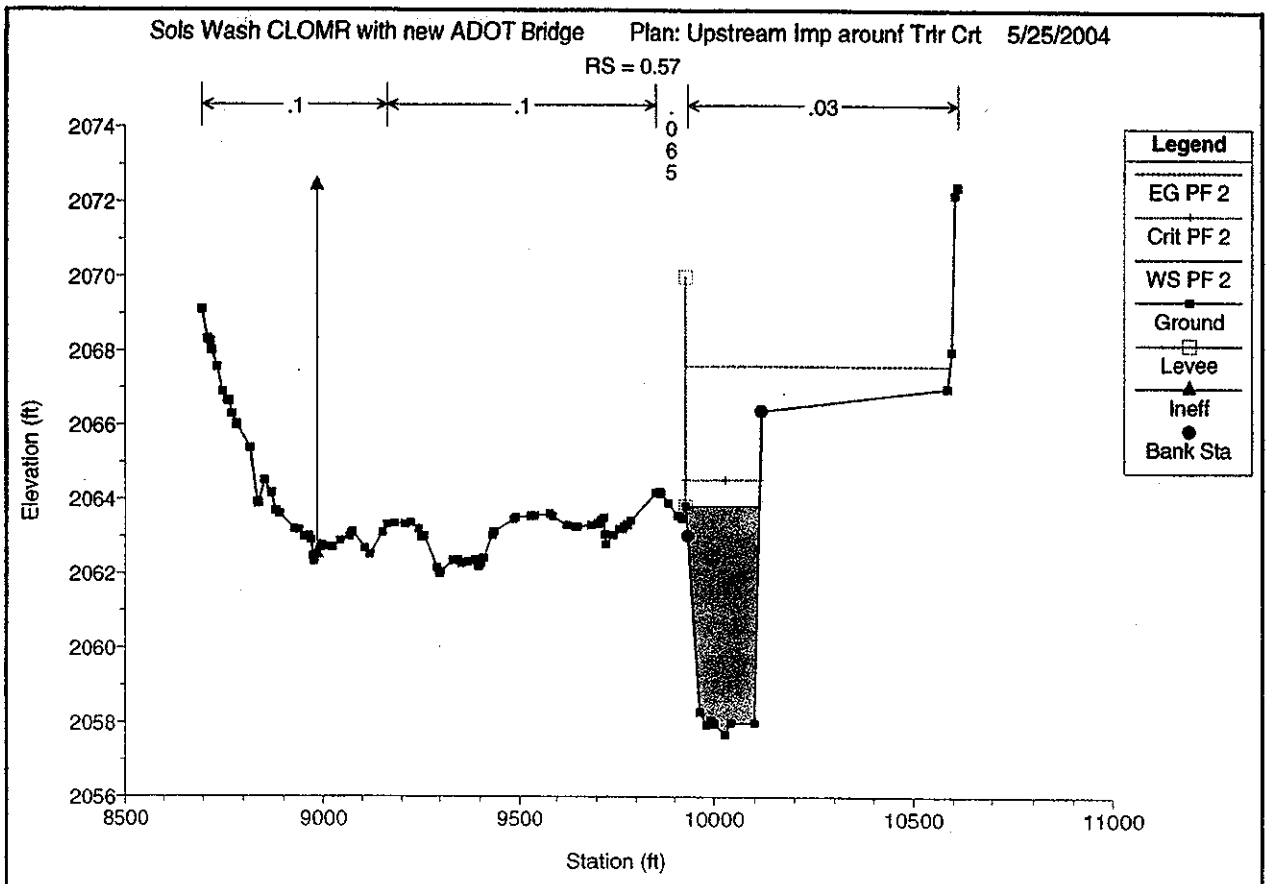

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.79 Begin new cross sections using 2002 mapping
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2084
2082
2080
2078
2076
2074
2072
2070
2068
2066
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

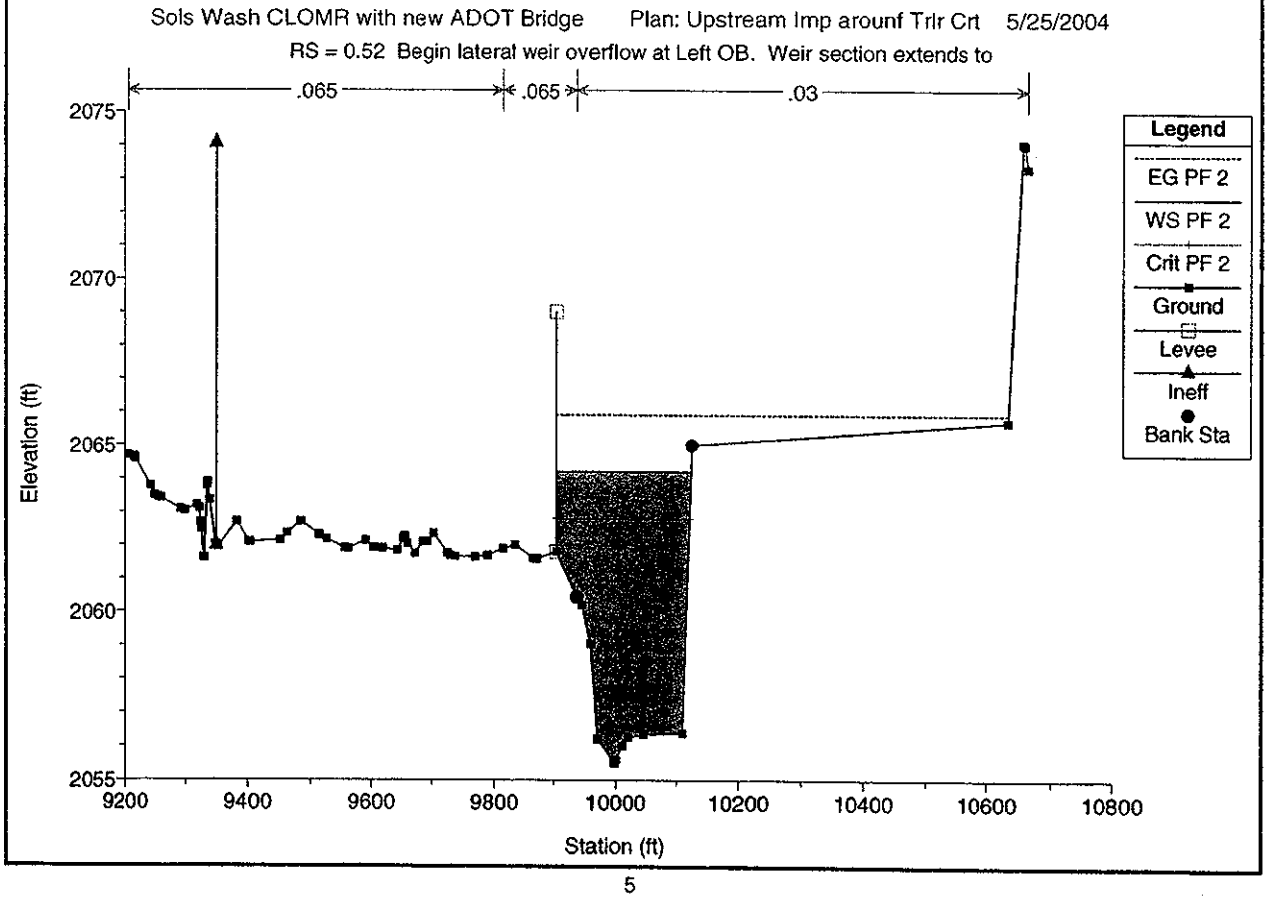

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.76
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

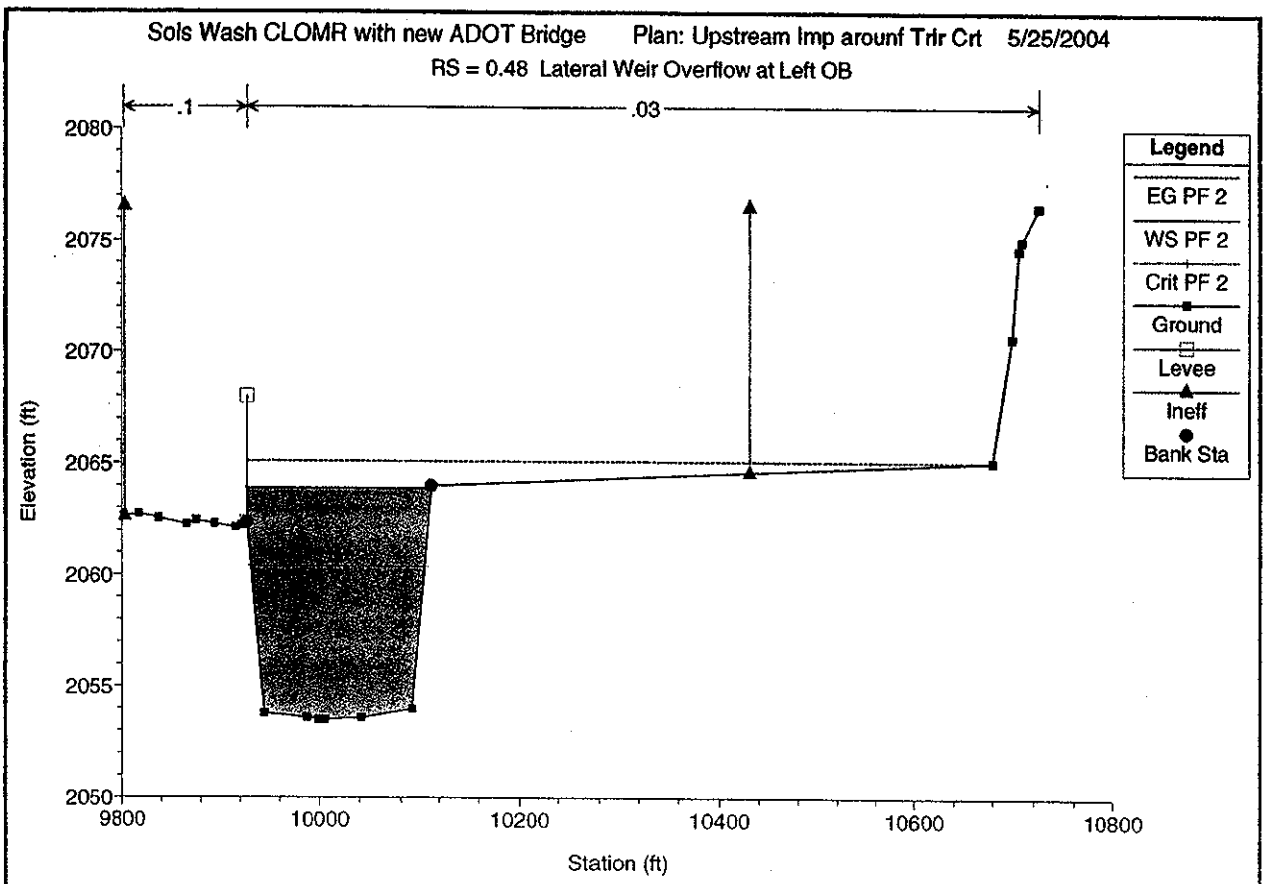

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.71
.065
1.
.035
.065
.035
.065
.03
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

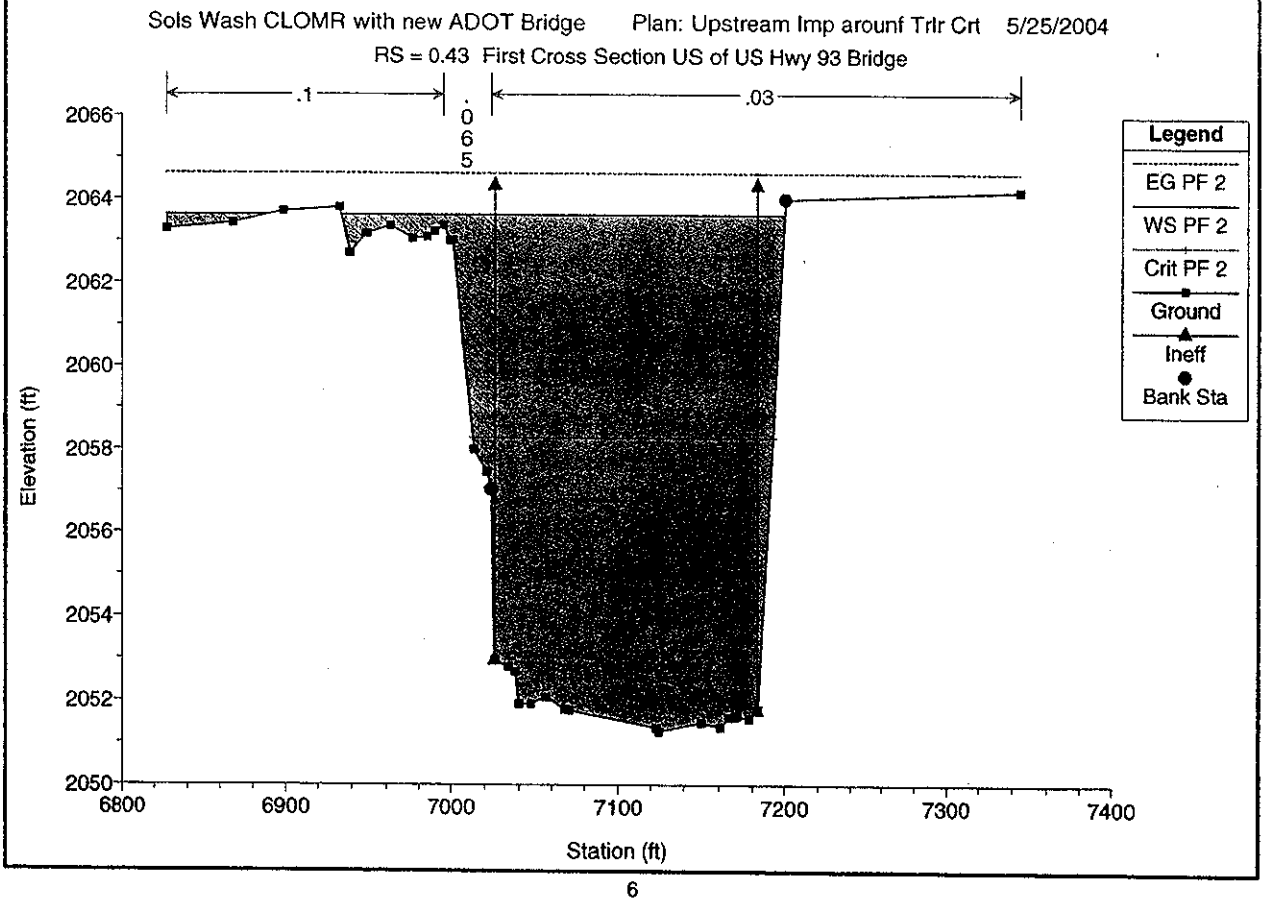

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.66
.065
.035
.065
.03
+.29
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

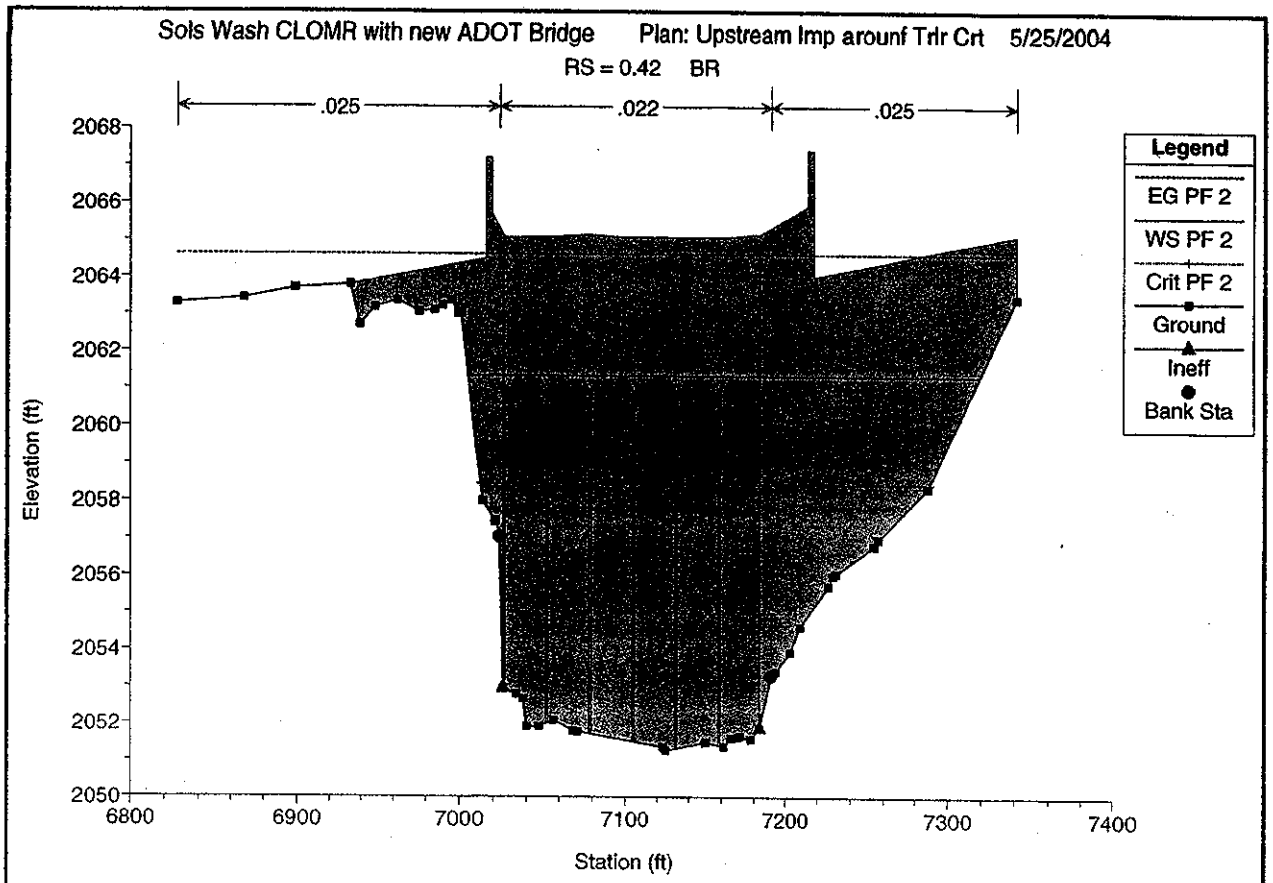

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.61
.1
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

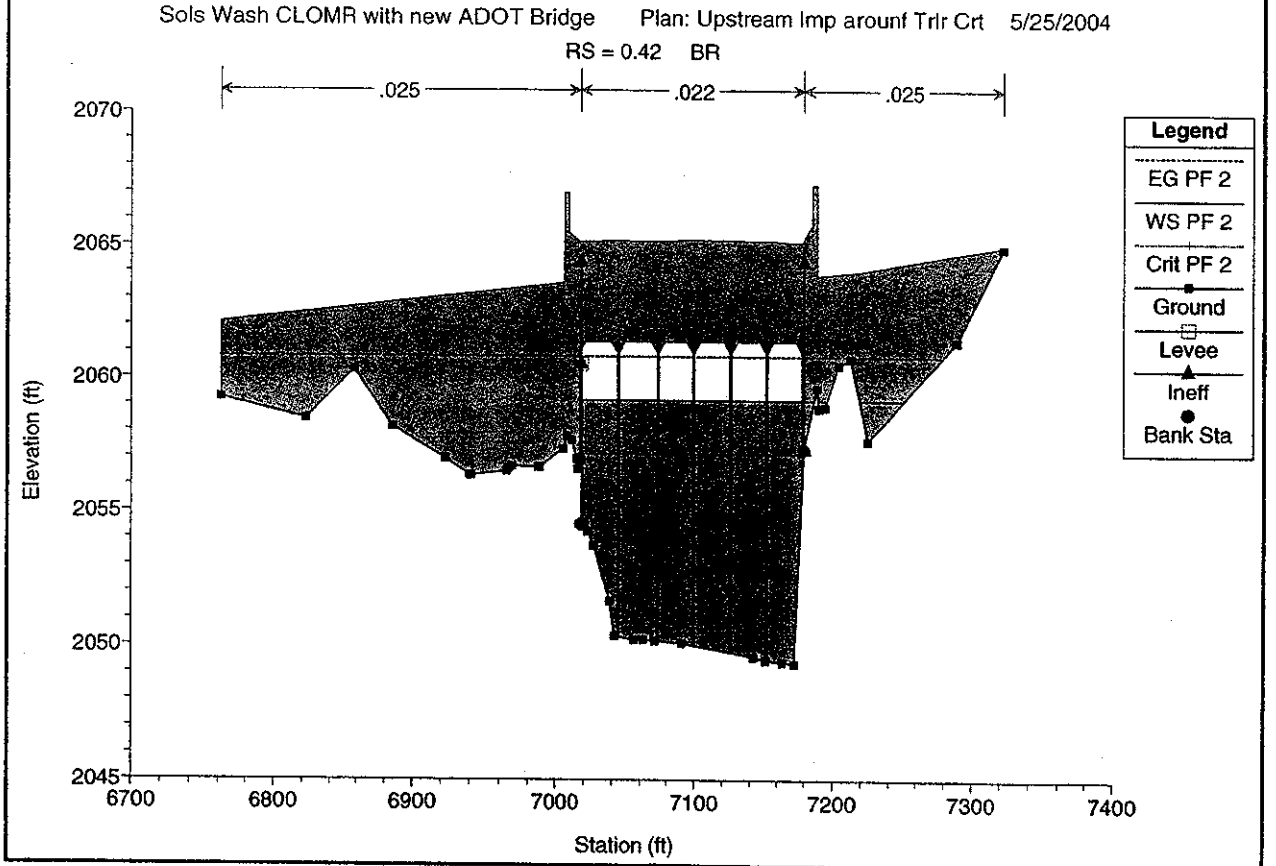

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.57
.1
.1
.065
.03
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
2058
2056
8500
9000
9500
10000
10500
11000

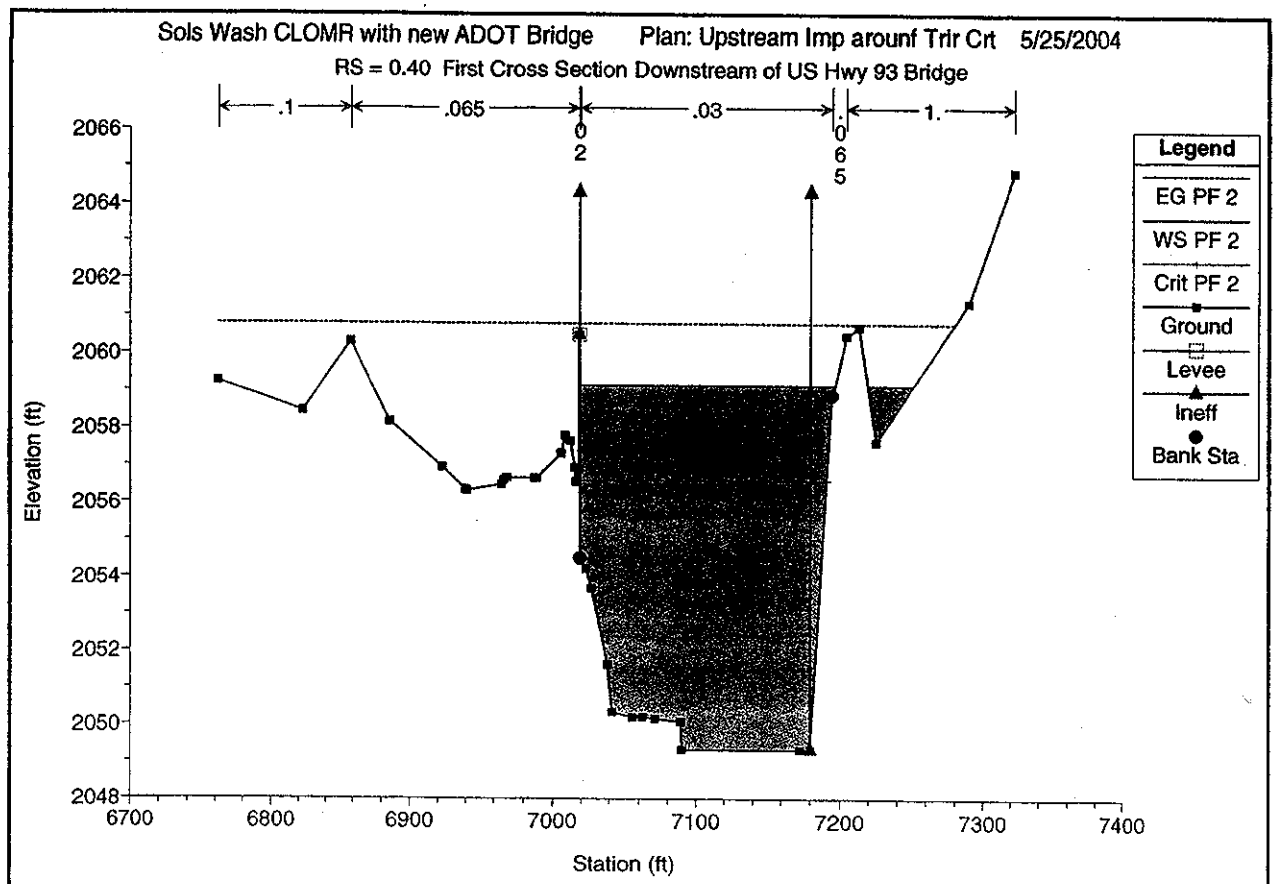

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.52 Begin lateral weir overflow at Left OB. Weir section extends to
.065
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2075
2070
2065
2060
2055
9200
9400
9600
9800
10000
10200
10400
10600
10800

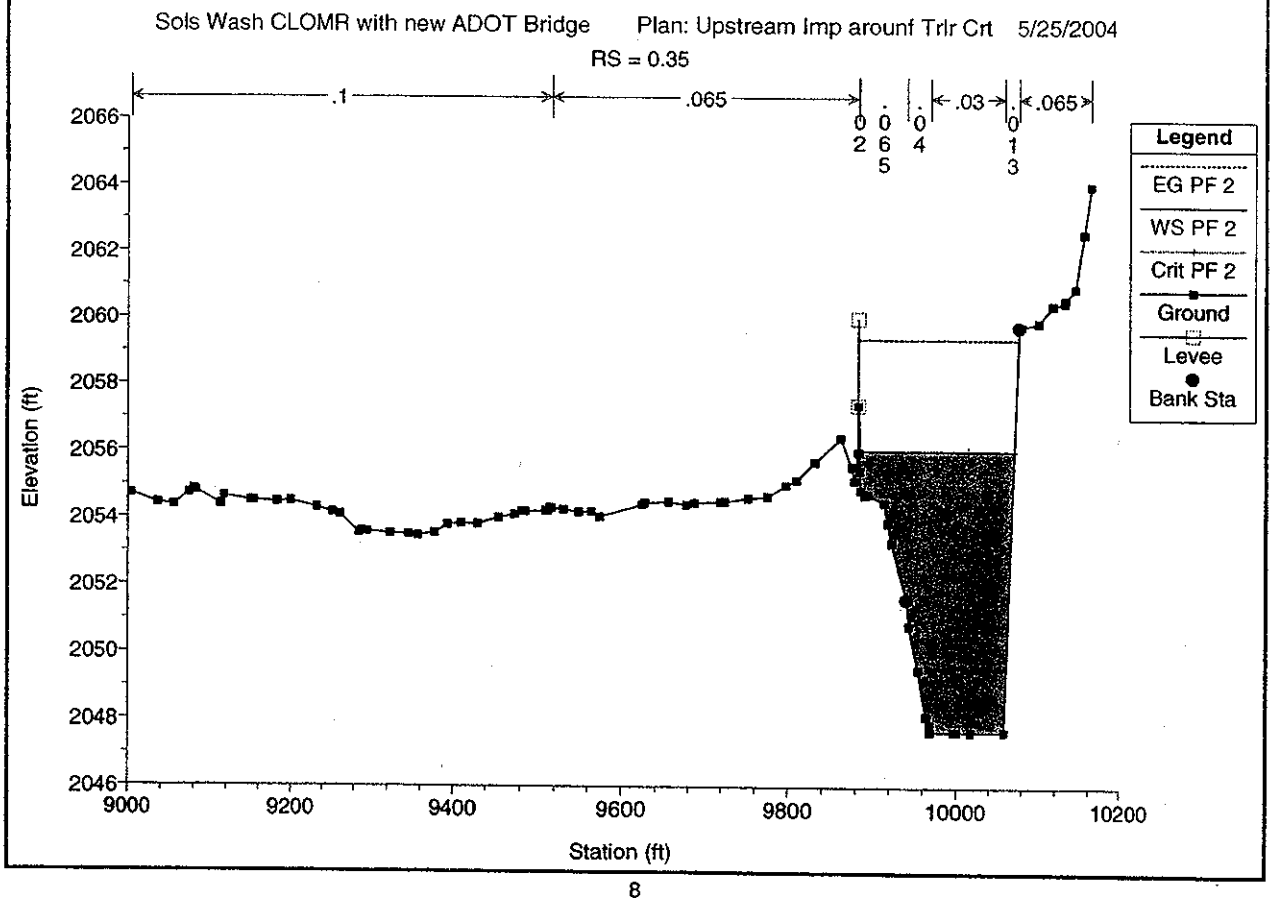

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.48 Lateral Weir Overflow at Left OB
.1
.03
Elevation (ft)
2080
2075
2070
2065
2060
2055
2050
9800
10000
10200
10400
10600
10800
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta

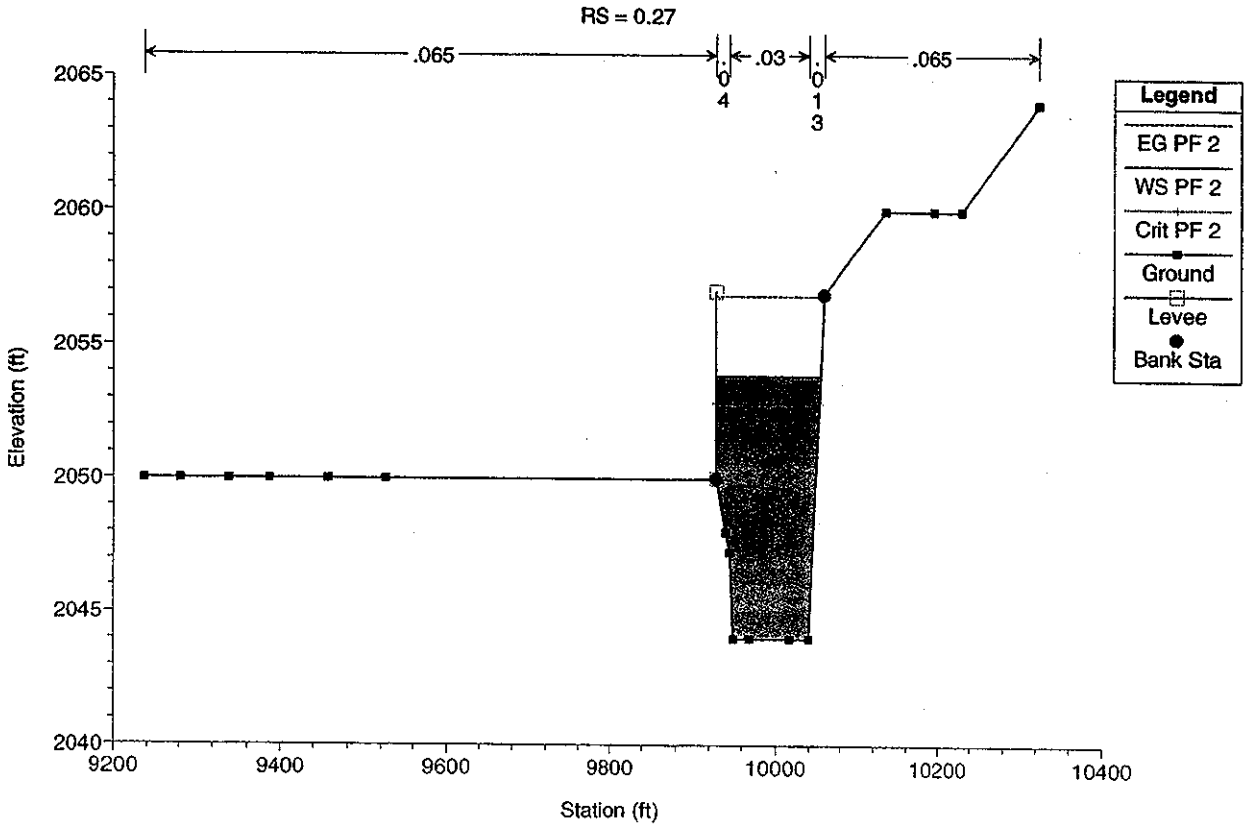

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.43 First Cross Section US of US Hwy 93 Bridge
.1
.065
.03
Elevation (ft)
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Ineff
Bank Sta

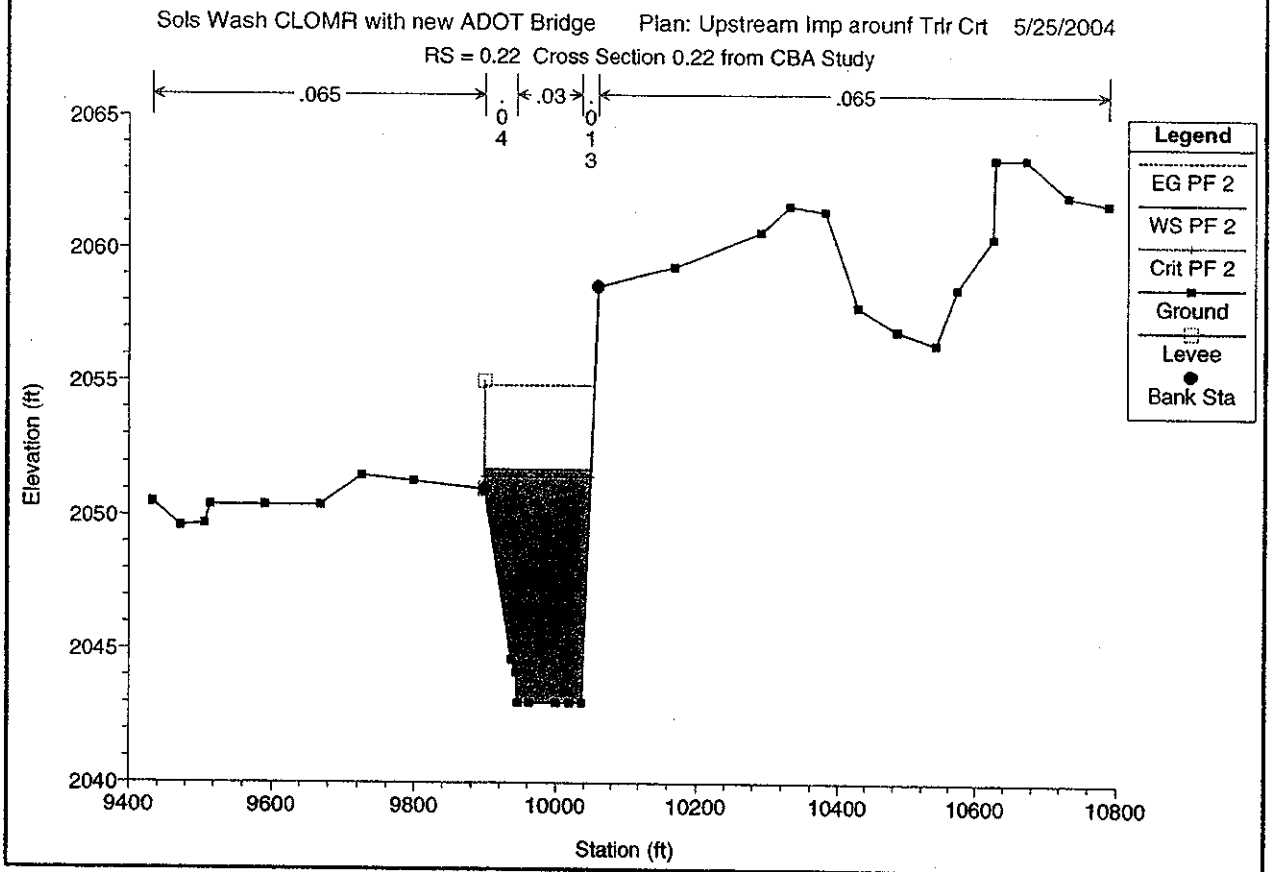

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Ineff
Bank Sta
Elevation (ft)
2068
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

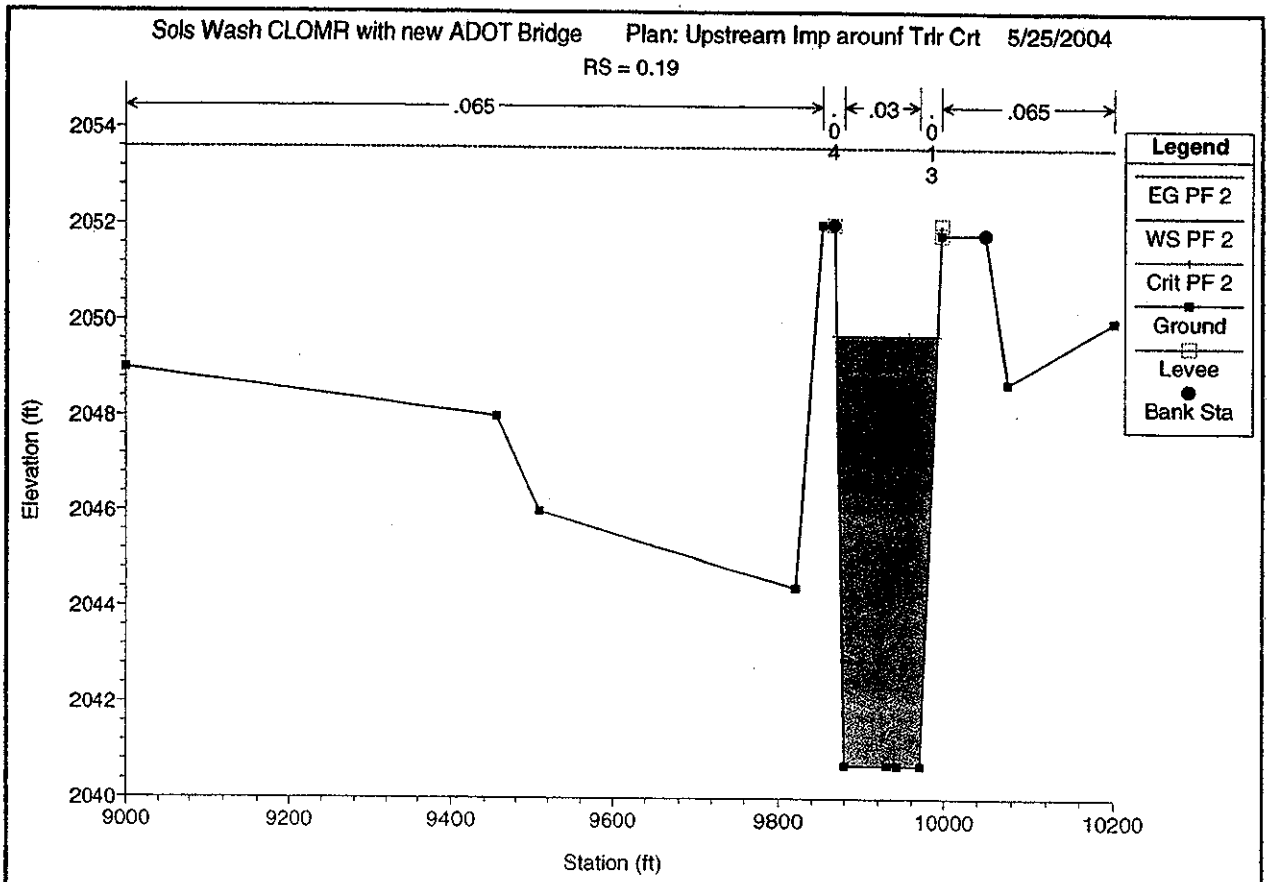

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2070
2065
2060
2055
2050
2045
6700
6800
6900
7000
7100
7200
7300
7400
Station (ft)

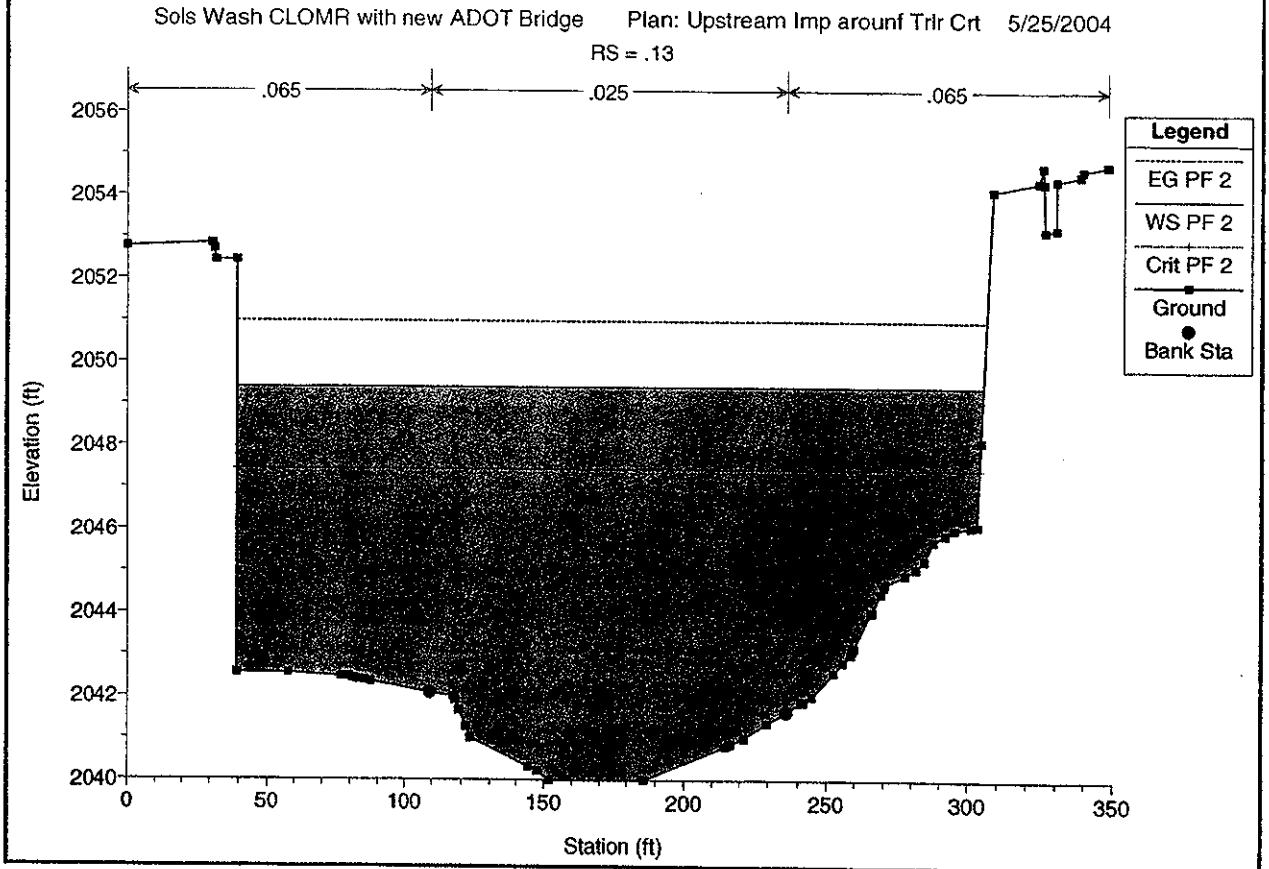

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.40 First Cross Section Downstream of US Hwy 93 Bridge
.1
.065
.03
1.
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

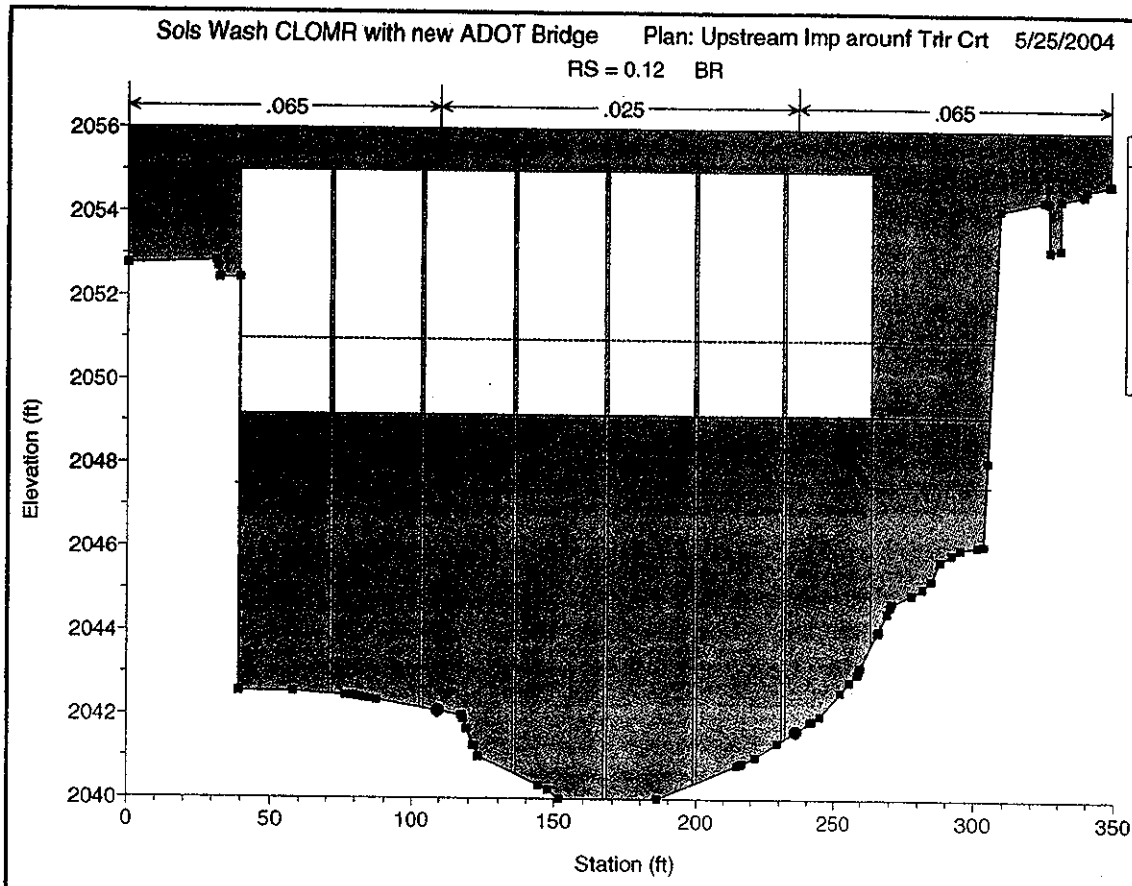

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.35
.1
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

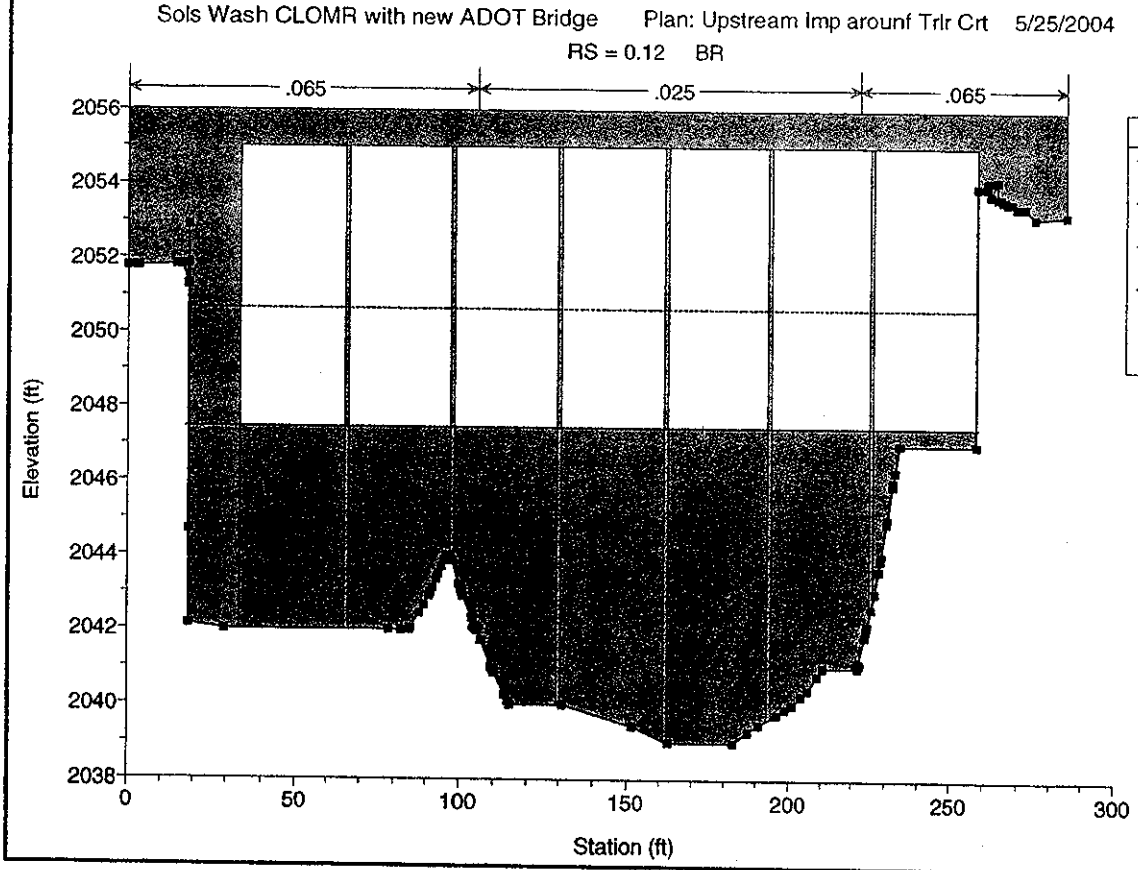

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.27
.065
.03
.065
0.4
0.13
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2065
2060
2055
2050
2045
2040
9200
9400
9600
9800
10000
10200
10400
Station (ft)

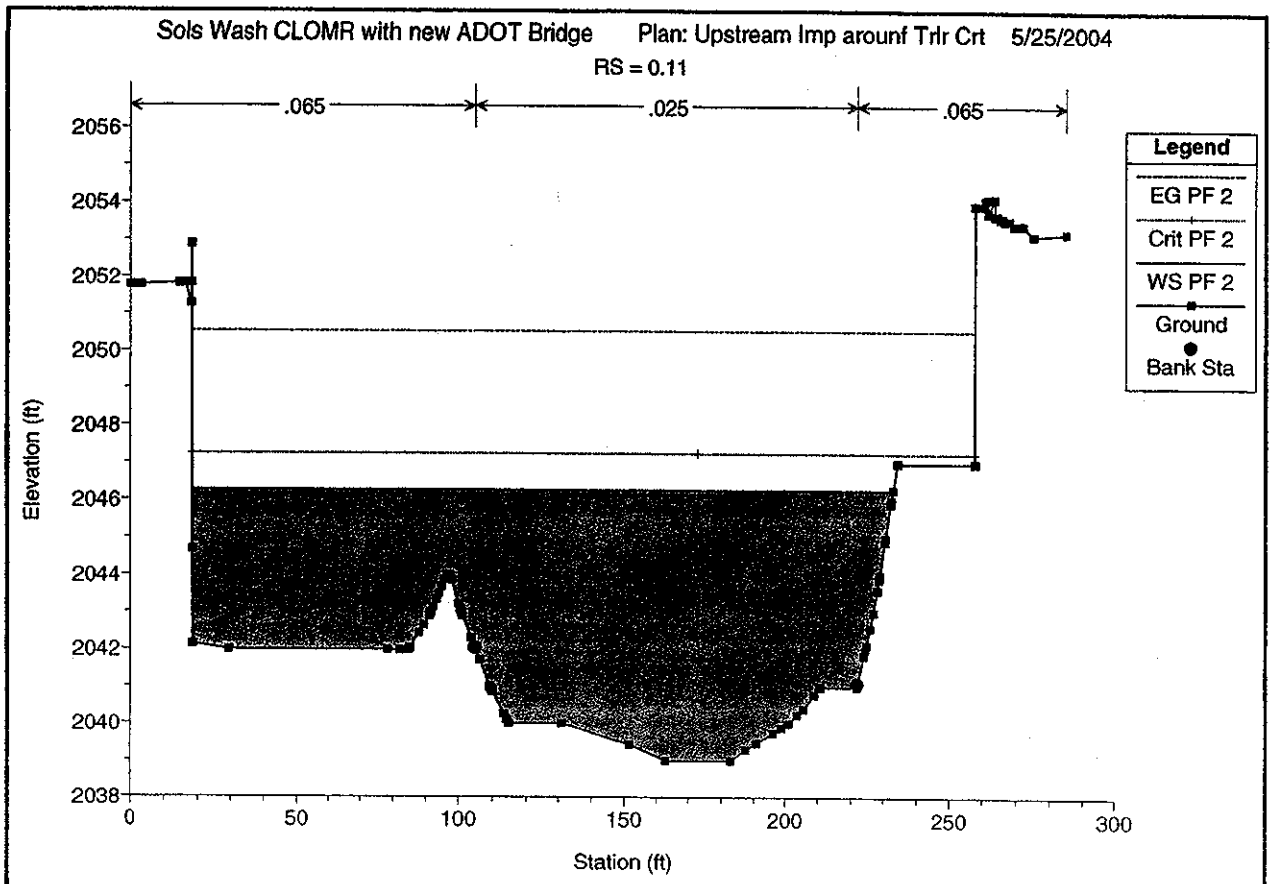

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.22 Cross Section 0.22 from CBA Study
.065
.03
.065
0.4
0.13
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2065
2060
2055
2050
2045
2040
9400
9600
9800
10000
10200
10400
10600
10800
Station (ft)

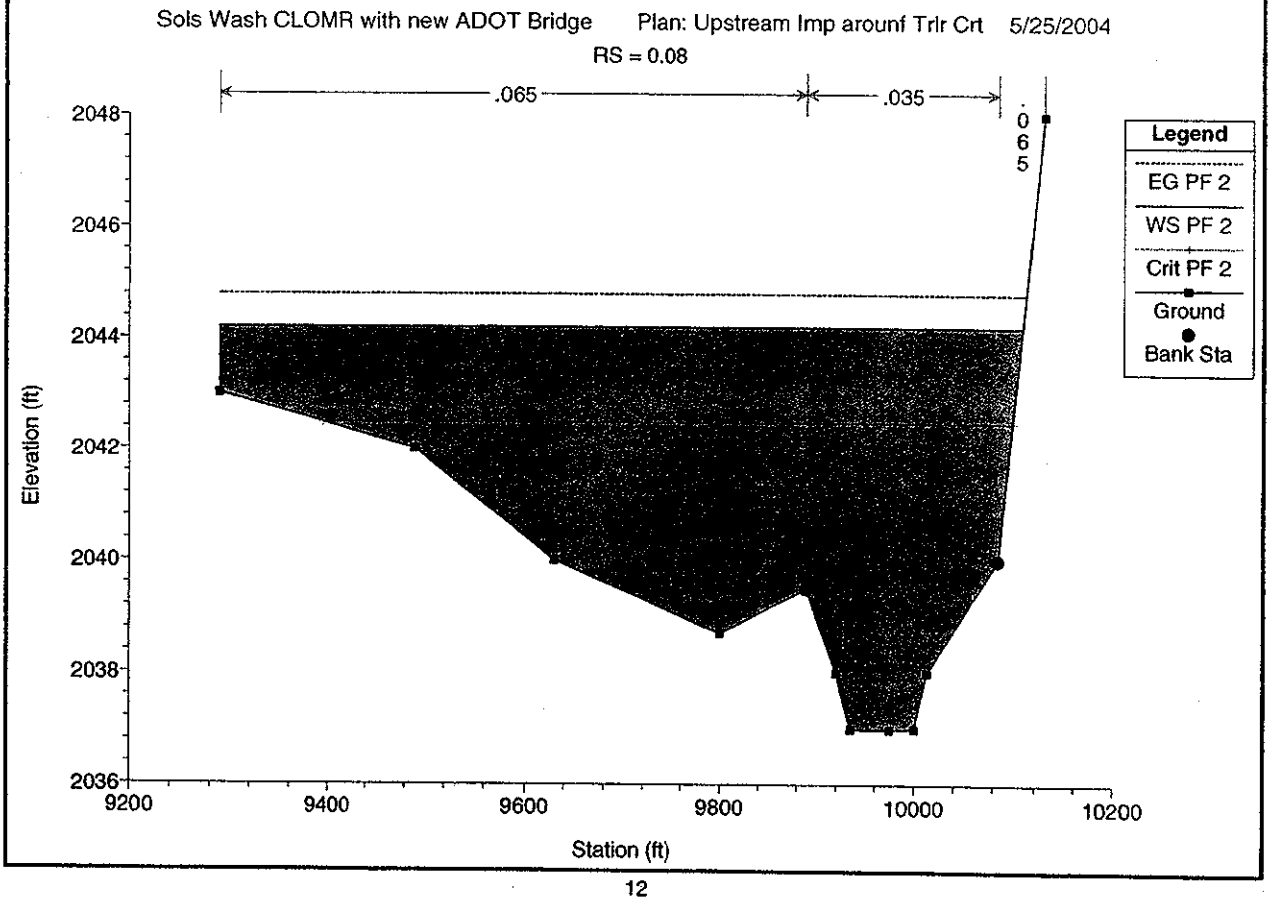

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.19
.065
.03
.065
0
0
4
1
3
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2054
2052
2050
2048
2046
2044
2042
2040
9000
9200
9400
9600
9800
10000
10200
Station (ft)

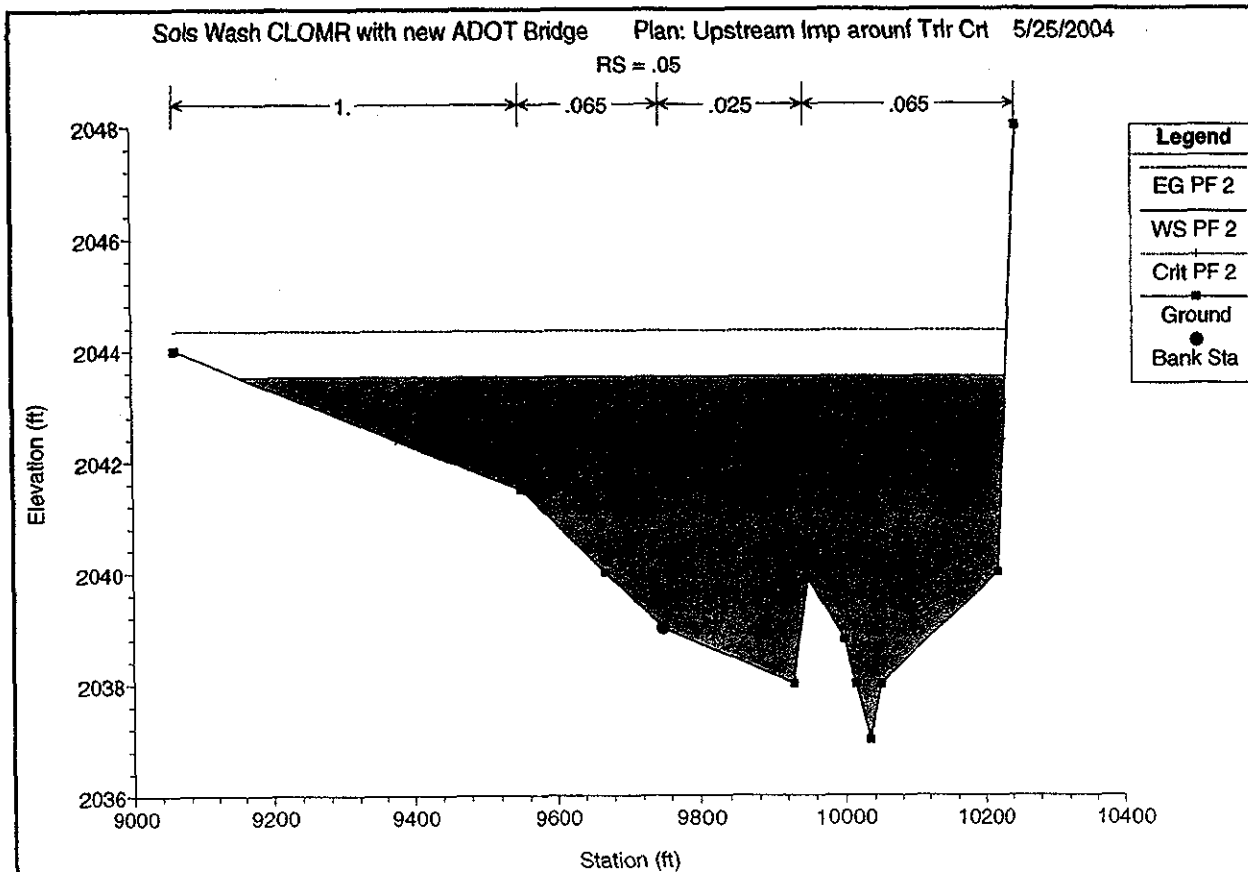

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = .13
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
0
50
100
150
200
250
300
350
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
0
50
100
150
200
250
300
350
Station (ft)

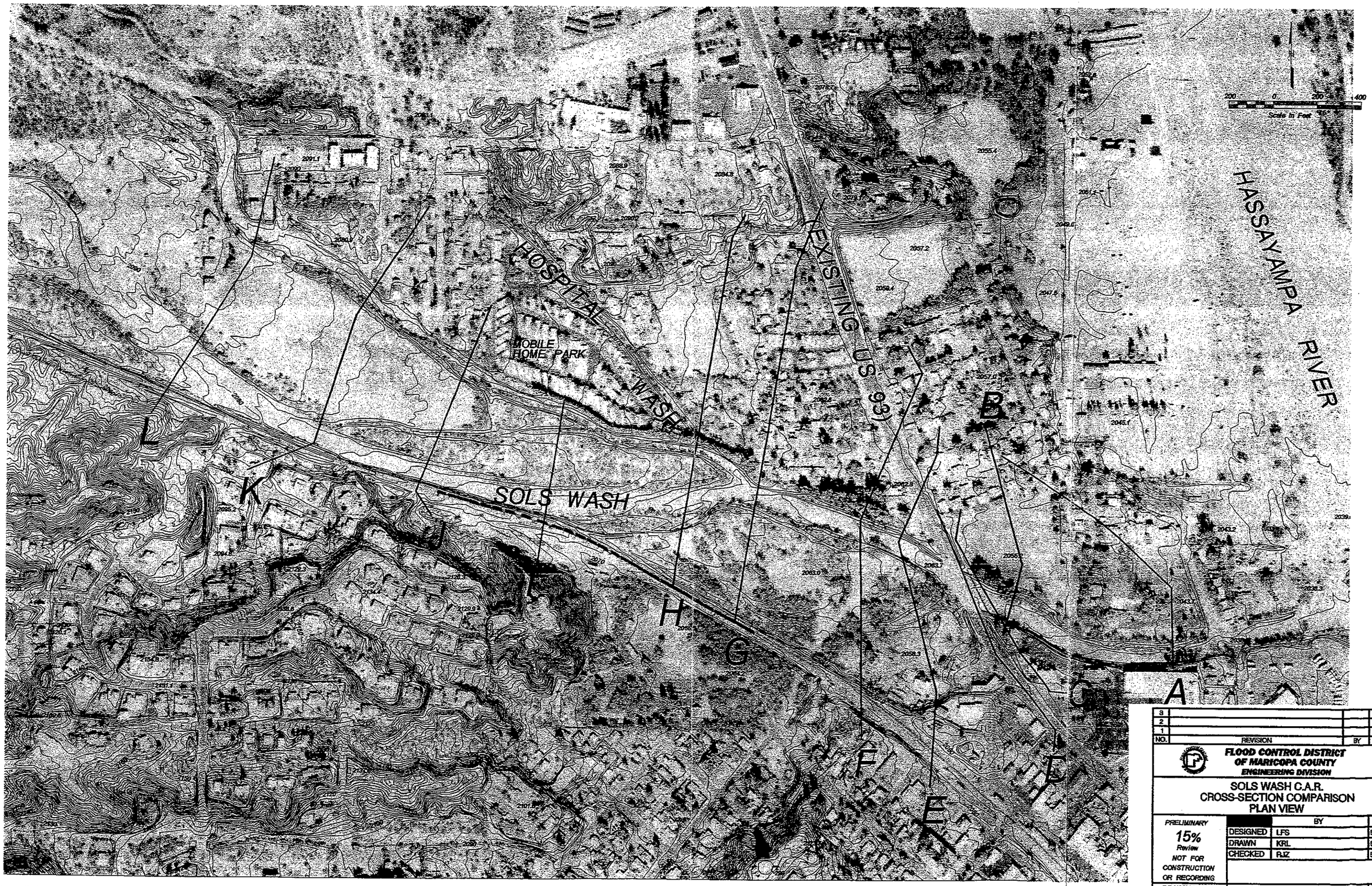

Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
2038
0
50
100
150
200
250
300
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.11
.065
.025
.065
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
2038
0
50
100
150
200
250
300
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = 0.08
.065
.035
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9200
9400
9600
9800
10000
10200
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Upstream Imp arounf Trlr Crt 5/25/2004
RS = .05
1.
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

ATTACHMENT I:
COMPARISON OF FIELD SURVEYED SECTIONS TO CORPS FIS SECTIONS



NO.	REVISION	BY	DATE
3			
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

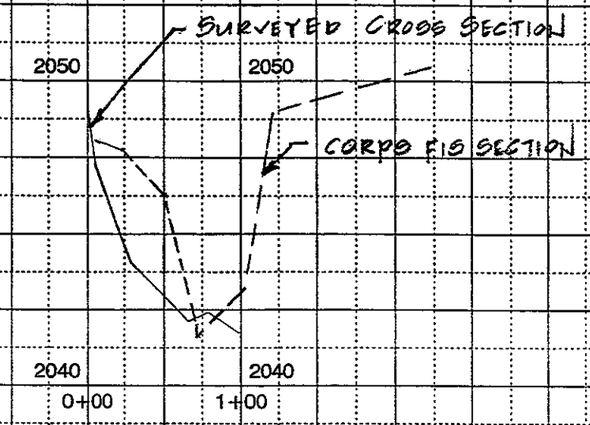
SOLS WASH C.A.R.
CROSS-SECTION COMPARISON
PLAN VIEW

PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

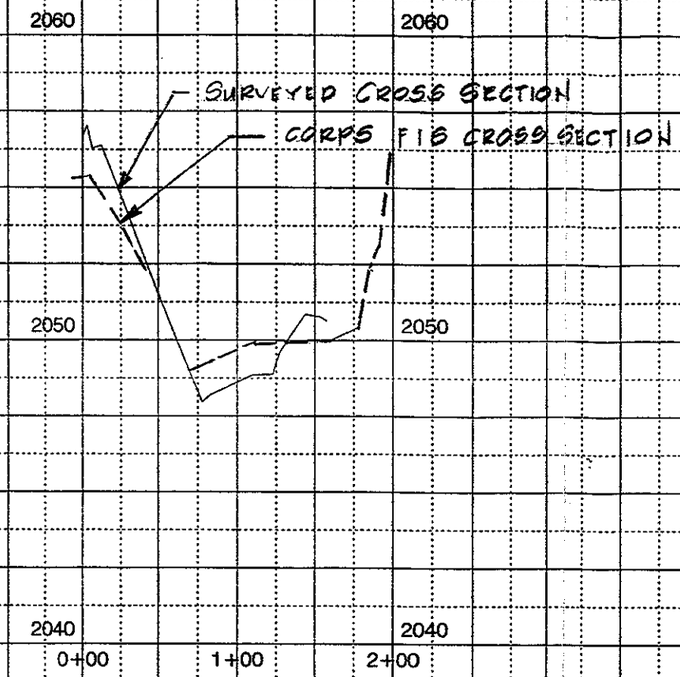
	BY	DATE
DESIGNED	LFS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

DRAWING NO. FIGURE 17 SHEET OF

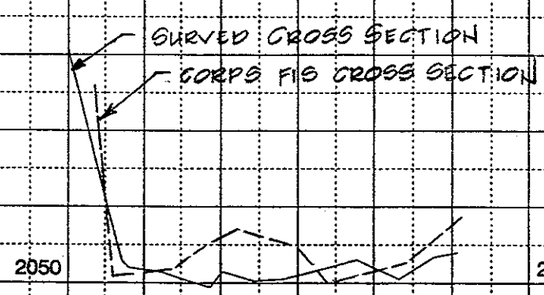
Plotted By: kleahy at 10:17:57 AM 5/27/2004 R:\PhoenixGrove\Projects\AZ03152\CADD\Report\3152Fig17.dgn



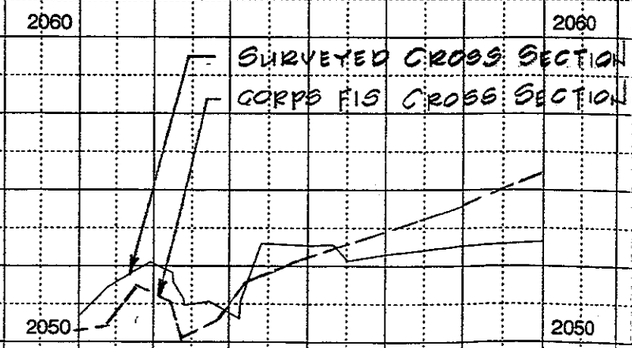
SECTION A



SECTION B



SECTION C



SECTION D

NO.	REVISION	BY	DATE
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

SOLS WASH C.A.R.
CROSS-SECTION COMPARISON
PROFILE I

PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LRS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

DRAWING NO. | FIGURE 18 | SHEET OF

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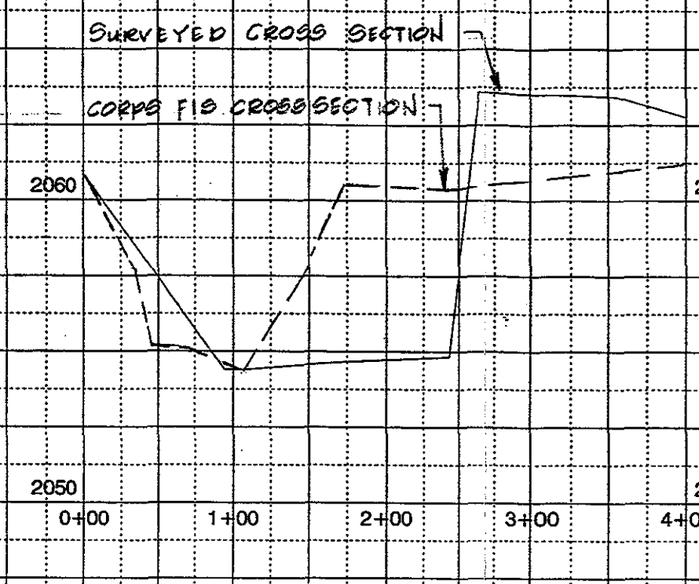
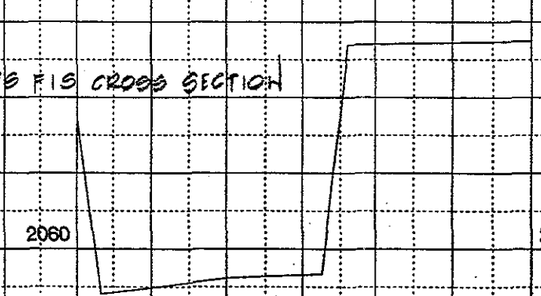
SECTION E



SECTION F



SECTION G

NO.	REVISION	BY	DATE
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

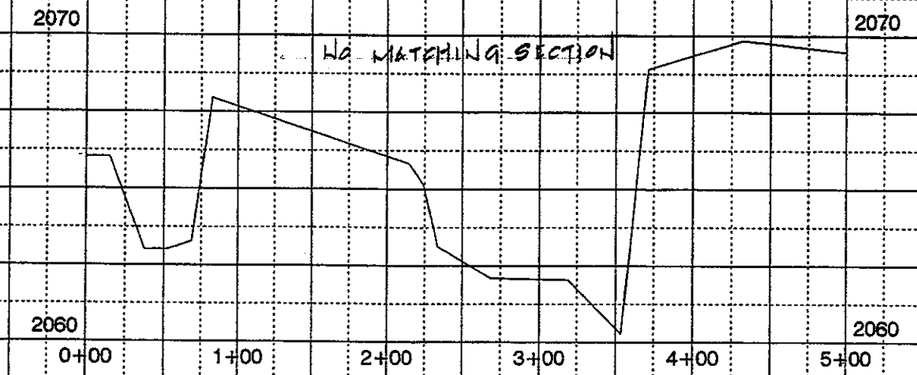
SOLS WASH C.A.R.
CROSS-SECTION COMPARISON
PROFILE II

PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

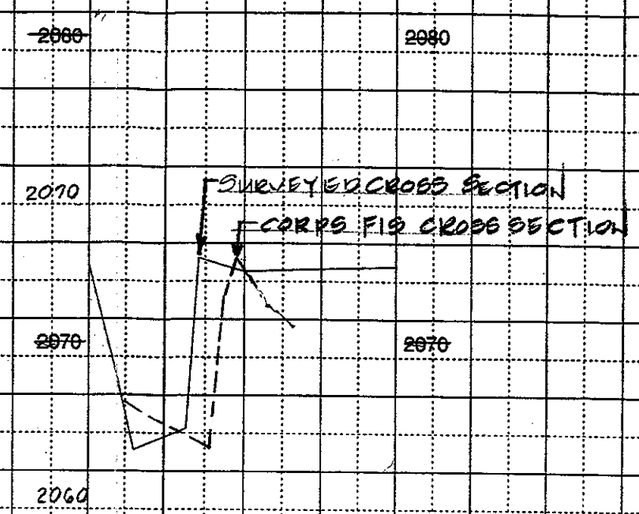
	BY	DATE
DESIGNED	LRS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

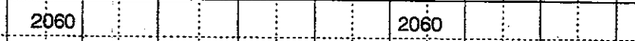
DRAWING NO. | FIGURE 19 | SHEET OF

Plotted By: kleahy at 1:14:21 PM 5/27/2004 R:\PhoenixGrove\Projects\AZ03152\CADD\Report\3152Fig19.dgn

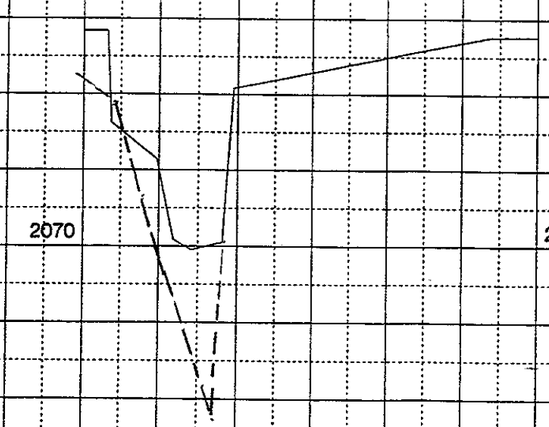


SECTION H

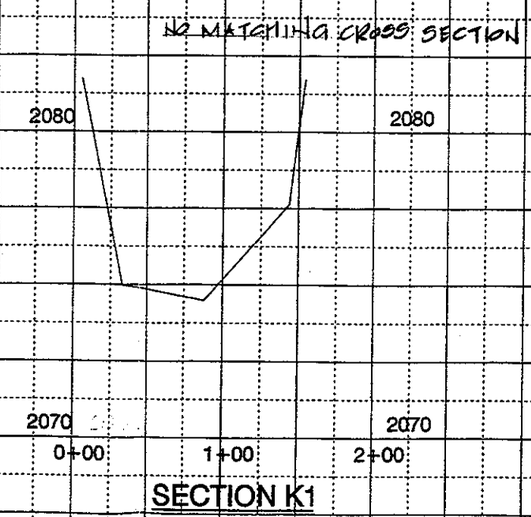




SECTION I



SECTION J



SECTION K1

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

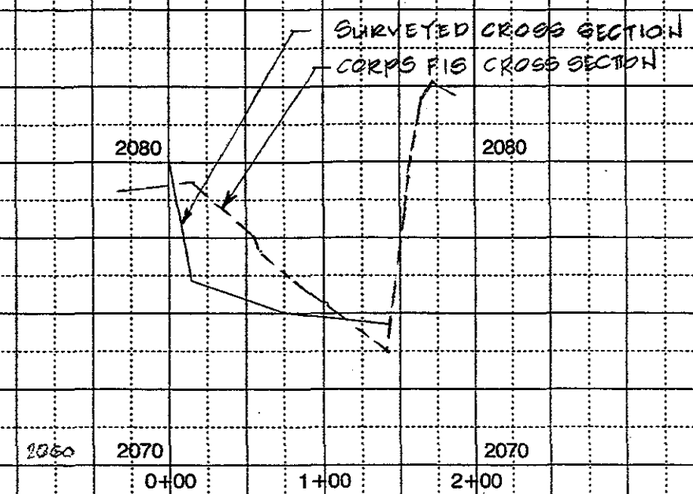
SOLS WASH C.A.R.
CROSS-SECTION COMPARISON
PROFILE III

PRELIMINARY
15%
Review
NOT FOR CONSTRUCTION OR RECORDING

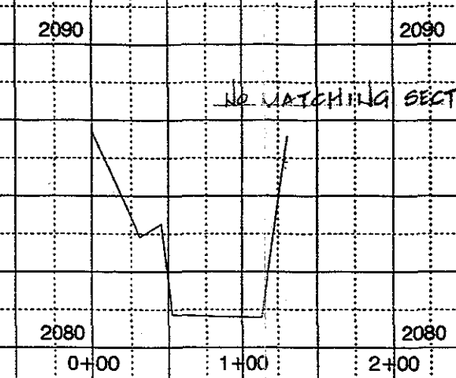
	BY	DATE
DESIGNED	LRS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

DRAWING NO. | FIGURE 20 | SHEET OF

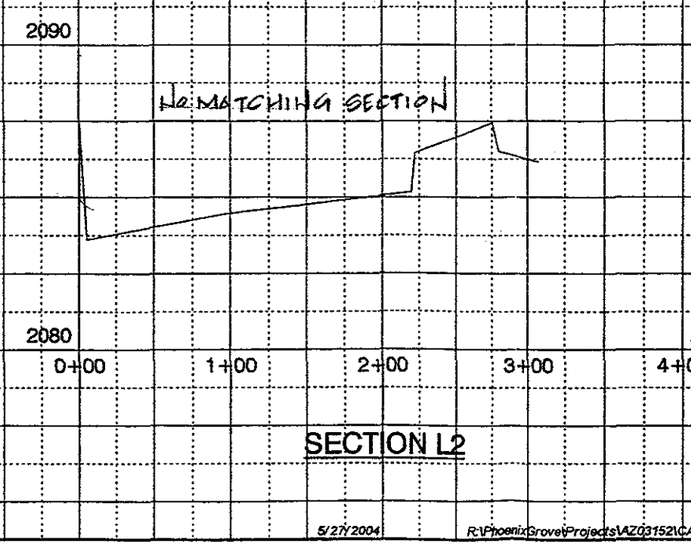
Plotted By: kleshy at 1:14:07 PM 5/27/2004 R:\PhoenixGrove\Projects\AZ03152\CADD\Report\3152Fig20.dgn



SECTION K2



SECTION L1



SECTION L2

NO.	REVISION	BY	DATE
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

SOLS WASH C.A.R.
CROSS-SECTION COMPARISON
PROFILE IV

PRELIMINARY
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Review
NOT FOR CONSTRUCTION OR RECORDING

	BY	DATE
DESIGNED	LRS	5/04
DRAWN	KRL	5/04
CHECKED	RJZ	5/04

DRAWING NO. FIGURE 21 SHEET OF

Plotted By: kleahy at 1:13:41 PM 5/27/2004 R:\PhoenixGroveProjects\AZ03152\CADD\Report\3152Fig21.dgn

ATTACHMENT J:
REFERENCE MATERIAL, MEETING MINUTES

ITEM NO.	REFERENCE MATERIAL DESCRIPTION
1	One roll plot of the project area
2	CD containing the Corps 2D Hydraulic Model
3	FCD pub. 'Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects'
4	FCD pub. 'Uniform Drainage Policies and Standards'
5	FCD pub. 'Wetlands for Water Quality Enhancement'
6	FCD pub. 'S-Graph Study'
7	FCD pub. 'Data Delivery Specifications'
8	USGS pub. 'Estimated Manning's Roughness Coefficients for Stream Channels...'
9	FCD pub. 'Computer Aided Drafting and Design'
10	FCD pub. 'Consultant Guidelines'
11	FCD pub. 'Drainage Design Manual, Vol. 1'
12	FCD pub. 'Drainage Design Manual, Vol. 2'
13	ADOT Bridge Selection Report, Sols Wash Bridge, May 1999
14	Wickenburg ADMS, Volume IIA HEC-1 Output, Sols Wash Area, May 1991
15	US 93, Wickenburg Interim Improvement Project, Initial Drainage Report, October 2002
16	Sols Wash Profiles
17	Goldmine Village CLOMR, TDN, July 2002
18	Flood Insurance Restudy of Hassayampa River (Cella Barr)
19	Floodplain Delineation for Wickenburg ADMS, sheets 1, 4, 75, 76 & 84
20	Sols Wash Floodplain Delineation (Cella Barr) unsealed - may not be final delineation
21	Downloaded Flooding Reports
22	Picture of Nora (1997) Flooding from Town of Wickenburg
23	Pictures of 2000 flooding from the Town of Wickenburg
24	Nora Flood Control Plans Tape
25	Topographic Data in DXF format and the 2003 Orthophoto Tiles for the Sols Wash Area - CD
26	Wickenburg FID-2D, HEC-RAS - CD
27	Sols Wash HEC-2 Model Proposed and Existing (For 1999 study) - CD
28	Hassayampa and Sols Wash HEC-RAS files - CD
29	Models from JE Fuller - 3 1/2 floppy
30	Electronic files from Jacob's (proposed alignment and HEC-RAS MP's)
31	West Consultants/Jacob's new ADOT Bridge Cross-section for baseline model

Greg Jones - FCDX

From: Leo Kreymborg [leok@westconsultants.com]
Sent: Friday, June 18, 2004 3:31 PM
To: Greg Jones
Cc: Gary Freeman
Subject: Comments on Sols Wash Draft CAR

D50/D90

Dear Greg,

I've read the report, although I have not analyzed it in depth. The report overall looks thorough and well done, and the recommendations seem reasonable. My comments:

- We have gotten 3 sieve analysis recently on Sols Wash downstream of Tegner. They have a smaller D50, and a much smaller D90 than what was mentioned in the report in paragraph 2 of p. 8. I sent an e-mail to Larry Doescher of ADOT asking if it would be OK to share the sieve analyses with you. Here's what he said:

> I don't see any harm in sharing this information with MCFCD as long as they aren't substituting our work for their own analysis. I wouldn't want to accept any liability for data they would normally develop/gather on their own. If it's critical data to their analysis, they probably should verify it with testing of their own. If it's extra data to verify what they already believe, that's fine.

The D50 from the 3 samples is about 1.2 mm, the D90 ranges from about 2.5 to 7mm. Let me know if you would like me to forward the gradation curves and the locations of the samples.

- The soil cement side slopes of 1.5:1 would be too steep for horses to traverse; I don't know if this is a concern or not. They could not traverse the gabions at any slope, of course.

- As I mentioned to you on Tuesday, my biggest question would be on how the Q100 was arrived at.

- On page 11, "Glori Underdown" -- is that a nickname, the actual name, or should it read Gloria?

- The 4th line on page 9 "0.00721 the by iteration" -- "the" should probably read "then"

- An aside: My topographic analysis of Sols Wash from a 1971 topo versus 2003 topo shows that the Wash downstream of Tegner has degraded by about 1 foot. That more or less agrees with the stable slope analysis in the CAR.

Feel free to forward these comments to Rebecca.

Regards,
Leo.

Leo Ramos Kreymborg, P.E.
WEST Consultants, Inc.
960 West Elliot Road
Suite 201
Tempe, Arizona 85284
(480) 345-2155
(480) 345-2156 Fax
http://www.westconsultants.com

Rebecca Zook

From: Rebecca Zook
Sent: Tuesday, May 04, 2004 3:36 PM
To: 'Robert Knighten - FCDX'
Subject: RE: Wickenburg Sols Wash CAR

Robert,
Here are the Progress Meeting No. 3 Minutes and related attachments for your review and approval. Please let me know if you have any questions or comments.
Thanks,
Rebecca

AZTEC
www.aztec.us
3747 E. Grove St
Phoenix, Arizona 85040
[602] 454-0402
[602] 454-0403 Fax

Meeting Minutes

Meeting Date:	04-28-04	Meeting Time:	10:00 am
Location:	FCDMC		
Subject:	Progress Meeting No. 3	Project:	Sols Wash CAR
		Project No:	AZ03152
Attendees:	Robert Knighten, FCDMC	Shane Dille, Town of Wickenburg	
	Greg Jones, FCDMC	Gerald Stricklin, Town of Wickenburg	
	Cathy Regester, FCDMC	Leo Kreymborg, WEST Consultants	
	Kathryn Gross, FCDMC	Jeff Ford, AZTEC	
	Lon McDermott, Town of Wickenburg	Rebecca Zook, AZTEC	
Prepared By:	Rebecca Zook	Date Published:	05-04-04

A Meeting Agenda was distributed (attached to these meeting minutes along with the sign in sheet), and the meeting began with introductions.

Robert made a brief statement as to the reason for the meeting which was for AZTEC to give a status update on the progress of the Sols Wash CAR. He also thanked the Town of Wickenburg for attending.

Rebecca began by stating the first goal of Progress Meeting No. 3 was to finalize the Preliminary Hydraulic Models Comment Resolution - attached to the Meeting Minutes. The comments had been sent to the District on April 8, 2004 as part of the Progress Meeting (P.M.) Minutes No. 2 packet. The comments had originally been received from Cathy during the P.M. No. 2 on April 5, 2004. Cathy said that we could go over the comments after the close of the formal P.M. No. 3.

The second goal of the meeting was to present the progress of the Sols Wash CAR. Rebecca initially discussed the work items that have been completed. Those include:

- Revise Base Sols Wash HEC-RAS Model
  - ✓ Starts with CLOMR by J.E. Fuller (existing conditions)
  - ✓ AZTEC added 5 downstream sections from ADOT model
  - ✓ Revised by adding new ADOT Bridge sections 4/6/04
- Revise Base Hospital Wash HEC-RAS Model
  - ✓ Cross-sections realigned as per comment from C. Regester
  - ✓ Levee elev. w/in Hospital Wash controlled by Sols Wash

Greg stated that even though the mobile home park is currently in the flood plain, if the improvements along Hospital Wash make the conditions worse, the issue requires mitigation.

- Revise Hospital Wash Improvements Model
  - ✓ Reran the model based on revised cross-sections
  - ✓ No change since Sols Wash controls
- Sols Wash Improvements Model with Composite Section
  - ✓ Revised model based on composite section

The composite section had concrete lining on the south slope by the grocery complex, a natural bottom channel and gabion mattress on the north side. Concrete was chosen over CSA due to the

fact that impacts into the Park property outweighed the increased cost (approx. 25% more for Concrete vs. CSA as determined by the key participants from the Town of Wickenburg and the District in Progress Meeting No. 2).

- ✓ Bottom width set at 90' (approx. 140' total)
- ✓ Equilibrium slope will be used to determine toe down

- Sediment Transport Memorandum (to District 4/9/04)
  - ✓ Approved by C. Regester on 4/22/04
  - ✓ AZTEC has incorporated the comments made on the memo(attached)
- Field Visits
  - ✓ Team field visit 4/26/04
  - ✓ Environmental survey completed – information will be included in draft report

Rebecca then discussed what items would be included in the Revised Hydraulic Report that was to be submitted the following day (4/29). *The document was submitted to both Robert Knighten and Cathy Regester on 4/29.* The report would include the following models:

- Part 1

Model I	Sols Wash - Baseline Conditions
Model II	Sols Wash - Levee Improvements West of US 93
Model III	Hospital Wash – Existing Conditions
Model IV	Hospital Wash – Levee Improvements west of US 93

- Part 2

Model IX	Sols Wash – Composite Channel Section

The final items discussed involved follow up or action items for the Draft Report being submitted to the District on May 26, 2004.

- Evaluation of area North of Sols 100 yr flood plain using ADOT study
  - ✓ Q's from ADOT study will be used
  - ✓ Cursory look at retention area requirements, pipe system with flap gates and pump station
  - ✓ AZTEC stated that it could complete the work with no additional cost, if during the analysis something unexpected arises, AZTEC will contact the District to discuss additional costs
  - ✓ Discussions involving Leo from West Consultants and how ADOT intended to mitigate for the areas of the Town they are adding to the 100 year flood plain evolved. Leo stated he would discuss this with ADOT. Greg said that ADOT will have to mitigate, it is just a matter of where they would rather put their money…in a joint project with the Town of Wickenburg and the District or mitigate on their own.
- Evaluate Mobile Home Park…protect/buy out – Potential future project
  Cost will be associated with:
  - ✓ New levee improvements around complex
  - ✓ Access roadway improvements
  - ✓ Goldmine Village back in Floodplain

- Tegner Street Bridge Freeboard…how levee improvements will tie into existing bridge
- How levee improvements will tie into proposed ADOT Bridge/Improvements
- Funding issues for the Sols Wash CAR were discussed along with a timeline. The District and the Town of Wickenburg have set a meeting to discuss an IGA which may affect the timing for this project to go to final design.

The Comments meeting was adjourned.

After the meeting was over, Rebecca and Cathy finalized the Comment Resolution for the Preliminary Hydraulic Models submittal.

AZTEC
www.aztec.us
3747 E. Grove St
Phoenix, Arizona 85040
(602) 454-0402
(602) 454-0403 Fax

Flood Control District of Maricopa County

Sign In

Meeting Subject: Progress Meeting #3

Date: April 28, 2004

Project Name: Wickenburg Sols Wash Candidate Assessment Report (C.A.R.)

Project No.: AZ 03152

INITIAL	NAME	AGENCY	PHONE	FAX	E-MAIL
1. AG	Kathryn Gross	FCD MC	(602) 506-4837		Kag@mail.maricopa.gov
2. CWR	CATHY REGESTER	FCDMC	602-506-4001		cwr@mail.maricopa.gov
3. JCF	JEFF FORD	J2	(602)438-2221		jford@j2design.US
4. RJZ	Rebecca Zook	Aztec			rzook@aztec.us
5. LBK	Leo Kreymborg	WEST Consultants	(480) 345-2155	345-2156	leok@westconsultants.com
6.	Greg Jones	FCD	602-506-5532		gjj@mail.maricopa.gov
7.	Jack McBennett	Town of Wickenburg	928-684-5451		
8.	GERALD STRICKLIN	Town of Wickenburg	928-668 0512	602 506 1580	GSTRICKLIN@ci.wickenburg.az.us
9.	Shane Dille	"	" " 0522	"	sdille@ "
10.	ROB KNIGHTON	FCD	602-506-4503		rlk@mail.maricopa.gov
11.	GREG JONES	FCD	" "		
12.					
13.					
14.					
15.					

Sheet _____ of _____

AZTEC
www.aztec.us

3747 East Grove Street
Phoenix, AZ 85040
602.454.0402
602.454.0403

Meeting Agenda

Meeting Date: April 28, 2004
Meeting Time: 10:00 am
Location: FCDMC 2801 W. Durango Street Phoenix, Arizona
Subject: Wickenburg Sols Wash Candidate Assessment Report (C.A.R.)
Progress Meeting Number 3 AGENDA

I. Introductions

II. Meeting Goals

- Finalize Preliminary Models Comment Resolution
- Present Progress
- Discuss Milestones

III. Work Completed

- Revise Base Sols Wash HEC-RAS Model
- Revise Base Hospital Wash HEC-RAS Model
- Revise Hospital Wash Improvements Model
- Sols Wash Improvements Model with Composite Section
- Sediment Transport Memorandum
- Field Visit (4/26)

IV. Hydraulic Models Report (4/29)

- Part 1

Model I	Sols Wash - Baseline Conditions
Model II	Sols Wash - Levee Improvements West of US 93
Model III	Hospital Wash – Existing Conditions
Model IV	Hospital Wash – Levee Improvements west of US 93

- Part 2

Model IX	Sols Wash – Composite Channel Section

V. Follow Up/Action Items for Draft Report (5/26)

- Evaluation of area North of Sols 100 yr flood plain using ADOT study
- Evaluate Mobile Home Park…protect/buy out

- Tegner Street Bridge Freeboard…how levee improvements will tie into existing bridge
- How levee improvements will tie into proposed ADOT Bridge/Improvements

VI. Open Discussion

VII. Adjourn

Flood Control District of Maricopa County
Project Number: FCD2002C030

Disposition Codes:
A. Will Comply
B. Consultant to Evaluate
C. Client to Evaluate
D. No Further Action

SOLS WASH, CANDIDATE ASSESSMENT REPORT REVIEW COMMENTS

AZTEC ENGINEERING

Reviewed By: Cathy Regester **Organization: Flood Control District of Maricopa County**

Comment No.	Sheet Number	Code	Review Comment	Response
1		A	Model I is stated to be the Goldmine Village CLOMR HEC-RAS model with the proposed US 93 Bridge added to the model. The discharges (Q's), however, used in Model I do not reflect the breakouts shown in the CLOMR model. I recommend that the Qs used in the CLOMR model be used in the existing conditions model (Model I) so that a more accurate comparison of the changes due to the proposed channelization may be made.	The CLOMR model will be included in the final report as the existing conditions model.
2		A	Model II should also be run in the sub-critical flow regime for evaluation of levee heights.	
3		A	The computed water surface elevations (CWSELs) stated in the table Sols Wash Levee Design, included in the Model II analysis, do not always match those stated in the HEC-RAS summary output (Figure II-2).	
4		A	In Model III, it appears that the breakout of flows from Hospital Wash to US 93 may be more attributable to the alignment of cross sections 1 through 5 than to an actual breakout. The left side of these 5 cross sections may be more appropriately aligned further up the slope. However, it appears that the elevations in the Sols Wash are higher than those in Hospital Wash and, therefore, elevations in the Sols Wash will control the height of the levee anyway.	Will re-align to determine effects.
5		D	In Model V, the CWSELs shown on the HEC-RAS cross section plots do not always match those elevations stated in the HEC-RAS summary output (Figure V-2).	The CWSEL stated in the comment is from the Subcritcal water surface elevation. The mixed flow WSEL is 2045.70, which is shown in the plot.

Flood Control District of Maricopa County
Project Number: FCD2002C030

Disposition Codes:
A. Will Comply
B. Consultant to Evaluate
C. Client to Evaluate
D. No Further Action

SOLS WASH, CANDIDATE ASSESSMENT REPORT REVIEW COMMENTS

AZTEC ENGINEERING

Reviewed By: Cathy Regester **Organization: Flood Control District of Maricopa County**

Comment No.	Sheet Number	Code	Review Comment	Response
			(See cross section 0.19, for example. Plot shown CWSEL less than el. 2046; Summary output shows CWSEL as el. 2047.73.	WSEL is 2045.70, which is shown in the plot.
6		A	The CWSELs are higher in the AZTEC models at cross sections 0.90 and 1.00 than in the CLOMR model. Please explain.	Ineffective flow areas in several sections upstream were removed. These areas will be re-added and will not affect project limit WSE's.
7		A	The modeling of the channelization upstream of the Tegner Street Bridge is showing an increase in CWSELs at cross sections 0.66 and 0.71 over the existing conditions. Is the proposed channelization worsening conditions in this area?	Inclusion of the improvements west of the existing 93-bridge does raise the water surface at two sections, which are in the upstream sections of the Goldmine development.

AZTEC
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Phoenix, Arizona 85040
[602] 454-0402
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Memo

To: FCDMC
Subject: Sediment Transport Methodology
Project: Sols Wash
From: Larry Sibala, P.E.

Date: 04/09/2004
Project Number: FCD2002C030
AZ03152

Sediment Transport and Scour Evaluation within Sols Wash

As part of the Sols Wash Candidate Assessment Report (CAR), selection of the preferred alternative will require sediment transport to be considered.

The following memorandum will outline the methodology to be used for this CAR. The scope of the sediment transport analysis for this CAR is limited to a general evaluation to ensure that sediment transport is considered in the selection of the recommended solution and to propose the detailed analysis that will be required during final design. The Arizona Department of Water Resources publication "Design Manual for Engineering Analysis of Fluvial Systems was referenced for the procedures to use in this analysis, which will be broken down into four categories.

1. Previous reports of studies in the area will be researched for applicable data.

The District's library will be used in the research for studies of watersheds similar to or within the Hassayampa basin. The reports and studies prepared for Sols Wash will be referenced for information relative to sediment will be used. Information regarding particular sizes for bed material from similar watersheds will be incorporated in this study.

Survey of the FIS cross sections are complete and an evaluation of the reach can be made by comparing these section to the sections used in the FIS.

2. Potential for Armoring will be investigated

As a result of field visits to the site, preliminary investigations and from previous studies, the potential for armoring will not likely be a factor in the design of the channel sections in the subject reach. However, the size of bed material required to armor will be determined on order to rule out armoring potential. Several equations recommended by the Bureau of Reclamation will be used in this process. These equations are:

Meyer-Peter, Muller, equation for bedload transport
Shields Diagram

Each method computes a different armoring size, but can provide a check on the other equations in determining if there is any potential for armoring in the subject reach.

3. Limiting Slope for Scour

The limiting or stable slope will be determined to evaluate the potential for degradation in the subject reach. This method is used when it is determined that there is insufficient coarse material to form an armoring layer. The dominant discharge will be used. The following equations will be used to determine stable slope:

Meyer-Peter, Muller equations for beginning transport
Shield Diagram for no motion

The results from the above equations or method can be averaged, but depending on the results, the slope can be selected from the technique considered most applicable. The sediment continuity principle will also be applied to the reach to determine potential for erosion or sedimentation using the 100 year discharge. This will be accomplished by using an estimate of sediment loading based on information gathered from previous reports completed for studies in the area. Local scour and general scour will also be determined considering sediment continuity in the proposed channel (an estimate of sediment loading will be used as noted above).

Low flow incisements will be included in the design by inspecting the existing channel and providing a similar depth if a low flow channel exists. A low flow channel was observed during the field trips, and the depth will be measured during the next field trip.

Where it is determined that there is possibility of supercritical flow, the depths for antidune troughs can estimated using the equation provided in the design manual to determine the necessary toe down of the bank protection. Since both banks will be protected with either concrete or gabions, lateral migration will not be considered.

4. Equilibrium Slope

The Equilibrium Slope is defined as the slope the channel wants to achieve over the long term when the channel sediment transporting capacity is equal to the incoming sediment. The first step in determining the equilibrium slope will be to evaluate the state of the present profile by evaluating surveyed cross sections with those used in the FEMA flood insurance study. Since channelization of the study reach will change the sediment transport capacity of the channel, the new rate will have to be evaluated with the incoming sediment supply rate. The bank full discharge will be used as the dominant discharge since an improved section is being evaluated. Results of this analysis will then be incorporated in the design channel section in the study reach.

Rebecca Zook

From: Rebecca Zook
Sent: Thursday, April 08, 2004 3:47 PM
To: 'Robert Knighten - FCDX'
Subject: FCD 2002C030, On-Call CAR

Robert,
I am enclosing the Progress Meeting No. 2 meeting minutes and attachments for your approval.
Please let me know if you have any comments or changes.
Thank you,
Rebecca

AZTEC
www.aztec.us

3747 East Grove Street
Phoenix, AZ 85040
602.454.0402
602.454.0403

Meeting Agenda

Meeting Date: April 5, 2004
Meeting Time: 10:00 am
Location: FCDMC 2801 W. Durango Street Phoenix, Arizona
Subject: Wickenburg Sols Wash Candidate Assessment Report (C.A.R.)
Progress Meeting Number 2 AGENDA

I. Introductions

II. Meeting Goals

- Select channel alternative between Tegner Street and the Hassayampa River for further refinement.
- Present Progress

III. Work Completed

- Base Sols Wash HEC-RAS Model
- Base Hospital Wash HEC-RAS Model
- Hospital Wash Improvements Model
- Four (4) Sols Wash Improvements Models
- Survey along Sols Wash 1989 cross sections
- Property Valuation Information acquired online

IV. Hydraulic Models Report

- Part 1
  - I Sols Wash - Existing Conditions (Base Model)
  - II Sols Wash - Levee Improvements West of SR93
  - III Hospital Wash – Existing Conditions
  - IV Hospital Wash – Levee Improvements west of SR93

- Part 2
  - V Sols Wash – Natural Channel
  - VI Sols Wash – Concrete Lined Channel
  - VII Sols Wash – CSA Bank Protection
  - VIII Sols Wash – Reno Mattress Channel Protection

V. Preferred Alternative

- Qualitative alternative selection

VI. Follow Up/Action Items

- No Action cost refinement
- Refine selected channel alternative
- Prepare Sediment Transport methodology memo (Friday, 4/9/04)
- Evaluate Mobile Home Park
- Tegner Street Bridge Freeboard
- Eliminate River Street Crossing?
- Field Visit
- Proposed ADOT Sols Wash Bridge

VII. Open Discussion/ADOT Update

VIII. Adjourn

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[602] 454-0403 Fax

Meeting Minutes

Meeting Date:	04-05-04	Meeting Time:	10:00 am
Location:	FCDMC		
Subject:	Progress Meeting No. 2	Project:	Sols Wash CAR
		Project No:	AZ03152
Attendees:	Robert Knighten, FCDMC	Shane Dille, Town of Wickenburg	
	Greg Jones, FCDMC	Dennis Crandall, ADOT	
	Cathy Regester, FCDMC	Larry W. Doescher, ADOT	
	Kathryn Gross, FCDMC	Leo Kreymborg, WEST Consultants	
	Harry Pars, Town of Wickenburg	Jeff Ford, AZTEC	
	Gerald Stricklin, Town of Wickenburg	Larry Sibala, AZTEC	
	Lon McDermott, Town of Wickenburg	Rebecca Zook, AZTEC	
Prepared By:	Rebecca Zook	Date Published:	04-05-04

A Meeting Agenda was distributed (attached to these meeting minutes along with the sign in sheet), and the meeting began with introductions.

Robert then made a brief statement as to the reason for the meeting which was for AZTEC to give a status update on the progress of the Sols Wash CAR. He also stated that the Town of Wickenburg and ADOT had been invited in an effort to coordinate the Sols Wash improvements with the proposed State SR93 project.

Rebecca Zook began by stating that the goal of Progress Meeting No. 2 is to discuss the hydraulic models that were submitted to the FCDMC on 3/22/04 and to identify the recommended alternative for further evaluation between the existing SR 93 Bridge and the proposed SR 93 Bridge. She then restated what Robert had said about trying to find a solution that will work for all of the entities involved in the proposed improvements around the Sols Wash/US 93 project. Rebecca then acknowledged that Jeff Ford would continue with the meeting by giving the project status update to the group.

Jeff began by discussing what items had been completed;
-The preliminary hydraulic models were submitted to the FCDMC on March 22, 2004.
-The 'base' Sols Wash HEC-RAS Model that was used was the CLOMR Model by J.E. Fuller with the addition of several cross-sections from the ADOT Model to include the proposed bridge.
-AZTEC developed the 'base' Hospital Wash HEC-RAS Model from digital mapping and topography.
-The improvements west of SR 93 and extending up into Hospital Wash have been modeled. These improvements encompass levees on the north side of Sols and Hospital Wash to eliminate the breakout over Tegner Street.
-Jeff then stated that 4 (four) Sols Wash Improvements Models between the existing SR 93 and the proposed US 93 Bridges were included in the 3/22/04 submittal. Jeff asked Cathy and Kathryn if they had a chance to review the report. Cathy stated that she had comments, but nothing that was significant enough to change the results. A short meeting was held after this meeting to discuss these comments.
-AZTEC has completed survey along the Sols Wash 1989 cross section locations but had not plotted these versus the 1989 cross sections to identify if aggradation or degradation had occurred.
-AZTEC has obtained some property valuation information from the Maricopa County Assessor's website

Jeff outlined the work that will be done along Hospital Wash for Progress Meeting Number 3. Levees required to remove the mobile home park north of Sols Wash, west of Hospital Wash will be modeled. The costs of the new levees, new access, and any other improvements to channelize this reach will be compared to the cost of purchasing these properties.

Jeff then went through an explanation of Part 1 of the Hydraulic Models Report detailing the existing conditions models used for both Sols and Hospital Wash. He then discussed the extents of the levee improvements in this region of the study limits. The Sols Wash Improvements in Part 2 of the report that are located between the existing SR 93 Bridge and the proposed US 93 Bridge. The alternatives studied are the Natural channel, a concrete lined channel, CSA Bank Protection and Reno Mattress Channel Protection. Jeff stated the channel widths determined for each alternative were 200', 75', 80' and 90', respectively. Rebecca added that the existing channel ranges in width from 80-100 feet to establish a relationship between the existing and the improved widths. At this point, questions arose about what the CSA and Reno Mattress alternatives look like. Examples in the area were given for each of these options. Representatives from the Town of Wickenburg voiced their opinion on the Natural Channel. They stated that a 200' bottom width (approximately 100' into the Park area) was an undesirable option because of the major impacts to the park. This option would remove the access road around the park along with existing structures and land allotted for proposed improvements. Velocities for each alternative were also discussed.

It was brought up that a system of equestrian trails are to be included under the bridges and along the tops of the levees. AZTEC asked if they could obtain information on the trails to include provisions for the riders to travel 'up and out of' or 'down into' the wash area. Which alternatives are equestrian friendly was then discussed.

The group also discussed which option would require less maintenance or easier maintenance. The conversation evolved into how would each alternative handle sediment deposition and the cleaning of the wash floor if required. It was determined that the reno mattress and concrete floor could possibly be damaged during maintenance to eliminated sediment deposits.

Everyone in attendance agreed that a natural floor for the wash is preferred with a reno mattress on the north side. The south side of the wash (fronting the existing buildings) would either be concrete, reno mattress, or CSA. The determination would depend on the cost and impact to the width (pushing bottom width over – more impacts to park property).

The next item on the agenda dealt with follow up items that would be acted upon at a later date. Jeff spoke about the 'do nothing' option cost refinement. He mentioned which properties would be removed from the flood plain due to the Sols/Hospital Wash improvements (figure attached). Therefore, the annual flood insurance these owners currently pay for would be eliminated. This cost would be what the 'do nothing' alternative saved to the property owners. An assumed 50 year study period was chosen along with a constant increase in property values and a constant annual rate of inflation. Once these criteria were set, a present value over the study life could be determined.

AZTEC stated that it would provide the FCDMC a Sediment Transport Methodology memo by Friday, April 9, 2004. It was pointed out that only determining the equilibrium slope would probably not show the big picture of the sediment transport issues associated with this project. Several factors complicate the sediment transport in this area, they include;
-The location and occurance of sedimentation or deposition will vary depending on what storm event occurs. It is likely that during frequent events degredation will occur for large reaches of Sols Wash between existing and proposed SR 93 Bridge, while for larger events large quantities of deposition could occur due to significant backwater up Sols Wash from the Hassayampa River. Additionally, large quantities of sediment has accumulated just upstream of the existing SR 93 bridge, which currently causes significant backwater effects. ADOT's project will remove this constriction and construct a bridge that will greatly reduce the backwater effects. It is likely that the Sols Wash outfall elevation into the Hassayampa River will decrease in elevation. Constructing the proposed ADOT bridge over Sols Wash as a grade control structure to stop this migration up Sols Wash should be investigated.

Another issue that would be detailed for the Progress Meeting No. 3 is the freeboard at the Tegner Street Bridge. Due to the proposed elevations set for the levees approaching the bridge from the upstream side, it may be required that a wall be added on the upstream face of the bridge. This would be an addition of an approximately 2.5' wall on top of the already existing 18" wall. A question arose as to how this would tie into the improvements already constructed for the Goldmine Village. AZTEC said it would need to look into this area further for the next meeting.

Jeff stated that at the last ADOT meeting, the River Street crossing was discussed. At that time, ADOT and the Town of Wickenburg appeared to be eliminating this road. Jeff asked whether this had been decided, and all parties in attendance agreed that the River Street crossing of Sols Wash would be eliminated by this project. The Town of Wickenburg asked that pedestrian and aquestrian access be investigated.

The next item discussed was a field visit to the area the week of April 12th. Several parties mentioned they would like to attend and Robert said he would send an email out once the site visit day was chosen to those interested in attending.

Jeff then mentioned that AZTEC had used the HEC-RAS bridge input for ADOT's proposed Sols Wash bridge from the initial drainage report, but that the 30% bridge plans were different. It was confirmed that the bridge had changed and Leo K. said he would provide AZTEC with the revised cross sections in that area.

Progress Meeting No. 2 was adjourned. The representatives from the Town of Wickenburg and ADOT left the meeting, as did Greg and Robert with FCDMC.

AZTEC stayed and met with Cathy and Kathryn to discuss their comments regarding the Hydraulic Models report submitted to FCDMC. A copy of the comment resolution form is attached.

A final comment was introduced by Cathy and Kathryn as to why the study Q was not 24,000 cfs. Jeff stated that it was determined in Progress Meeting No. 1 to use the FEMA Q100 of 15,045 cfs.

The Comments meeting was adjourned.

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Flood Control District of Maricopa County

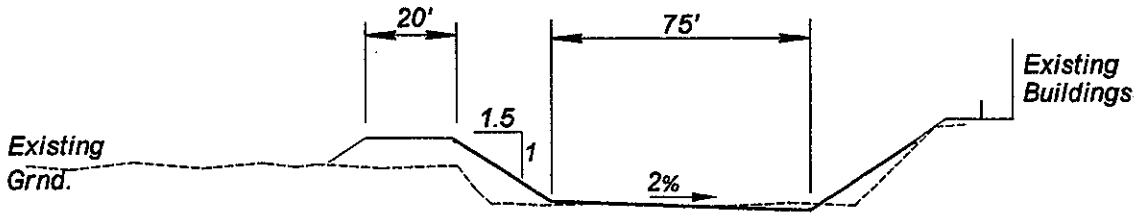
Sign In

Meeting Subject: Progress Meeting #2 **Date:** April 5, 2004

Project Name: Wickenburg Sols Wash Candidate Assessment Report (C.A.R.) **Project No.:** AZ 03152

INITIAL	NAME	AGENCY	PHONE	FAX	E-MAIL
1. H.P.	HARRY PARS	TOWN OF WICKENBURG	(928) 684-2761	(602) 506-1580	PUBLIC WORKS @ W3AZ.NET
2.	GERALD STRICKLIN	" "	928 668 0512	602 506 1580	GSTRICKLIN@ci.WICKENBURG.AZ.US
3.	LON McDERMOTT	" "	" " 0523	" "	
4.	Shane Dille	" "	" " 0524	" "	sdille@ci.wickenburg.az.u
5.	Rebecca Zook	Aztec Engineering			rzook@aztec.us
6.	CATHY REGESTER	FCDMC	602-506-4001		cwr@mail.maricopa.gov
7.	Dennis Crandall	ADOT	602-712-7197	602-712-3181	dcrandall@dot.state.az.us
8.	Leo Kreymborg	WEST Consultants	(480) 345-2155		leok@westconsultants.com
9.	Greg James	FCD	602-506-5537		gjames@mail.maricopa.gov
10.	Larry W. Daescher	ADOT-SPMG	602.712.7551	602.712.7630	ldaescher@dot.state.az.us
11.	JEFF FORD	J2	602-438-2221		jford@j2design.US
12.	LARRY SIBALA	AZTEC	602-659-3957		lsibala@aztec.us
13.	Kathryn Gross	FCD	(602) 506-4837		kog@mail.maricopa.gov
14.	Rob Knighten	FCD			
15.					

Sheet _____ of _____



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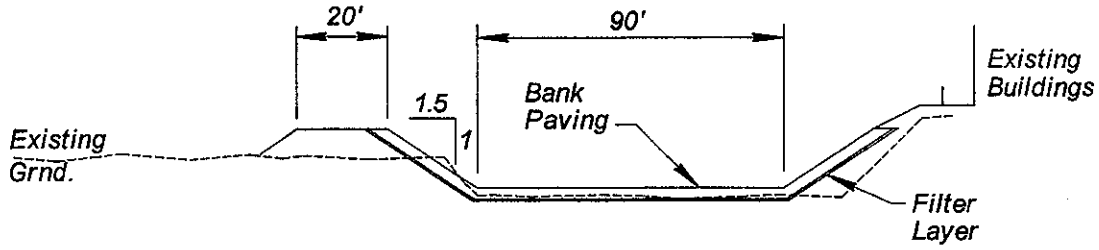
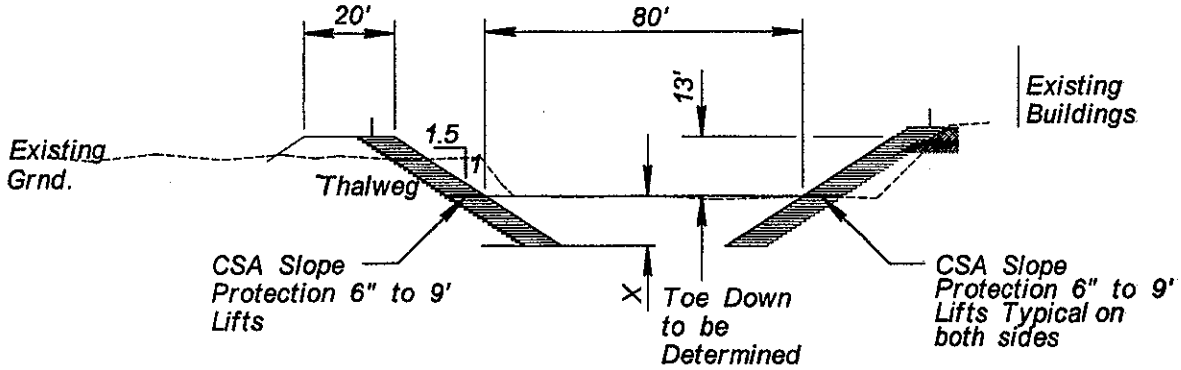
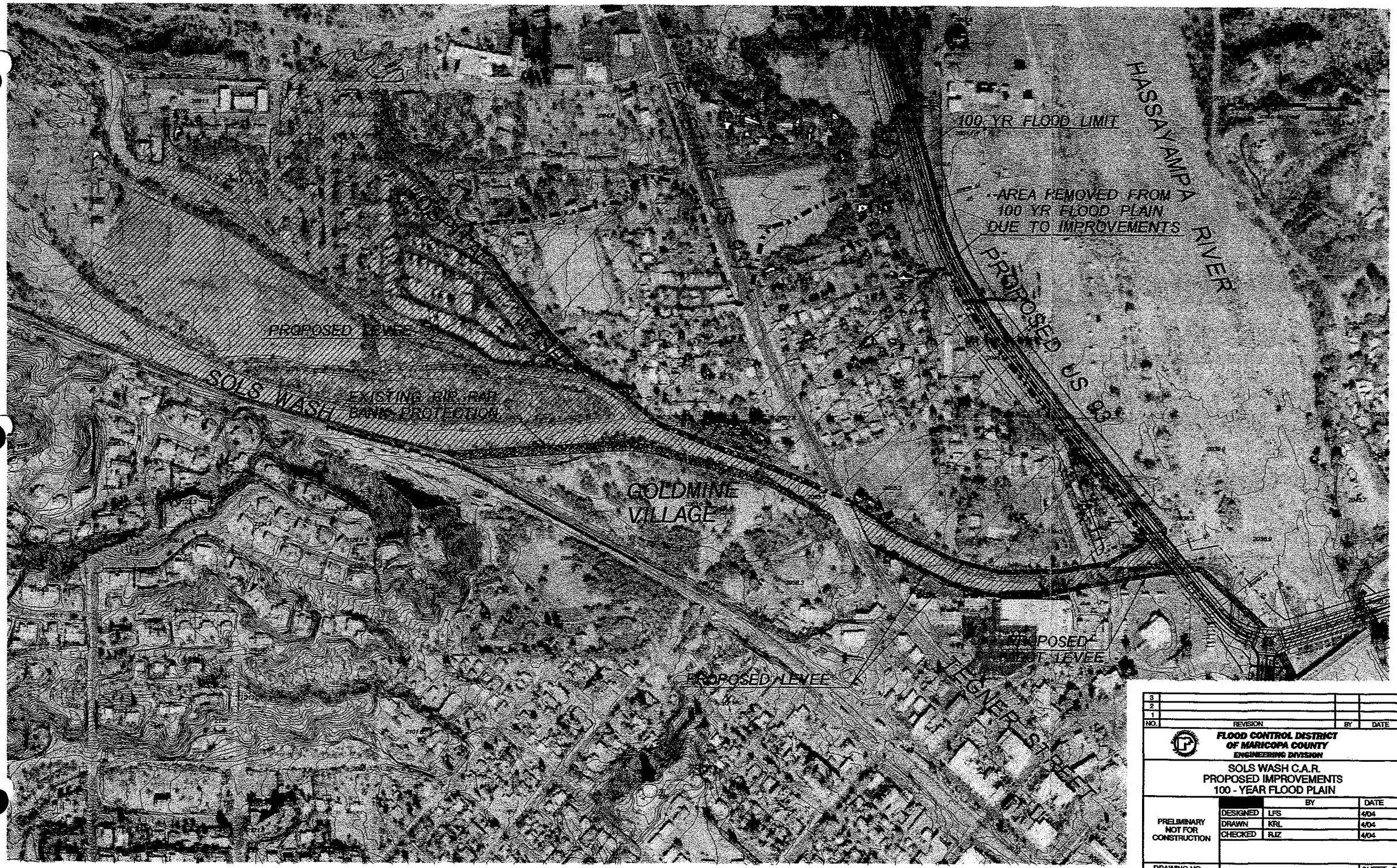


RENO MATTRESS
CHANNEL PROTECTION



CSA



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

SOLS WASH C.A.R.
PROPOSED IMPROVEMENTS
100 - YEAR FLOOD PLAIN

PRELIMINARY NOT FOR CONSTRUCTION

	BY	DATE
DESIGNED	LFS	4/04
DRAWN	KRL	4/04
CHECKED	RJZ	4/04

DRAWING NO. FIGURE 8 SHEET OF

Plotted By: kleahy at 7:46:27 AM 4/1/2004 R:\PhoenixGrove\Projects\AZ03152\Cadd\Presentation\3152fig08.dgn

Flood Control District of Maricopa County
Project Number: FCD2002C030

Disposition Codes:
A. Will Comply
B. Consultant to Evaluate
C. Client to Evaluate
D. No Further Action

SOLS WASH, CANDIDATE ASSESSMENT REPORT REVIEW COMMENTS

AZTEC ENGINEERING

Reviewed By: Cathy Regester **Organization: Flood Control District of Maricopa County**

Comment No.	Sheet Number	Code	Review Comment	Response
1		A	Model I is stated to be the Goldmine Village CLOMR HEC-RAS model with the proposed US 93 Bridge added to the model. The discharges (Q's), however, used in Model I do not reflect the breakouts shown in the CLOMR model. I recommend that the Qs used in the CLOMR model be used in the existing conditions model (Model I) so that a more accurate comparison of the changes due to the proposed channelization may be made.	The CLOMR model will be included in the final report as the existing conditions model.
2		A	Model II should also be run in the sub-critical flow regime for evaluation of levee heights.	
3		A	The computed water surface elevations (CWSELs) stated in the table Sols Wash Levee Design, included in the Model II analysis, do not always match those stated in the HEC-RAS summary output (Figure II-2).	
4		A	In Model III, it appears that the breakout of flows from Hospital Wash to US 93 may be more attributable to the alignment of cross sections 1 through 5 than to an actual breakout. The left side of these 5 cross sections may be more appropriately aligned further up the slope. However, it appears that the elevations in the Sols Wash are higher than those in Hospital Wash and, therefore, elevations in the Sols Wash will control the height of the levee anyway.	Will re-align to determine effects.
5		D	In Model V, the CWSELs shown on the HEC-RAS cross section plots do not always match those elevations stated in the HEC-RAS summary output (Figure V-2).	The CWSEL stated in the comment is from the Subcritcal water surface elevation. The mixed flow WSEL is 2045.70, which is shown in the plot.

Disposition Codes:
A. Will Comply
B. Consultant to Evaluate
C. Client to Evaluate
D. No Further Action

SOLS WASH, CANDIDATE ASSESSMENT REPORT REVIEW COMMENTS

AZTEC ENGINEERING

Reviewed By: Cathy Regester **Organization: Flood Control District of Maricopa County**

Comment No.	Sheet Number	Code	Review Comment	Response
			(See cross section 0.19, for example. Plot shown CWSEL less than el. 2046; Summary output shows CWSEL as el. 2047.73.	WSEL is 2045.70, which is shown in the plot.
6		A	The CWSELs are higher in the AZTEC models at cross sections 0.90 and 1.00 than in the CLOMR model. Please explain.	Ineffective flow areas in several sections upstream were removed. These areas will be re-added and will not affect project limit WSE's.
7		A	The modeling of the channelization upstream of the Tegner Street Bridge is showing an increase in CWSELs at cross sections 0.66 and 0.71 over the existing conditions. Is the proposed channelization worsening conditions in this area?	Inclusion of the improvements west of the existing 93-bridge does raise the water surface at two sections, which are in the upstream sections of the Goldmine development.

Rebecca Zook

From: Rebecca Zook
Sent: Monday, March 15, 2004 3:32 PM
To: 'rlk@mail.maricopa.gov'
Cc: Jeff Ford
Subject: Sols Wash CAR

Robert,
As per our conversation, I am enclosing the following information as part of this email:

- March 8, 2004 Meeting Minutes (Draft for your review and approval)
- Enclosures as part of 3/8/04 minutes
  - Sign in Sheet
  - Letter requesting change in Project Manager
- Anticipated Schedule for Sols Wash CAR
- Contact information
  - Rebecca J. Zook
  - phone: 602-659-9358
  - fax: 602-454-0403
  - email: rzook@aztec.us
  - address: 3747 East Grove St.
    Phoenix, AZ 85040-3982

030804MMrjz-Change of PM Meeti... signsheet030804.pdf 030804RequestPMet.pdf Anticipated Schedule.pdf

Please give me a call if you have any questions,
Rebecca

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[602] 454-0403 Fax

Meeting Minutes

Meeting Date:	03-08-04	Meeting Time:	1:30
Location:	FCDMC		
Subject:	Change of Personnel	Project:	Sols Wash CAR
		Project No:	
Attendees:	Robert Knighten, FCDMC Greg Jones, FCDMC Wanett Maxwell, FCDMC Kelli Sertich, FCDMC Peter Hemingway, AZTEC Scott McKenzie, AZTEC Jeff Ford, AZTEC Larry Sibala, AZTEC Rebecca Zook, AZTEC		
Prepared By:	Rebecca Zook	Date Published:	03-15-04

A Meeting Agenda was distributed (attached to these meeting minutes along with the sign in sheet), and the meeting began with introductions.

Peter Hemingway made a brief statement as to the reason for the meeting which was to request a change of Project Manager for the Sols and Hospital Wash CAR. A letter requesting the change in Project Manager was submitted and a copy of the letter is attached to these minutes.

Robert Knighten began by discussing the need to follow the District's protocol for keeping accurate details for the progression of a project. Wanett stated that this could be done through a no cost change order. Greg Jones requested that Rebecca's resume be submitted. This was submitted to Robert Knighten on Thursday, March 11, 2004.

The next topic was a short discussion of the schedule for upcoming deliverables. AZTEC stated that there would be no adjustments to the schedule as a result of the change in Project Manager. It was stated that Larry Sibala has been and will continue to be the hydraulic modeler for the project. It was noted that the hydraulic models will be provided to the District for their review on March 22, 2004. It was also agreed that the second progress meeting would be scheduled the week of April 5th. Robert Knighten would determine the exact date and let all parties involved know.

Greg Jones said that the project completion date set at the beginning of July, 2004 must not change. Robert agreed and added that due to the end of the fiscal year, final billing should occur by the 25th of June.

It was decided that pending the submittal of Rebecca's resume, the District would prepare a no cost change order.

The meeting was adjourned.

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Flood Control District of Maricopa County

Sign In

Meeting Subject: Status Meeting

Date: March 08, 2004

Project Name: Wickenburg Sols Wash Candidate Assessment Report (C.A.R.)

Project No.: AZ 03152

INITIAL	NAME	AGENCY	PHONE	FAX	E-MAIL
1.	Scott McKenzie	AZTEC	602 659 9304	602 454 0403	smckenzie@aztec.us
2.	LARRY SIBALA	AZTEC	602 659 9357	" " "	lsibala@AZTEC.US
3.	REBECCA ZOOK	AZTEC	-9358	"	rzook "
4.	JEFF FORD	AZTEC	(602) 659-9359	(602) 454-0403	jford@aztec.us
5.	Peter Hemingway	AZTEC	(602) 458-7461	(602) 458-7465	phemingway@aztec.us
6.	WANETT MAXWELL	FCD	602-506-4433	602-506-2903	mwm@mail.maricopa.gov
7.	Kelli Sertich	FCD	(602) 506-0867	(602) 506-8561	kas@mail.maricopa.gov
8.	Greg Lowe	FCD	602-506-5537	—	gwl@ " " "
9.					
10.					
11.					
12.					
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15.					

Sheet _____ of _____

AZTEC
www.aztec.us

March 8, 2004

Mr. Robert Knighten
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

RE: Contract FCD 2002C030, On-Call Candidate Assessment Report Services
Request for a Change of Project Manager
AZTEC Engineering Project Number: AZ03152

Dear Mr. Knighten,

AZTEC Engineering requests a change in Project Manager for the Sols Wash and Hospital Wash work assignment. It is proposed that Rebecca Zook, P.E. assume this role for the remainder of this project.

We appreciate the opportunity to work with the DISTRICT on this project. Should you have any questions please give me a call at (602) 458-7461.

Sincerely,
Aztec Engineering Arizona, LLC

Peter Hemingway, P.E.
Senior Vice President
Project Principal

Schedule for Sols Wash CAR		
TASK	**Anticipated Date**	**Comments**
Notice to Proceed	11/18/2003	Actual Date
Field Visit	11/26/2003	Actual Date
Progress Meeting No. 1	12/18/2003	Actual Date
Initial Model Submittal	3/22/2004	Actual Date
Progress Meeting No. 2	4/6/2004	(Includes 2 Weeks Review)
Field Visit	4/8/2004	
Revised Model Submittal	4/22/2004	
Progress Meeting No. 3	4/29/2004	(Includes 1 Week Review)
Draft Drainage Report Due	5/26/2004	
Comments Meeting	6/2/2004	
Final Drainage Report	6/25/2004	

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[602] 454-0403 Fax

Meeting Minutes

Meeting Date:	12-18-03	Meeting Time:	9:00
Location:	FCDMC		
Subject:	Progress Meeting No. 1	Project:	Sols Wash CAR
		Project No:	
Attendees:	Robert Knighten, FCDMC Kathryn Gross, FCDMC Catherine Regester, FCDMC Larry Doescher, ADOT Dennis Crandall, ADOT Leo Kreymborg, West Consultants Jeff Ford, AZTEC Duc Dao, AZTEC		
Prepared By:	Jeff Ford	Date Published:	01-08-04

A Meeting Agenda was distributed (attached to these meeting minutes), and this meeting began with introductions.

Jeff Ford stated that the purpose of this meeting was to;

- Define the base model to be used for the remainder of the project
- Define the Q that will be used along Sols Wash for the remainder of the project
- Determine the 4 channel configurations to be analyzed along Sols Wash

A summary of the information collected to date was distributed and is included in these meeting minutes.

Jeff explained that the areas located within the floodplain to the southwest of the existing SR 93 and Hassayampa River is caused by both a breakout from Sols Wash and wraparound flooding from the Hassayampa River downstream of the SR 93 bridge. Therefore, to remove this area from the floodplain would require improvements downstream of the SR 93 bridge. These improvements would include approximately 1900 LF of levee along the west side of the Hassayampa River, just south of the SR 93 bridge.

The 100-year flows used within Sols Wash are as follows;

- 1989 FEMA Study, (15,045 cfs)
- Wickenburg ADMS (23,401 cfs)
- Corps Study (24,000 cfs)

JE Fuller submitted a CLOMR that has been approved for the Goldmine Village development located to the south west of Sols Wash and the existing SR 93 bridge. Sols Wash will be channelized just upstream of the existing SR 93 bridge as a part of these improvements. This CLOMR made significant revisions to the existing regulatory model. It modified the bridge routine and indicated that significant breakout occurs over to the north of Sols Wash west of the existing SR 93 bridge, and flows over existing SR 93. This modeling indicates that 1,492 cfs flows over SR 93 after the improvements are completed. This volume would be significant if it were to pond up to the west of the proposed SR 93 along the west side of the Hassayampa River. This CLOMR also adds a significant number of homes east of SR 93 and north of Sols Wash to the floodplain. It was agreed that this will be used as the base model for this project.

The JE Fuller model was modified using 24,000 cfs and compared to the CLOMR model that used 15,045 cfs. The water surface elevation was between 0.5' and 1.5' throughout the run, but this run indicated a 5' rise in water surface elevation across the existing SR 93 bridge. Additional detail including modifying the breakouts would have to be run to accurately model the effects across the bridge of using the 24,000 cfs. This rise would likely put the proposed buildings in the Goldmine Village development back in the floodplain. The Flood Control District of Maricopa County (FCDMC) has indicated that they have reviewed the differences in Q's along Sols Wash in the past, and that the 15,045 cfs is a reasonable number. It was decided that the FEMA Q of 15,045 cfs would be used in all future modeling.

Jeff stated that the Corps report stated, "After the October 2000 event, sediment impacts resulted in the south branch of Sols Wash to be significantly wider and have a lower invert than the north branch. It was reported that there was three feet of deposition from the last two floods on the north branch of Sols Wash." There are also potential problems with the long term degradation/aggregation process since it is likely that storms of different frequencies produce a variety of degradation and aggregation along Sols Wash, and it will be important to consider a series of storms. A maintenance plan will be required as a part of any final design.

During the evaluation of this model, it was discovered that Hospital Wash, a tributary to Sols Wash just upstream of the existing SR 93 bridge over Sols Wash, likely contributes to the breakout over SR 93. Therefore, any improvements to eliminate this breakout would need to extend into Hospital Wash. During the original scoping for this project, no analysis of Hospital Wash was included since at the time it was believed that only Sols Wash contributed to the breakout. To adequately define the limits of improvements required to contain this breakout, an analysis of Hospital Wash should be included. As an alternative, assumptions can be made to estimate the limits based on the available floodplain mapping, but additional analysis would have to be done during final design to define these limits.

Catherine Register provided Aztec with a copy of the U.S. Army Corps of Engineers "Hydraulic Design of Flood Control Channels."

It was agreed to by everyone in attendance that:

- The JE Fuller CLOMR model should be used as the base model for the remainder of this project
- The regulatory Q of 15,045 cfs should be used.
- The four alternatives to for further evaluation will include a concrete lined channel, Reno mattresses or gabions, CSA, and a natural channel.

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[602] 454-0403 Fax

Meeting Minutes

Meeting Date:	10-23-03	Meeting Time:	8:30
Location:	FCDMC		
Subject:	Town of Wickenburg Meeting	Project:	Sols Wash
		Project No:	
Attendees:	Gregory Jones, FCDMC Gerald Stricklin, Town of Wickenburg Harry Parsi, Town of Wickenburg Jeff Ford, AZTEC		
Prepared By:	Jeff Ford	Date Published:	10-29-03

This meeting was held to discuss the Draft Final Scope of Work for the Sols Wash CAR, and began with introductions.

Greg introduced the project. ADOT is currently in final design to improve SR93 through the Town of Wickenburg. These improvements will connect to Sols wash, and the Districts project will consist of performing a concept level study through Sols Wash to ensure that the ADOT tie-in to Sols Wash will be compatible with any future project to channelize Sols Wash, and to scope this future project.

Greg recommended that the District take the lead in coordinating the improvements along Sols Wash with ADOT, and that this CAR was the first step.

Greg requested utility plans from the Town, along with any photo's or other items that document any flooding along Sols Wash.

The scope of work was reviewed paragraph by paragraph, and Gerald and Harry agreed that the Scope of Work included all required items.

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Meeting Minutes

Meeting Date:	10-08-03	Meeting Time:	2:00
Location:	FCDMC		
Subject:	Stakeholders Meeting	Project:	Sols Wash
		Project No:	
Attendees:	Gregory Jones, FCDMC Kathryn Gross, FCDMC Catherine Regester, FCDMC Larry Doescher, ADOT Dennis Crandall, ADOT Larry Sibala, AZTEC Jeff Ford, AZTEC		
Prepared By:	Jeff Ford	Date Published:	10-13-03

This meeting was held to discuss the Draft Final Scope of Work for the Sols Wash CAR, and began with introductions.

Greg introduced the project. ADOT is currently in final design to improve SR93 through the Town of Wickenburg. These improvements will connect to Sols wash, and this project will consist of performing a concept level study through Sols Wash to ensure that the ADOT tie-in to Sols Wash will be compatible with any future project to channelize Sols Wash, and to scope this future project.

The following items were added to the draft scope of work;

- AZTEC is to attend approximately 2 ADOT coordination meetings.
- AZTEC is to prepare a general recommendation for the environmental work that will be required during final design. Eight (8) hours was added for this work.
- The schedule for this project will be 120 days. This has been revised from the 100 days shown in the Draft Scope of Work for the additional sediment transport work that will be required.
- The existing FEMA mapping and regulatory model will be compared to the mapping and HEC RAS model prepared by J. E. Fuller for the development west of the existing SR 93 bridge along Sols Wash. These models will be evaluated and discussed at progress meeting #1. *After this meeting a AZTEC contacted Scott Ogden at J. E. Fuller. He said that the CLOMR that they submitted along Sols Wash was accepted in June. He will be contacting the owner to get their ok to send us a copy of this information. The project is being constructed as a design-build, and J. E. Fuller didn't do any sediment transport, scour calculations, or determine toe-down requirements because the contractors engineer was to perform this work. They developed a conceptual grading plan for their CLOMR submittal. Scott is also getting the contractors engineers contact information for me.*
- Documentation photo's need to be included in the Summary Report.
- Everyone agreed that the methodology to by used for the sediment transport should be proposed to the District in a memo and agreed to prior to the work being performed.
- A list of assumptions will be provided in the Recommendations and Future Studies section of the Summary Report. These assumptions should be verified by ADOT's SR 93 designers as that project evolves.
- All modeling information needs to be provided to the District in digital format.

SOLS WASH CAR
SIGN-IN SHEET

NOT IN PRESENT	NAME	COMPANY	PHONE	CELL	FAX	EMAIL
	Greg Jones	FCDMC	602-506-5537		602-506-8561	glj@mail.maricopa.gov
	Kathryn Gross	FCDMC	602-506-4837		602-506-4601	kag@mail.maricopa.gov
	Catherine Regester	FCDMC	602-506-4001		602-506-7346	cwr@mail.maricopa.gov
	Tim Murphy	FCDMC				
	Larry Sibala	AZTEC	602-659-9357		602-454-0403	lsibala@aztec.us
	Jeff Ford	AZTEC	602-659-9359	602-402-9909	602-454-0403	jford@aztec.us
	Larry Doescher	ADOT	602-712-7551			
	Dennis Crandall	ADOT	602-712-7197		602-712-3161	dcrandall@dot.state.az.us
	Jerry Stricklin	Town of Wickenburg	928-684-5451			

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Phoenix, Arizona 85040
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Meeting Minutes

Meeting Date:	09-29-03	Meeting Time:	9:00
Location:	FCDMC		
Subject:	Scoping Meeting	Project:	Sols Wash
		Project No:	
Attendees:	Gregory Jones, FCDMC Kathryn Gross, FCDMC Catherine Regester, FCDMC Tim Murphy, FCDMC Larry Sibala, AZTEC Jeff Ford, AZTEC		
Prepared By:	Jeff Ford	Date Published:	09-30-03

This meeting was held to discuss the scope of work for the Sols Wash CAR.

Greg began by introducing the project. ADOT is currently in final design to improve SR93 through the Town of Wickenburg. These improvements will connect to Sols wash, and this project will consist of performing a concept level study through Sols Wash to ensure that the ADOT tie-in to Sols Wash will be compatible with any future project to channelize Sols Wash, and to scope this future project.

ADOT's PM is Larry Doescher, and Jacobs is ADOT's consultant for SR93.

The group agreed that there are three different Q_{100}'s from various studies through Sols Wash.

- The FEMA Q_{100} is approximately 14,000 cfs.
- There is an existing Corps study with a Q_{100} of approximately 24,000 cfs.
- The Wickenburg ADMS determined the Q_{100} to be approximately 21,000 cfs.

A sensitivity analysis should be performed to determine what effect the differing Q's have on the water surface elevation through the wash.

The Corps study also developed a 2-D hydraulics model through Sols Wash and the FCDMC has this model, but does not have the Corps hydrology model. Greg indicated that the FCDMC had previously determined that the FEMA Q's seemed reasonable.

There is a development that is constructed along the northwest bank of Sols Wash, just north of the North Tegner Bridge. Greg indicated that a CLOMR has been submitted, and that Gerald Strickland with the Town of Wickenburg should be contacted for a copy of this information. ACTION: Jeff to contact Gerald to get a copy of the CLOMR and improvement plans.

The study limits include the tie in at Hassayampa River to the north at least as far as the improvements northwest of the bridge, but the FCD is looking for a recommendation on the limits of the study.

Greg indicated that approximately 2 years ago the area southeast of Sols Wash and North Tegner Street was flooded, and that any available information would need to be collected regarding this flooding. ACTION: Jeff to collect information regarding the flooding in the area southeast of Sols Wash and North Tegner Street.

Tim indicated that the final report should include historical documentation and a need and justification.

Greg pointed out that Sols Wash constitutes and western boundry of a park and it will be critical to incorporate a "kindler and gentler" approach to the channel improvements so it blends into the park environment.

Greg indicated the following regarding the Scope of Work;

- No public involvement would be necessary.
- Exhibits should be provided for the FCDMC to conduct future Public Meetings
- A preliminary cost estimate will be required
- Assume 5 meetings not including the scoping meeting
- An estimate of the number and value of facilities that will be taken out of the floodway
- Estimate the depth of scour to determine the depth of the toe down. Address reflective scour.
- 15% plans to hard bank both sides of the channel, including one cover sheet, 1 typical section, and 2-4 drawings
- Preliminary Utility Investigation
- Preliminary and Final Report
- Fee's for copies
- Rendering of future project

Greg indicated that the following deliverables are required for this project.

Preliminary Submittal;
- 10 sets of the Preliminary Plans and the Preliminary Drainage Report

Final Submittal;
- 5 sets of the Final Plans and the Final Drainage Report
- Originals for any Graphics in the Drainage Report
- Rendering of the proposed improvements
- Boards for future FCDMC public meetings

A CD containing the following;
- Final Plans and Final Drainage Report in PDF format
- All electronic AutoCAD files
- Graphics for the Drainage Report in TIFF or BMP format

The following existing relevant information was identified as being available.

- Corps Hydraulics Model, to be collected by Greg
- Aerial Maps, to be collected by Greg
- ADOT's SR93 Drainage Report, to be collected by Cathy
- Wickenburg ADMS, to be collected by Cathy
- Wickenburg Flood Response Plan, to be collected by Cathy
- Existing FEMA Study through Sols Wash, to be collected by Cathy
- Existing FEMA Study through Hassayampa River, to be collected by Cathy
- October 2001 Flooding Report, to be collected by Cathy

Greg indicated that the draft final scope, schedule, and manhour estimate need to be completed for the 10/08/03 stakeholders meeting. To meet this goal and give FCD personnel enough time to review it, this will be submitted by the end of day Thursday, 10/02/03. ACTION: Jeff to submit draft scope, schedule, and man hour estimate by end of day Thursday, 10/02/03.

Greg provided AZTEC with the following documents;
- One roll plot of the project area
- One CD containing the Corps 2D hydraulic model\
- Audio tape titled NORA/FLOOD CONTROL PLANS
- Pictures of flooding
- FCD pub. 'Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects

- FCD pub. 'Uniform Drainage Policies and Standards'
- FCD pub. 'Wetlands for Water Quality Enhancement'
- FCD pub. 'S-Graph Study'
- FCD pub. 'Data Delivery Specifications'
- USGS pub. 'Estimated Manning's Roughness Coefficients for Stream Channels...'
- FCD pub. 'Computer Aided Drafting and Design'
- FCD pub. 'Consultant Guidelines'
- FCD pub. 'Drainage Design Manual, Vol. 1'
- FDD pub. 'Drainage Design Manual, Vol. 2'

ATTACHMENT K:
HYDRAULIC ANALYSIS USING CORPS OF ENGINEERS DISCHARGE

HEC-RAS Plan: COE Q 90' River: Sols Wash Reach: Reach 1 Profile: PF 2

Reach	River Sta.	Profile	Q Total	Min Ch El	W.S. Elev.	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	24000.00	2082.30	2089.67	2089.67	2091.49	0.004969	14.74	3097.00	888.01	1.01
Reach 1	1.00	PF 2	24000.00	2078.10	2085.19	2085.19	2086.59	0.004551	14.15	4755.13	1730.14	0.97
Reach 1	0.90	PF 2	24000.00	2073.10	2080.27		2081.40	0.006103	13.07	4287.70	1405.92	0.91
Reach 1	0.79	PF 2	24000.00	2067.42	2075.32	2075.31	2077.27	0.009018	15.60	3290.55	1013.27	1.11
Reach 1	0.76	PF 2	24000.00	2065.84	2073.42	2073.42	2075.49	0.006941	14.54	3012.53	960.34	0.99
Reach 1	0.71	PF 2	24000.00	2063.89	2072.85	2071.63	2073.87	0.002600	10.34	3852.07	850.80	0.63
Reach 1	0.66	PF 2	24000.00	2061.79	2072.02	2071.08	2073.21	0.002392	10.64	3420.39	706.81	0.61
Reach 1	0.61	PF 2	24000.00	2059.91	2070.46	2070.46	2072.46	0.003033	12.21	2606.65	646.89	0.69
Reach 1	0.57	PF 2	24000.00	2057.69	2068.35	2068.35	2070.34	0.002954	12.01	2559.87	668.06	0.69
Reach 1	0.52	PF 2	24000.00	2055.50	2067.77	2066.57	2068.91	0.001579	9.45	3468.94	736.13	0.51
Reach 1	0.49	PF 2	24000.00	2053.51	2067.52	2062.72	2068.53	0.001040	8.63	3392.62	761.40	0.42
Reach 1	0.45	PF 2	24000.00	2051.27	2067.28	2060.67	2068.29	0.000814	8.37	3298.49	345.58	0.38
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	24000.00	2049.33	2065.90	2058.95	2066.61	0.000584	7.33	5440.15	560.48	0.33
Reach 1	0.35	PF 2	24000.00	2047.68	2059.55	2059.55	2064.88	0.005174	18.55	1308.20	123.28	1.00
Reach 1	0.27	PF 2	24000.00	2044.00	2057.31	2056.55	2062.22	0.004564	17.80	1366.34	141.23	0.89
Reach 1	0.22	PF 2	24000.00	2043.00	2055.06	2055.06	2060.43	0.005588	18.60	1290.57	119.97	1.00
Reach 1	0.13	PF 2	24000.00	2040.69	2052.67	2052.67	2057.77	0.005742	18.12	1324.71	128.67	1.00
Reach 1	0.13	PF 2	24000.00	2040.00	2052.14	2049.54	2054.31	0.001866	13.09	2693.00	267.78	0.68
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	24000.00	2039.00	2049.55	2049.55	2053.72	0.004315	17.73	1900.66	239.51	1.00
Reach 1	0.08	PF 2	24000.00	2036.99	2045.62		2046.40	0.003034	8.99	4484.47	826.62	0.58
Reach 1	0.05	PF 2	24000.00	2038.00	2043.55	2043.55	2045.62	0.006886	14.42	3364.66	1084.32	1.14

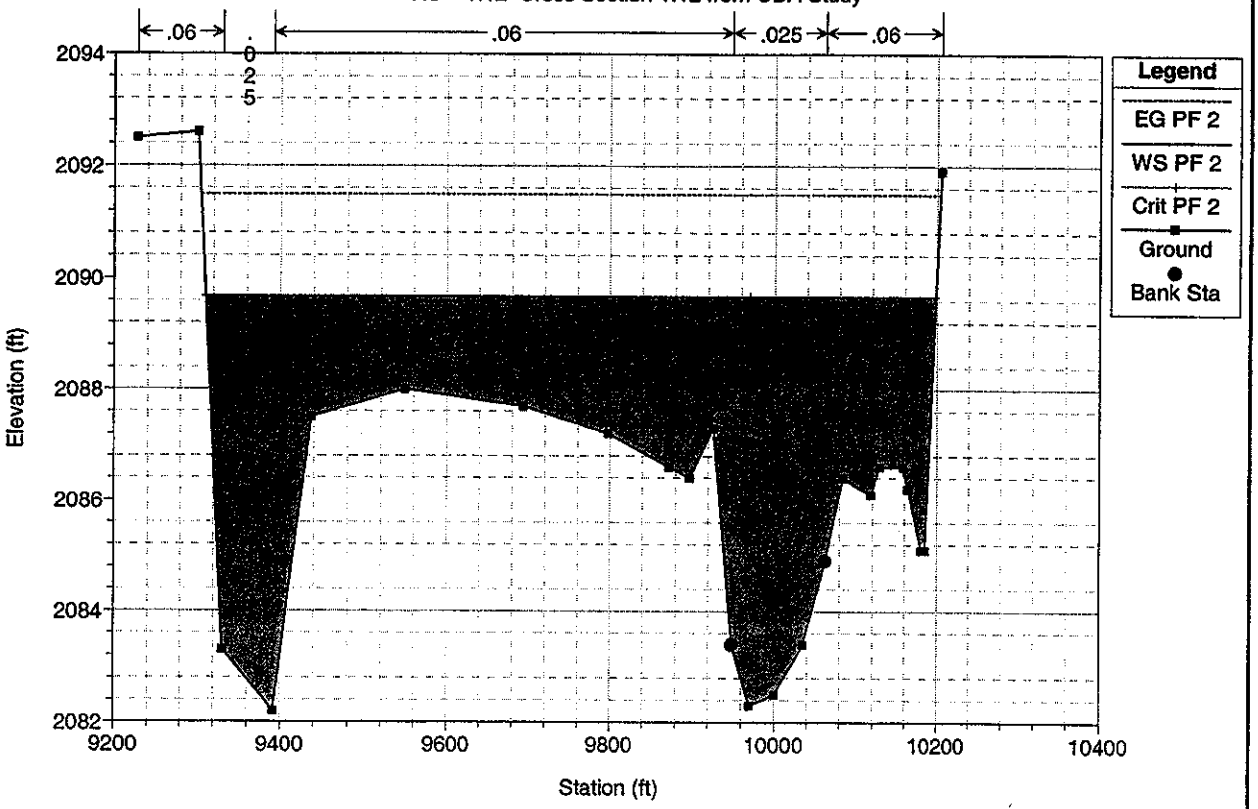
COMPOSITE 90' CHAN WITH COE Q_{100} = 24,000 CFS
MODEL IX MODIFIED

HEC-RAS Plan: COE Q 90' River: Sols Wash Reach: Reach 1 Profile: PF 2

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	24000.00	2082.30	2089.67	2089.67	2091.49	0.004969	14.74	3097.00	888.01	1.01
Reach 1	1.00	PF 2	24000.00	2078.10	2084.30	2085.19	2087.18	0.009899	18.97	3224.33	1715.01	1.39
Reach 1	0.90	PF 2	24000.00	2073.10	2080.27	2080.01	2081.40	0.006103	13.07	4287.70	1405.92	0.91
Reach 1	0.79	PF 2	24000.00	2067.42	2075.32	2075.31	2077.27	0.009018	15.60	3290.55	1013.27	1.11
Reach 1	0.76	PF 2	24000.00	2065.84	2073.42	2073.42	2075.49	0.006941	14.54	3012.53	960.34	0.99
Reach 1	0.71	PF 2	24000.00	2063.89	2072.85	2071.63	2073.87	0.002600	10.34	3852.07	850.80	0.63
Reach 1	0.69	PF 2	24000.00	2061.79	2072.02	2071.08	2073.21	0.002392	10.64	3420.39	706.81	0.61
Reach 1	0.61	PF 2	24000.00	2059.91	2070.46	2070.46	2072.46	0.003033	12.21	2606.65	646.89	0.69
Reach 1	0.57	PF 2	24000.00	2057.69	2066.24	2068.35	2071.02	0.008798	17.57	1379.38	188.90	1.13
Reach 1	0.52	PF 2	24000.00	2055.50	2067.77	2066.57	2068.91	0.001579	9.45	3468.94	736.13	0.51
Reach 1	0.48	PF 2	24000.00	2053.51	2067.52	2062.72	2068.53	0.001040	8.63	3392.62	761.40	0.42
Reach 1	0.43	PF 2	24000.00	2051.27	2067.28	2060.67	2068.29	0.000814	8.37	3298.49	345.58	0.38
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	24000.00	2049.33	2065.90	2058.95	2066.61	0.000584	7.33	5440.15	560.48	0.33
Reach 1	0.35	PF 2	24000.00	2047.68	2059.55	2059.55	2064.88	0.005174	18.55	1308.20	123.28	1.00
Reach 1	0.27	PF 2	24000.00	2044.00	2057.31	2056.55	2062.22	0.004564	17.80	1366.34	141.23	0.89
Reach 1	0.22	PF 2	24000.00	2043.00	2055.06	2055.06	2060.43	0.005588	18.60	1290.57	119.97	1.00
Reach 1	0.19	PF 2	24000.00	2040.69	2050.39	2052.67	2058.74	0.012249	23.19	1034.98	123.57	1.41
Reach 1	.13	PF 2	24000.00	2040.00	2052.14	2049.54	2054.31	0.001866	13.09	2693.00	267.78	0.68
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	24000.00	2039.00	2048.42	2049.55	2054.00	0.006714	20.37	1630.18	239.48	1.23
Reach 1	0.08	PF 2	24000.00	2036.99	2041.35	2043.96	2051.01	0.091198	28.23	1248.12	556.91	2.75
Reach 1	.05	PF 2	24000.00	2038.00	2043.16	2043.55	2045.68	0.009242	15.82	2956.70	1006.36	1.30

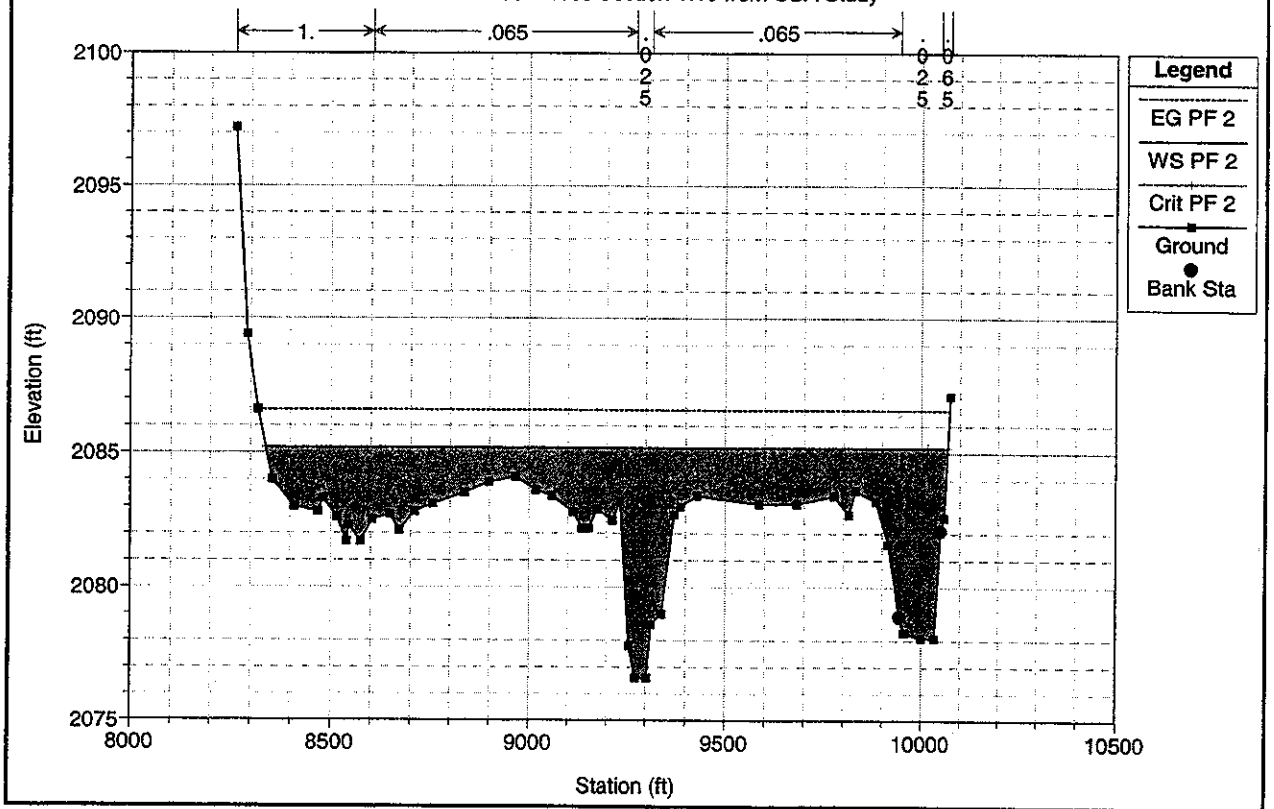
Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004

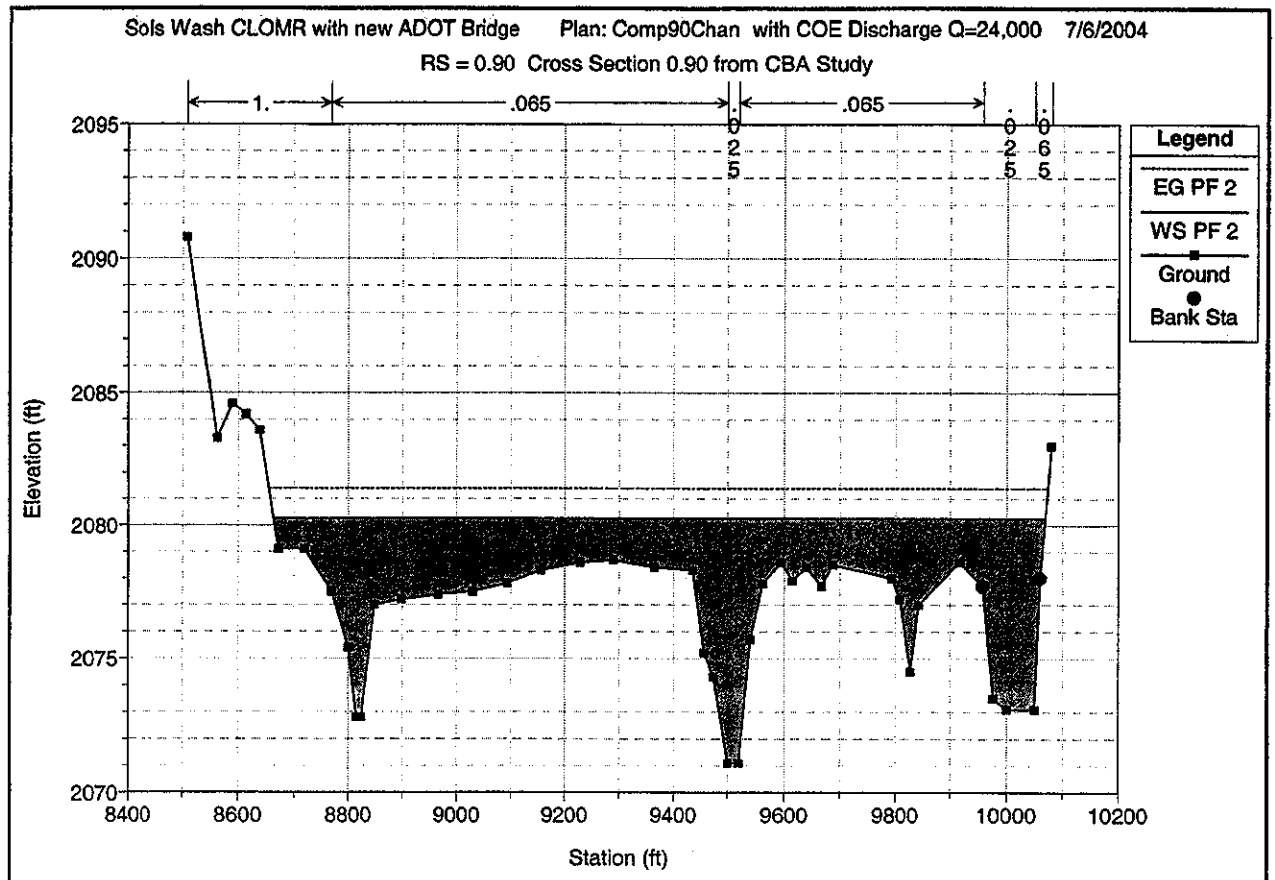
RS = 1.12 Cross Section 1.12 from CBA Study

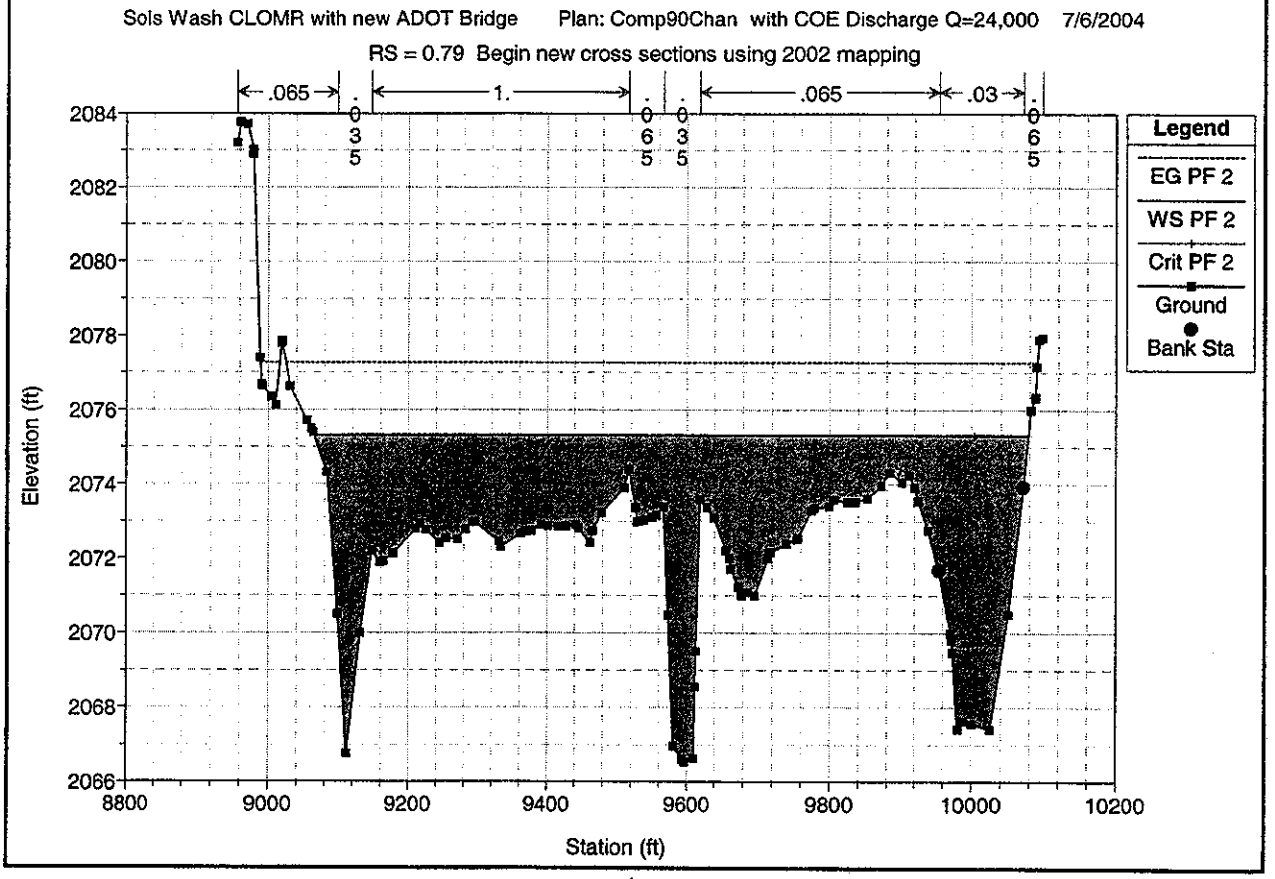


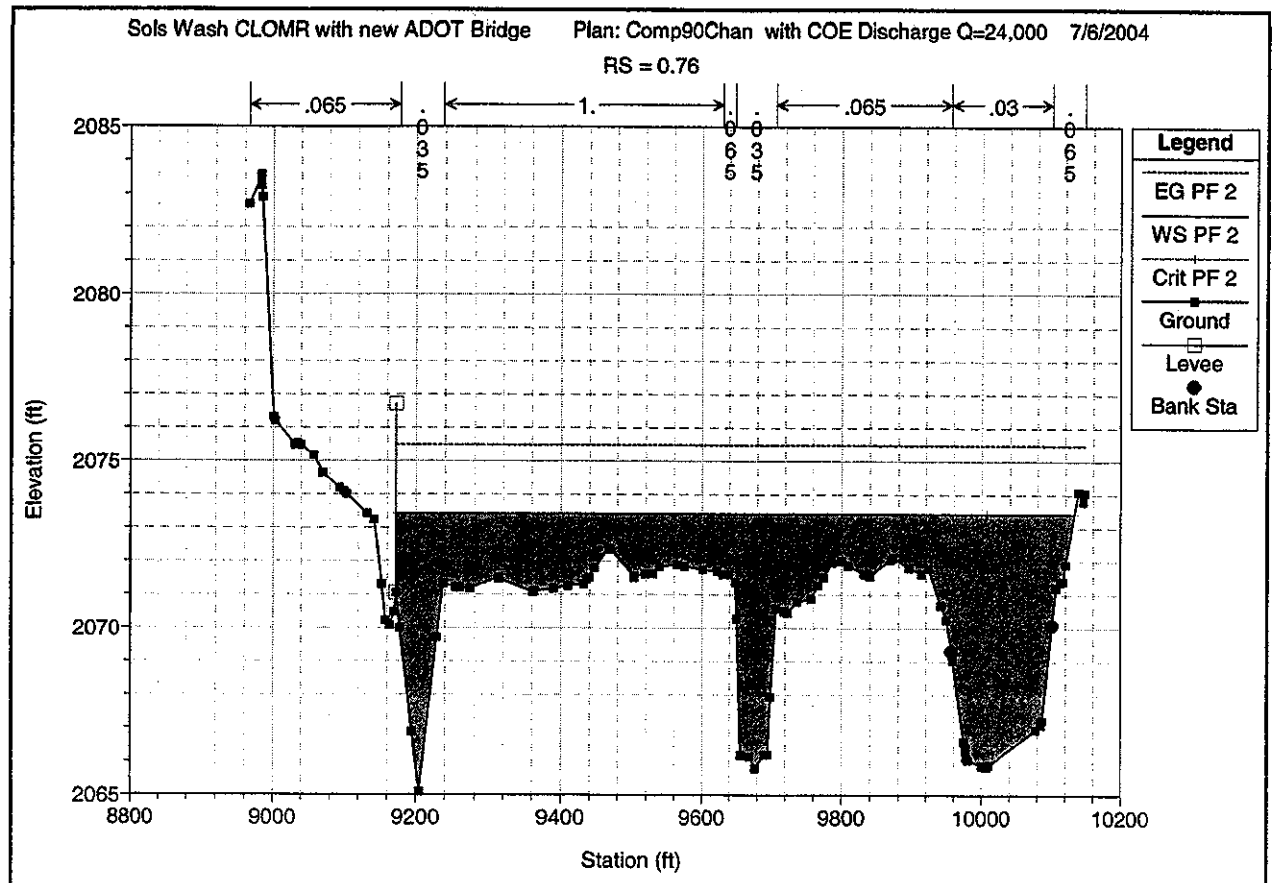
Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004

RS = 1.00 Cross Section 1.10 from CBA Study




Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.90 Cross Section 0.90 from CBA Study
1.
.065
.025
.065
.025
.065
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.79 Begin new cross sections using 2002 mapping
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
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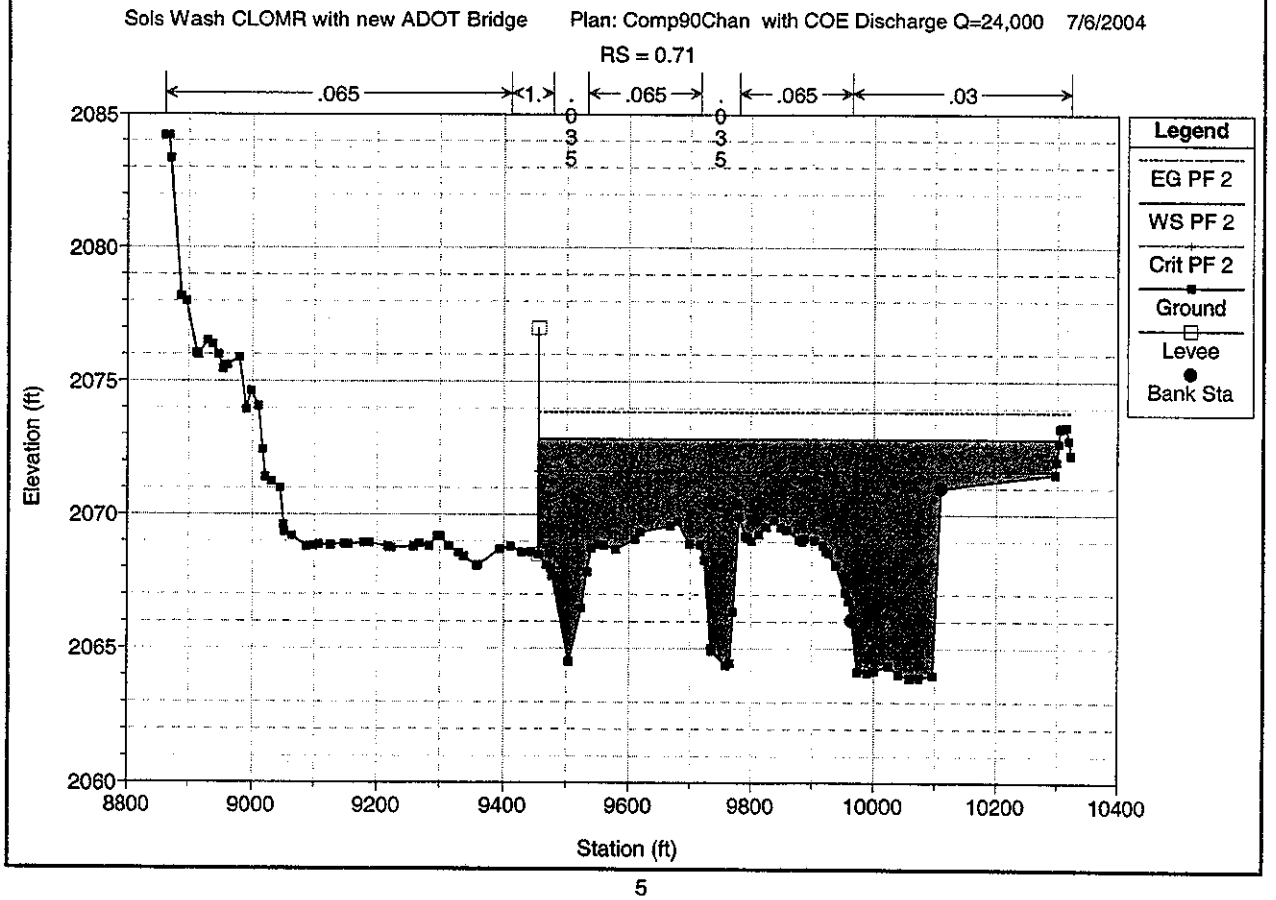
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
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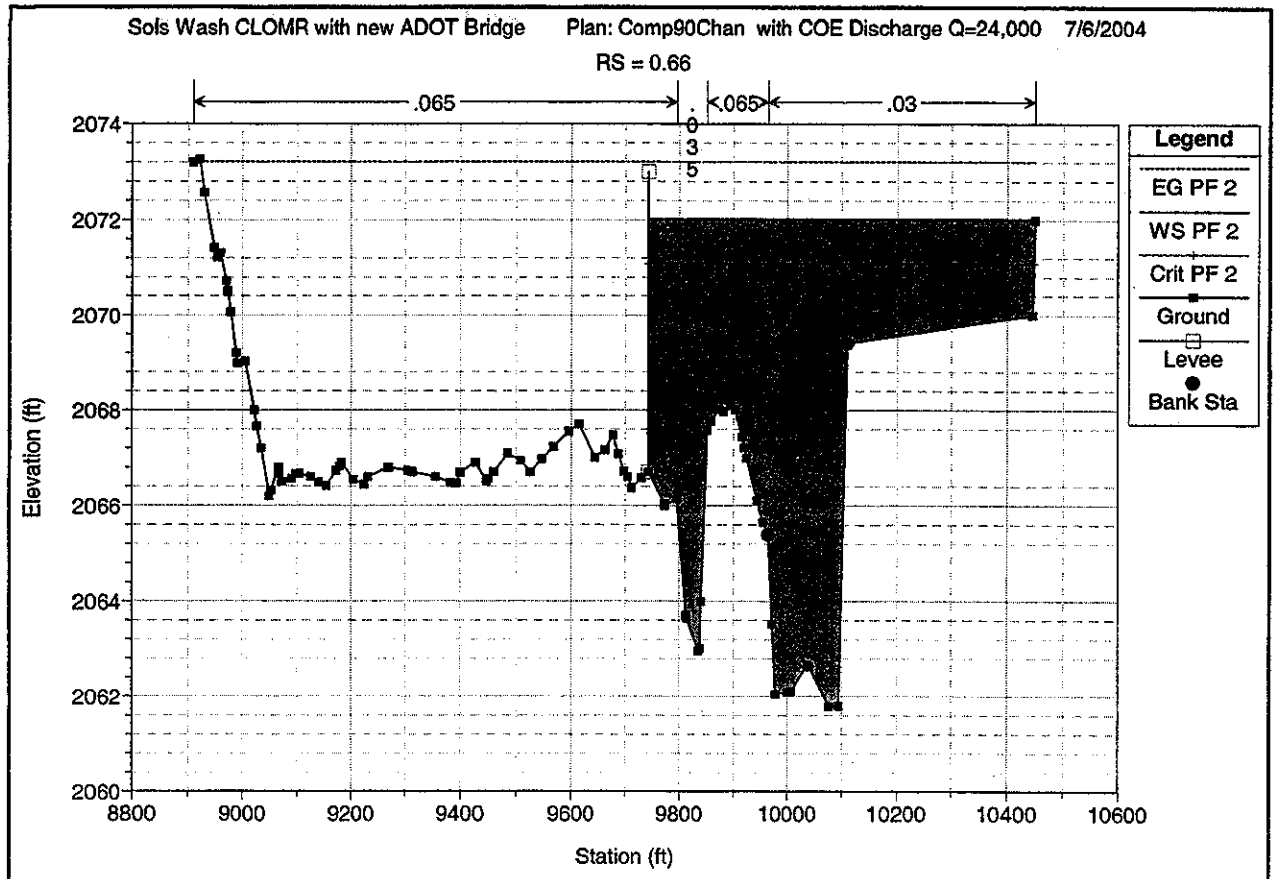
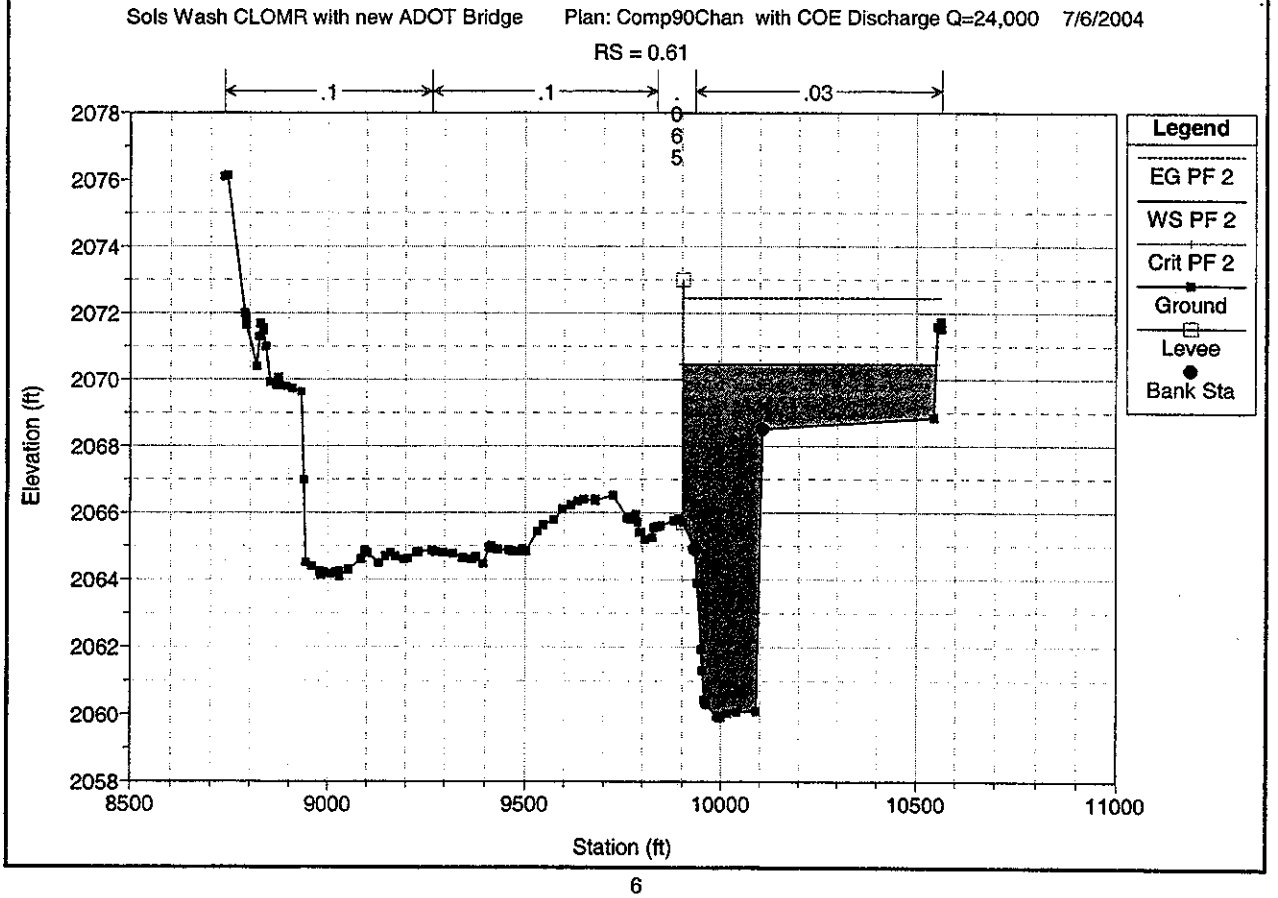
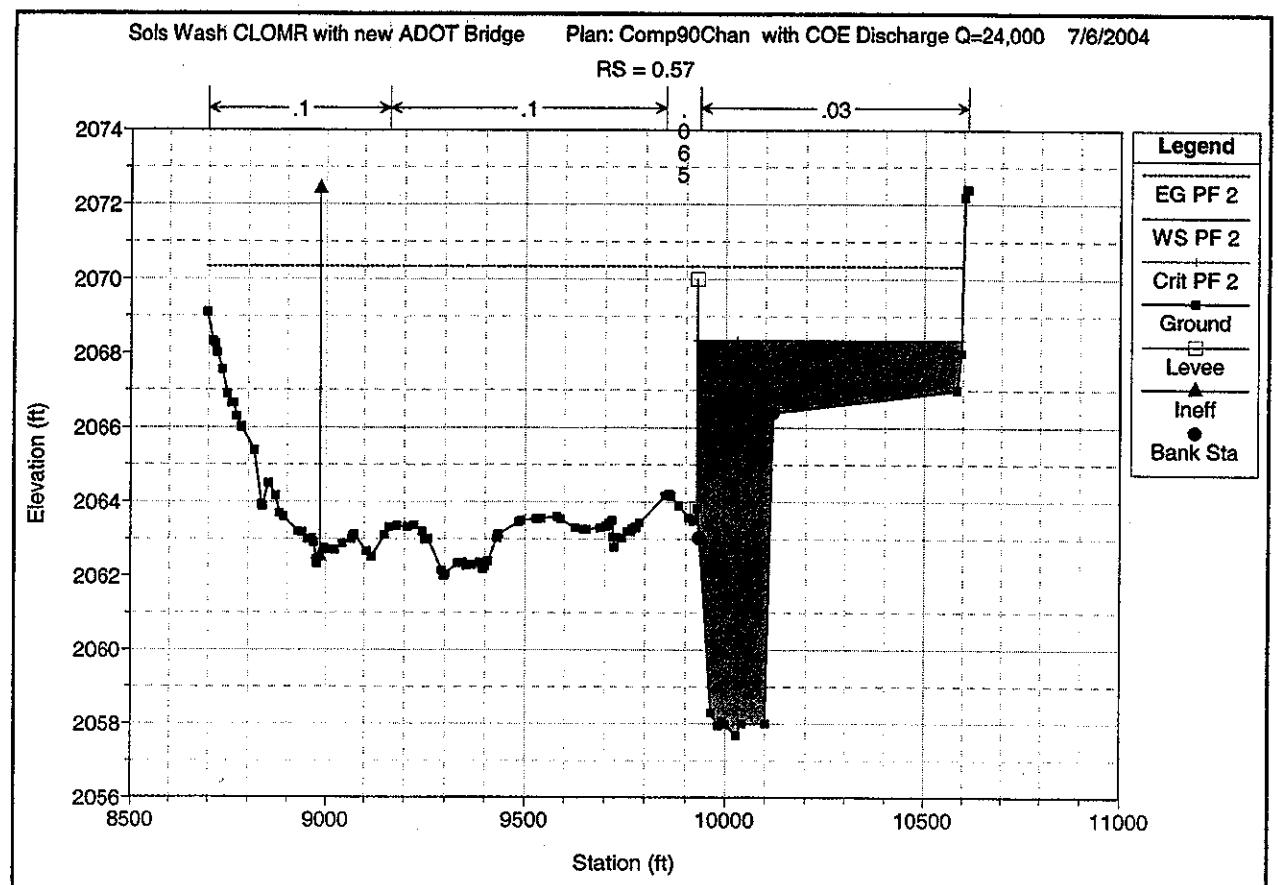
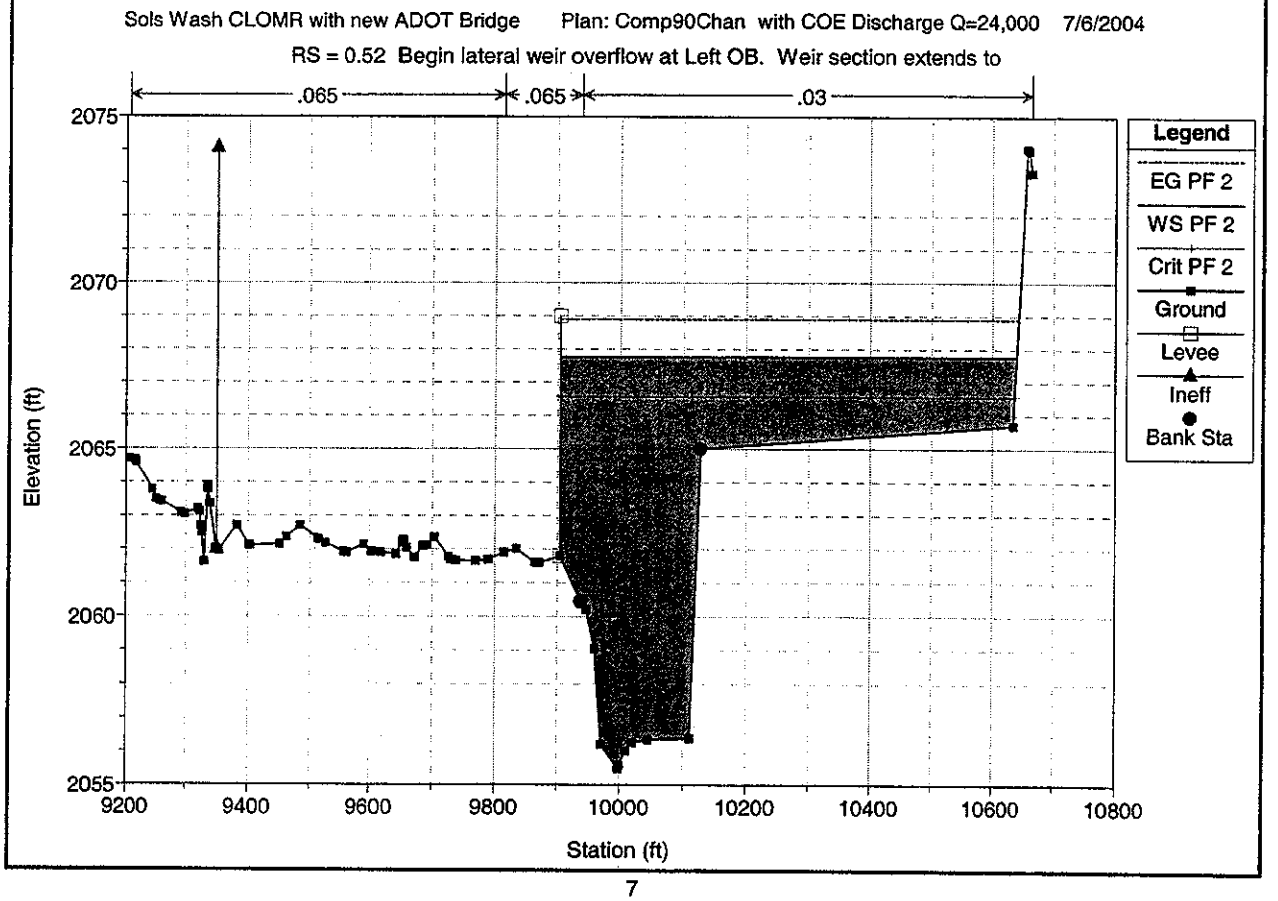
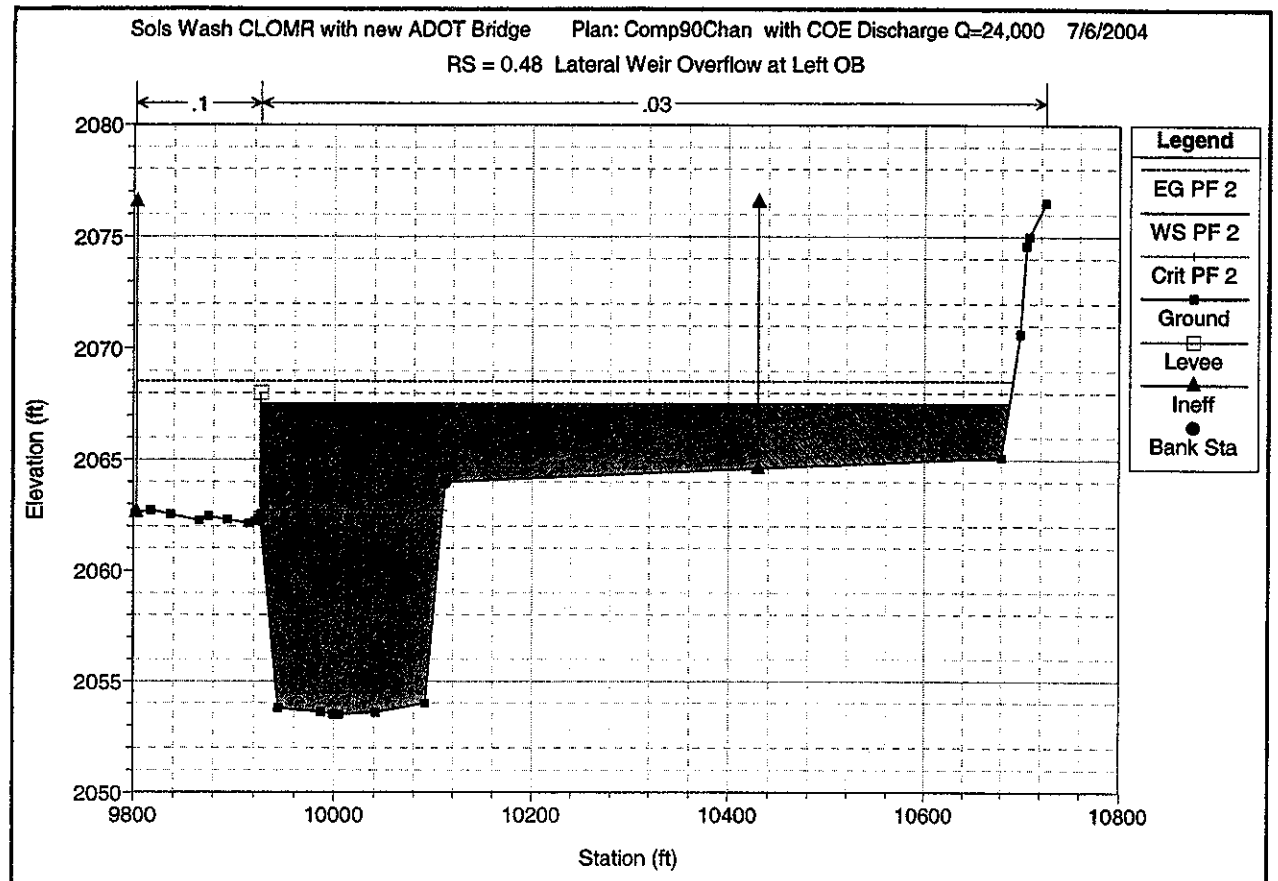
1.
.035
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

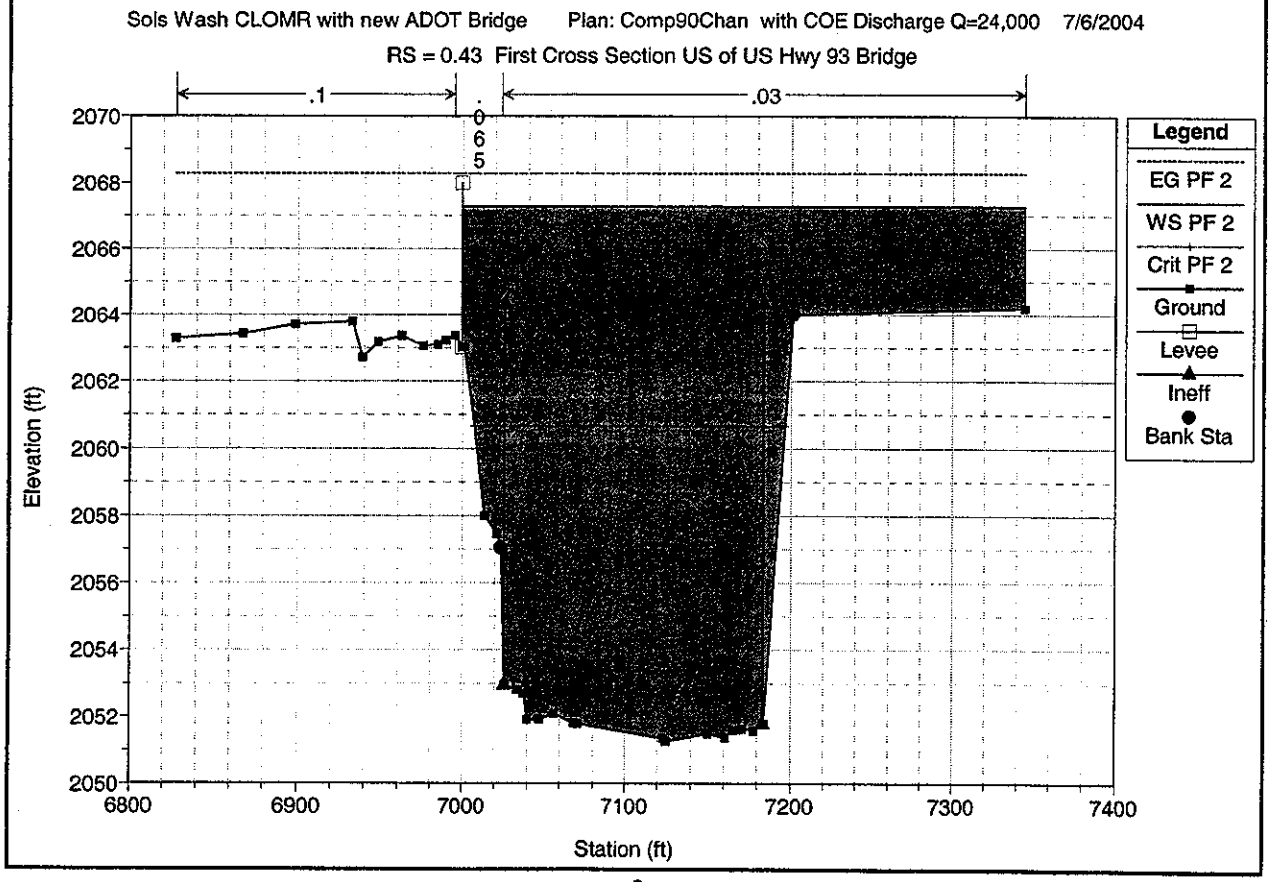

Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.66
.065
.065
.03
.035
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
10600

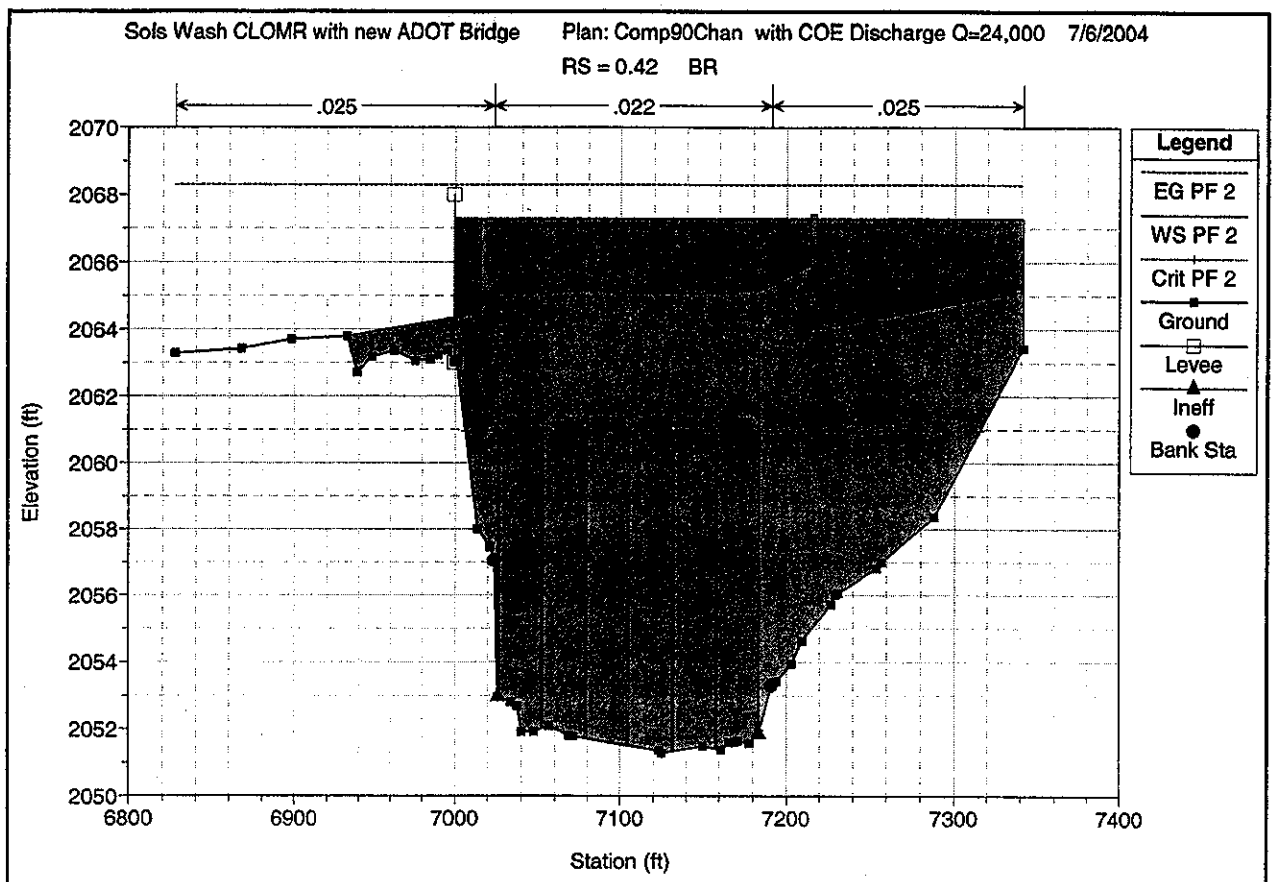

Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.61
.1
.1
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
2078
2076
2074
2072
2070
2068
2066
2064
2062
2060
2058
8500
9000
9500
10000
10500
11000

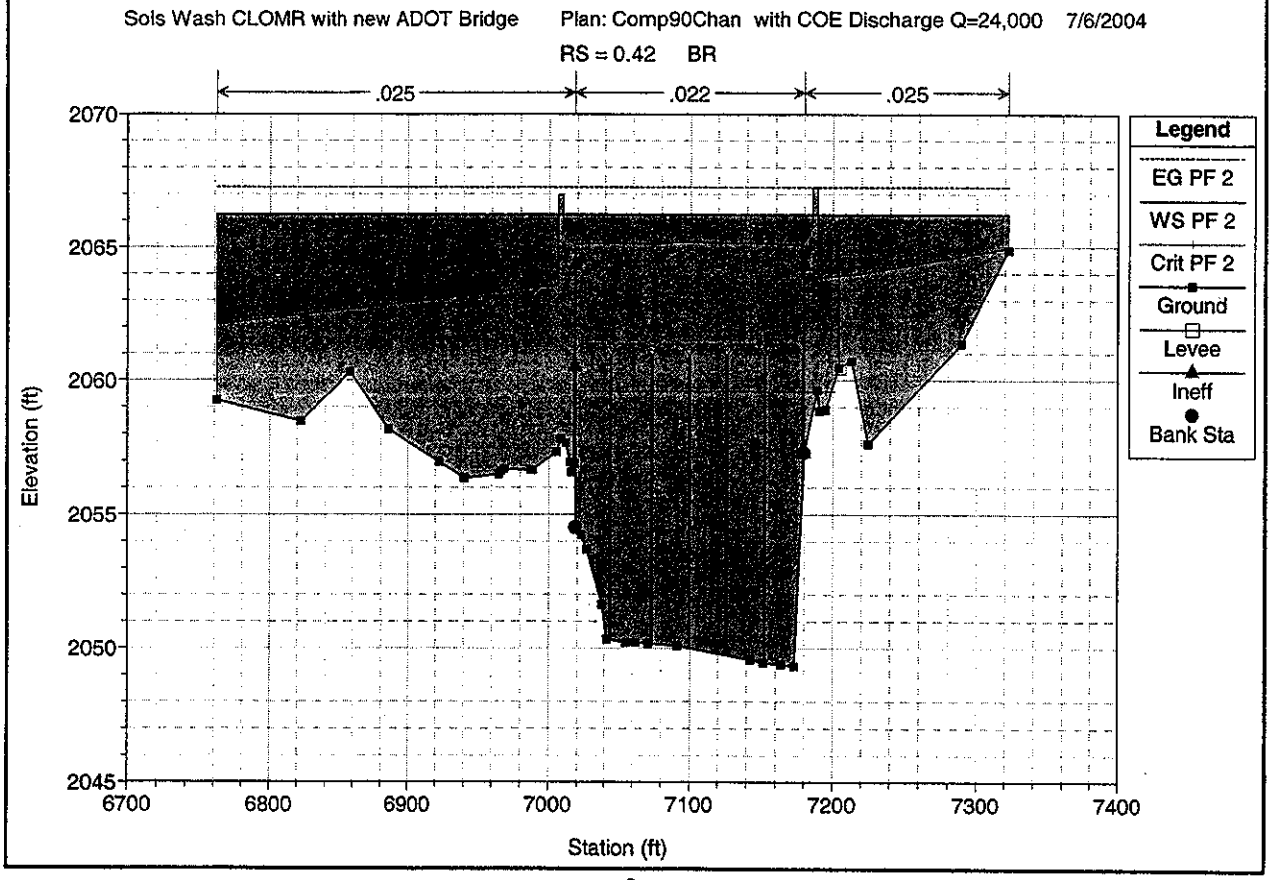

Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.57
.1
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
2058
2056
8500
9000
9500
10000
10500
11000

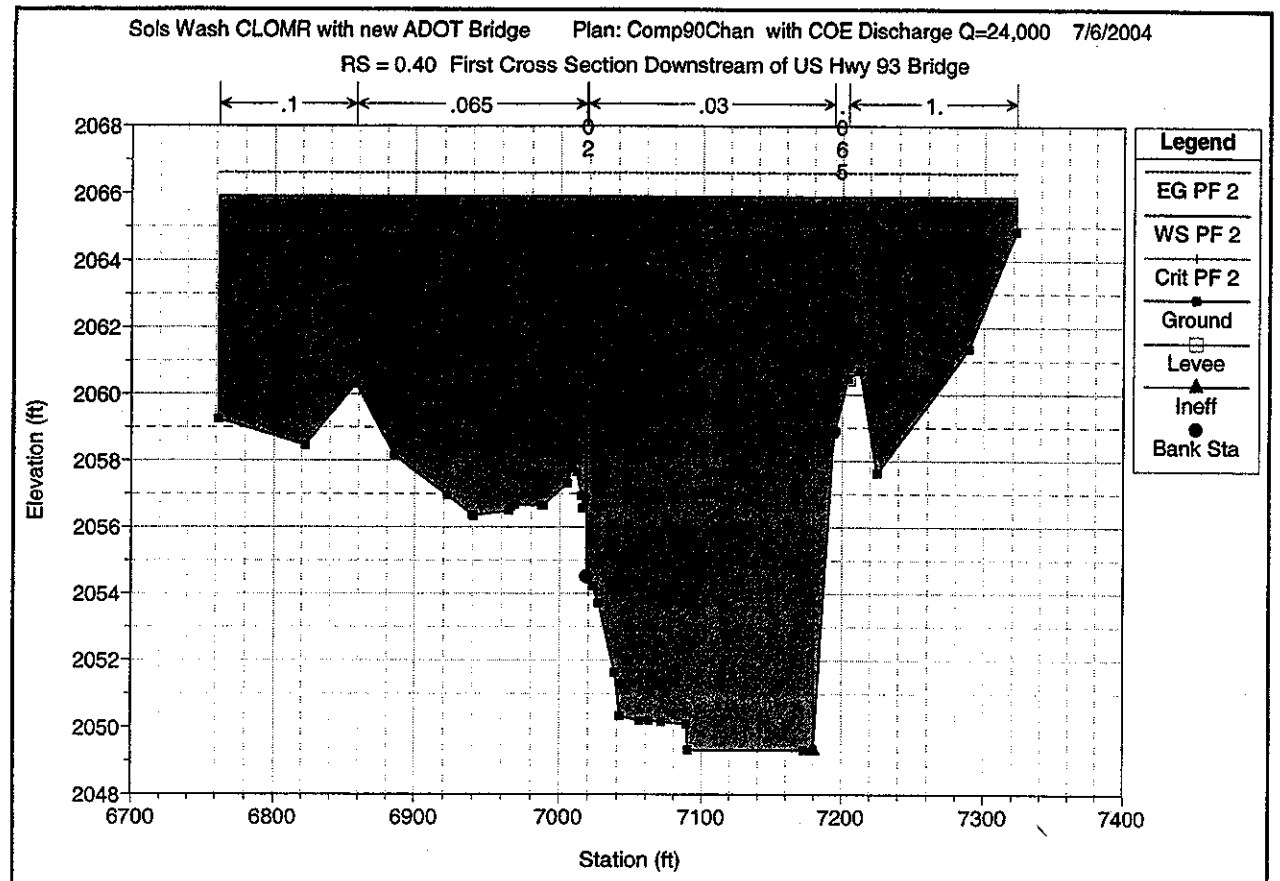

Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.52 Begin lateral weir overflow at Left OB. Weir section extends to
.065
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2075
2070
2065
2060
2055
9200
9400
9600
9800
10000
10200
10400
10600
10800

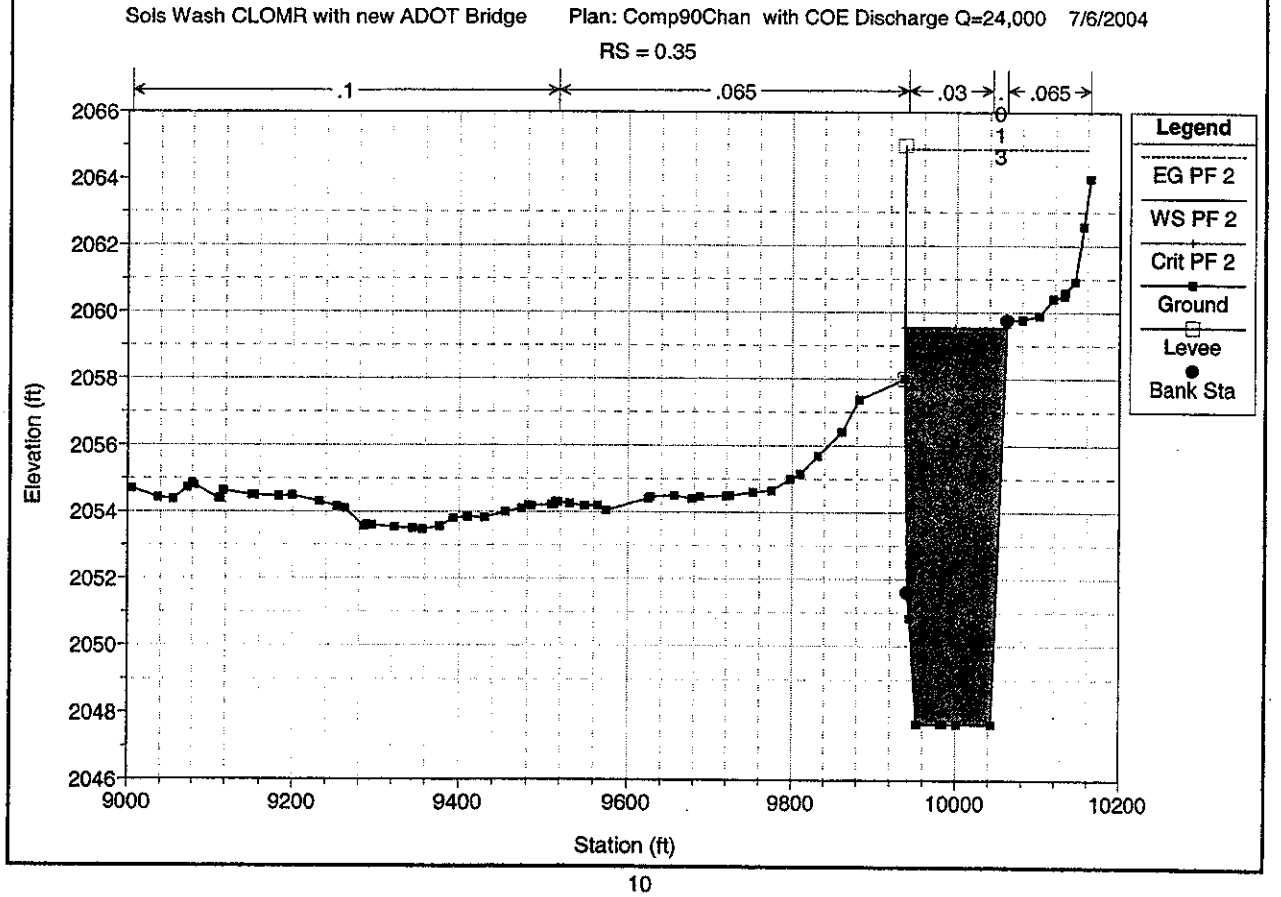

Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.48 Lateral Weir Overflow at Left OB
.1
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2080
2075
2070
2065
2060
2055
2050
9800
10000
10200
10400
10600
10800
Station (ft)

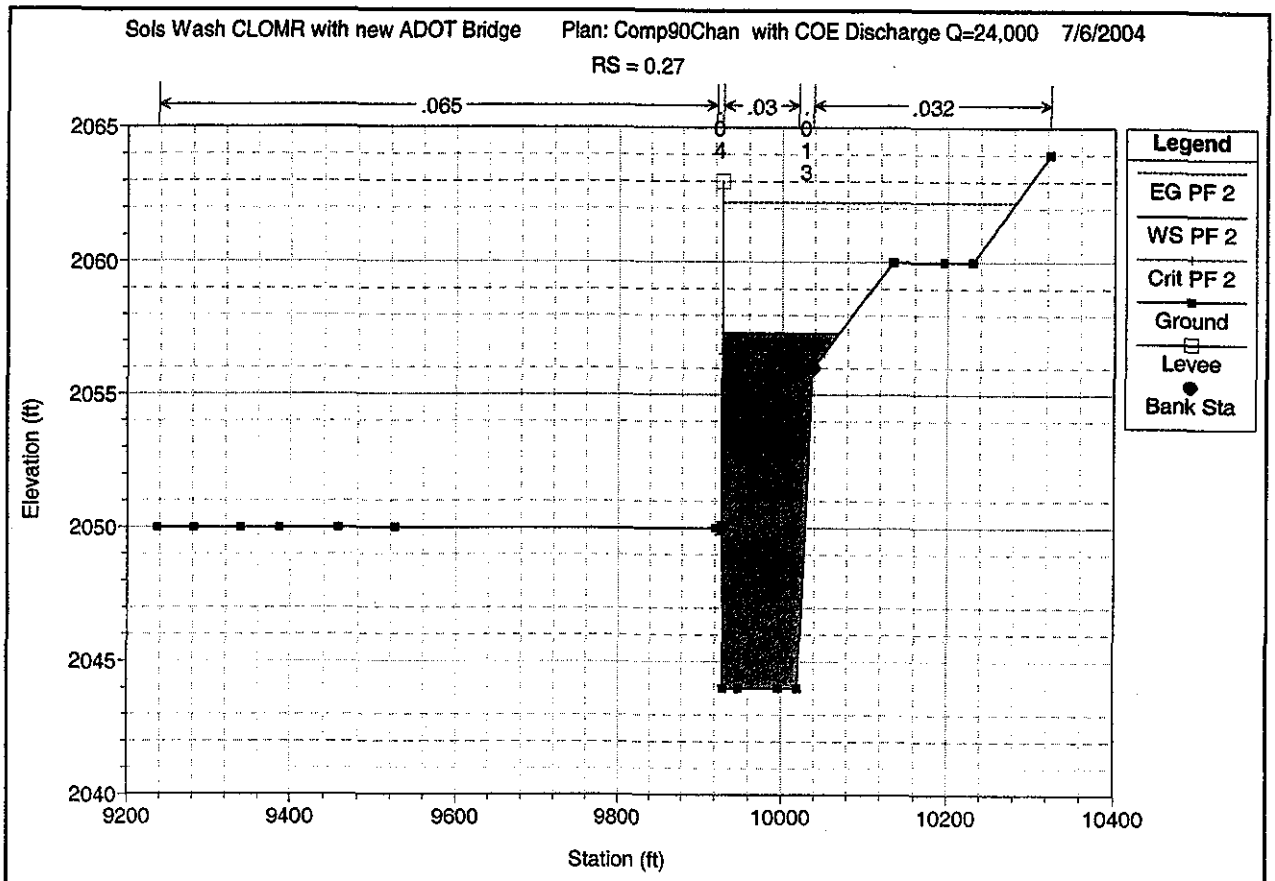

Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.43 First Cross Section US of US Hwy 93 Bridge
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2070
2068
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

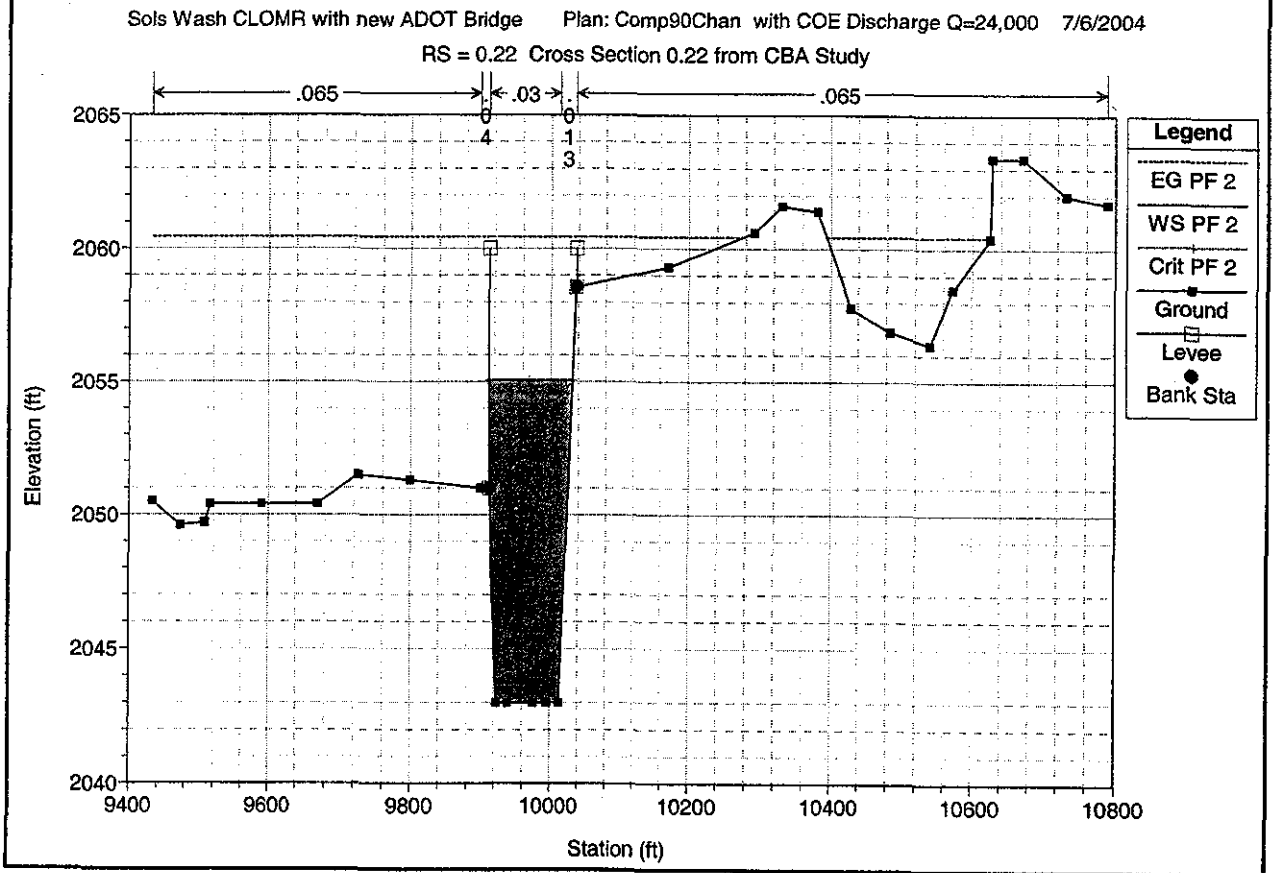

Sols Wash CLOMR with new ADOT Bridge
Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2070
2068
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

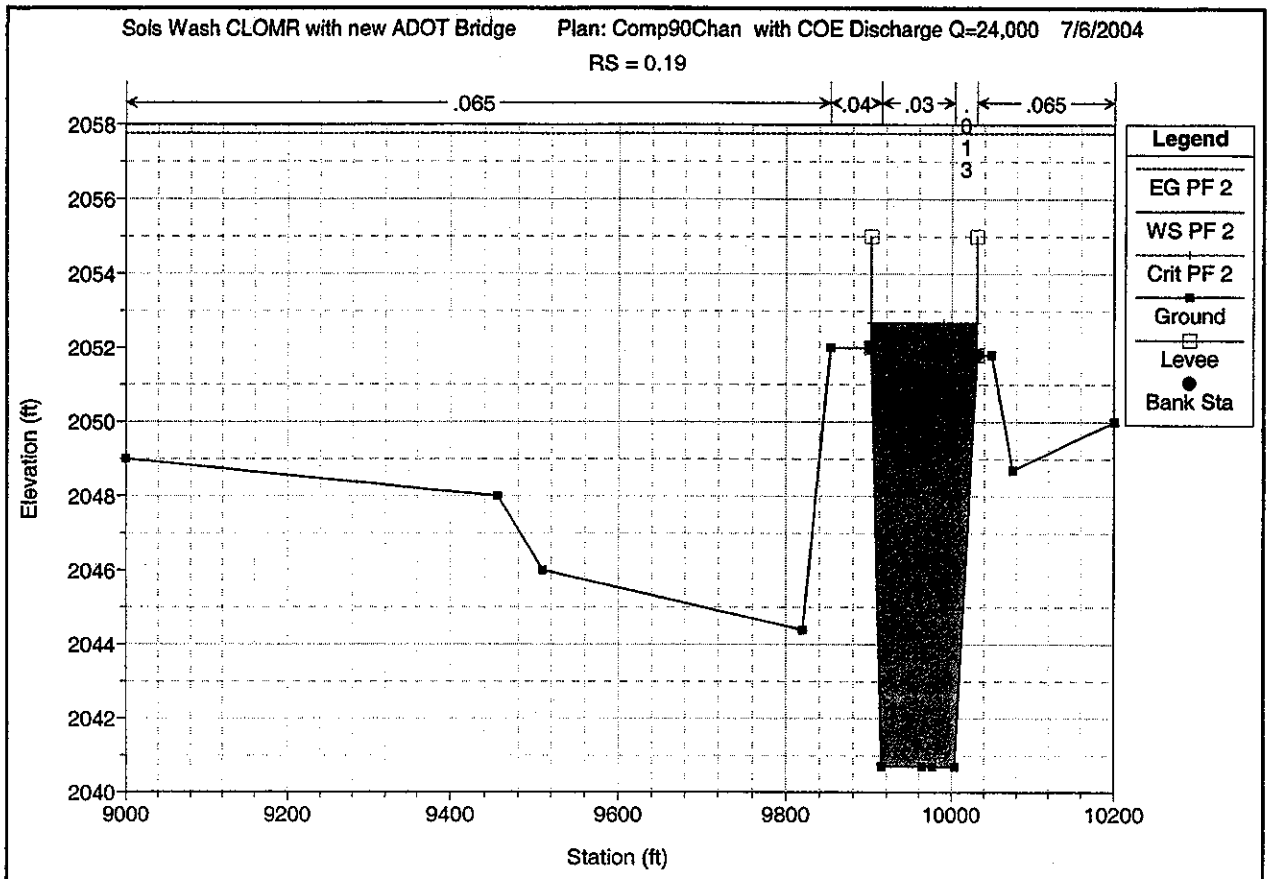

Sols Wash CLOMR with new ADOT Bridge
Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2070
2065
2060
2055
2050
2045
6700
6800
6900
7000
7100
7200
7300
7400
Station (ft)

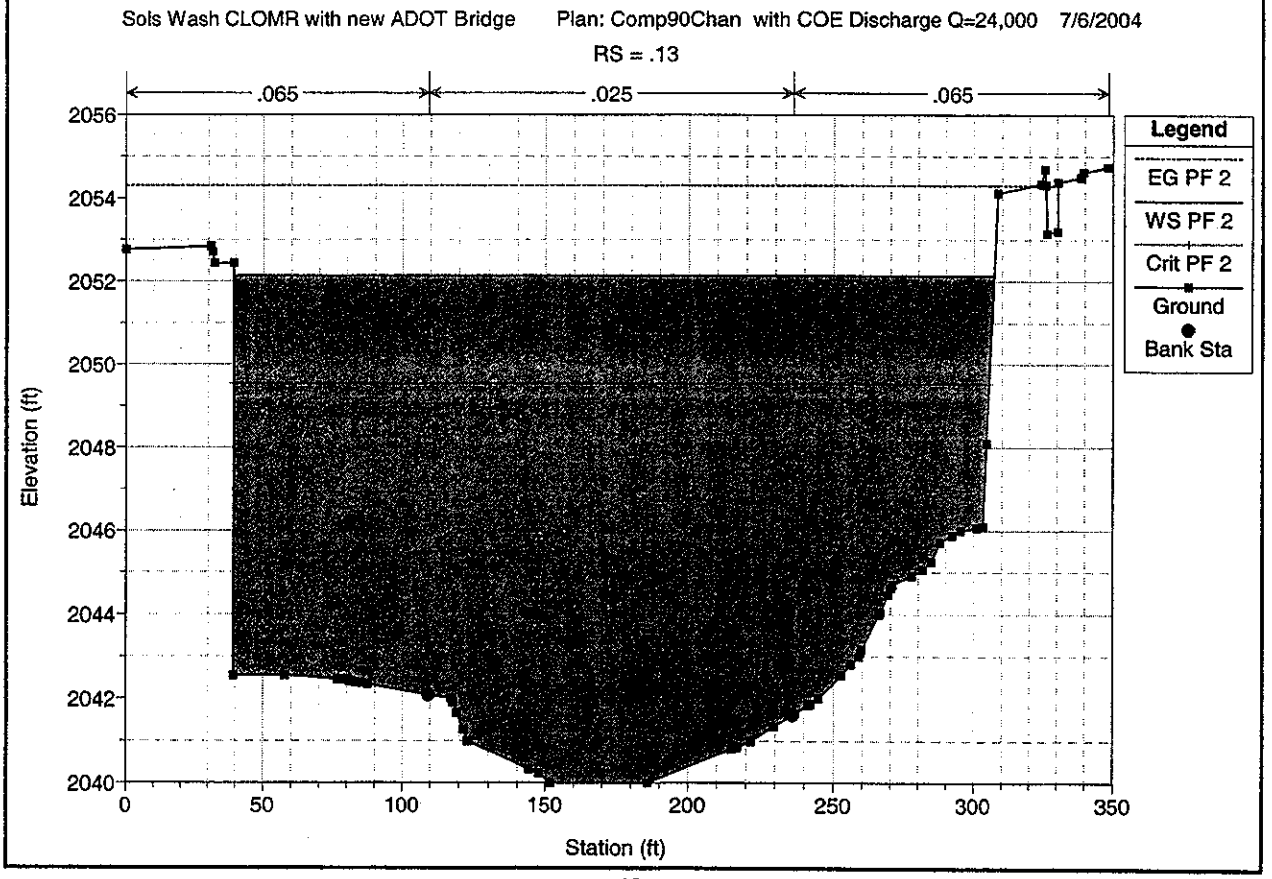

Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.40 First Cross Section Downstream of US Hwy 93 Bridge
.1
.065
.03
1.
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

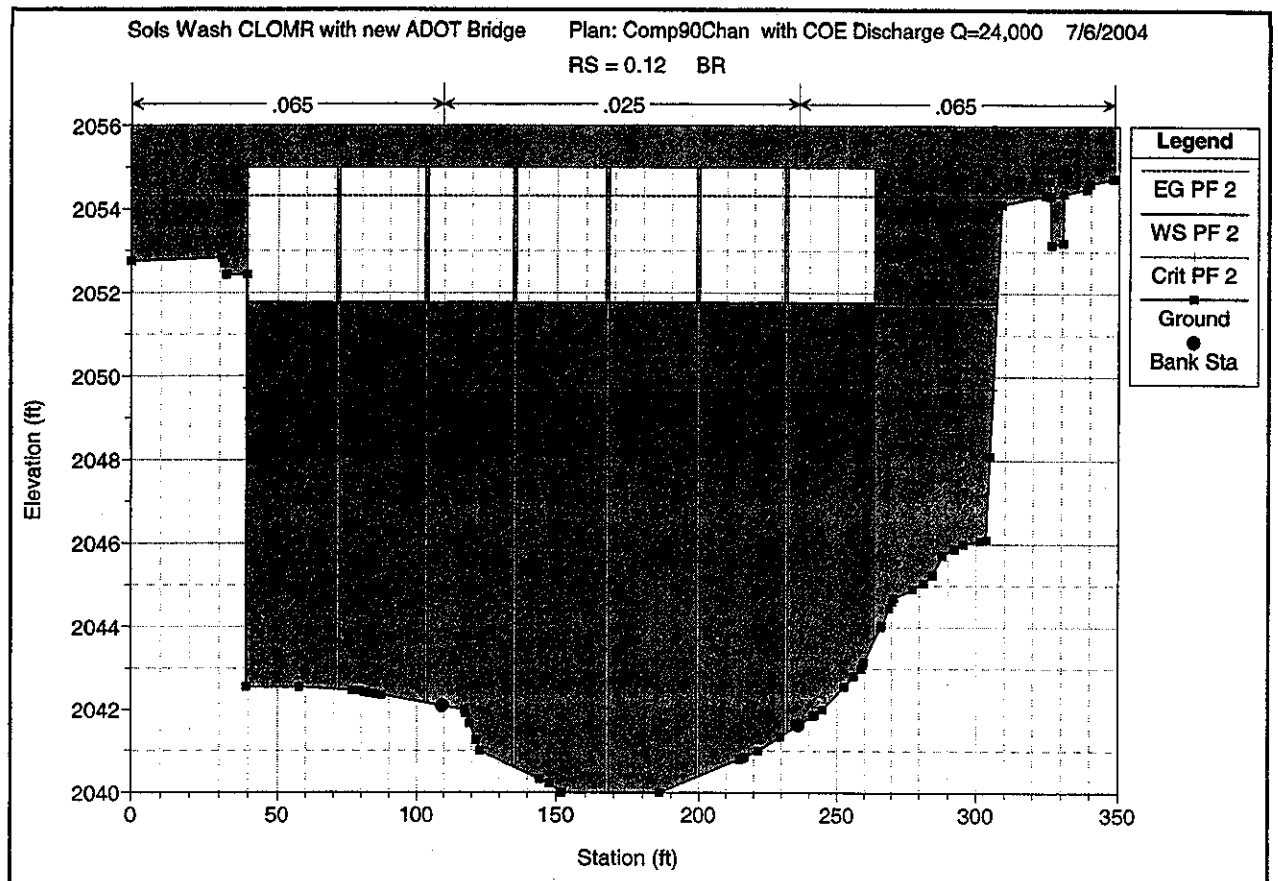

Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.35
.1
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

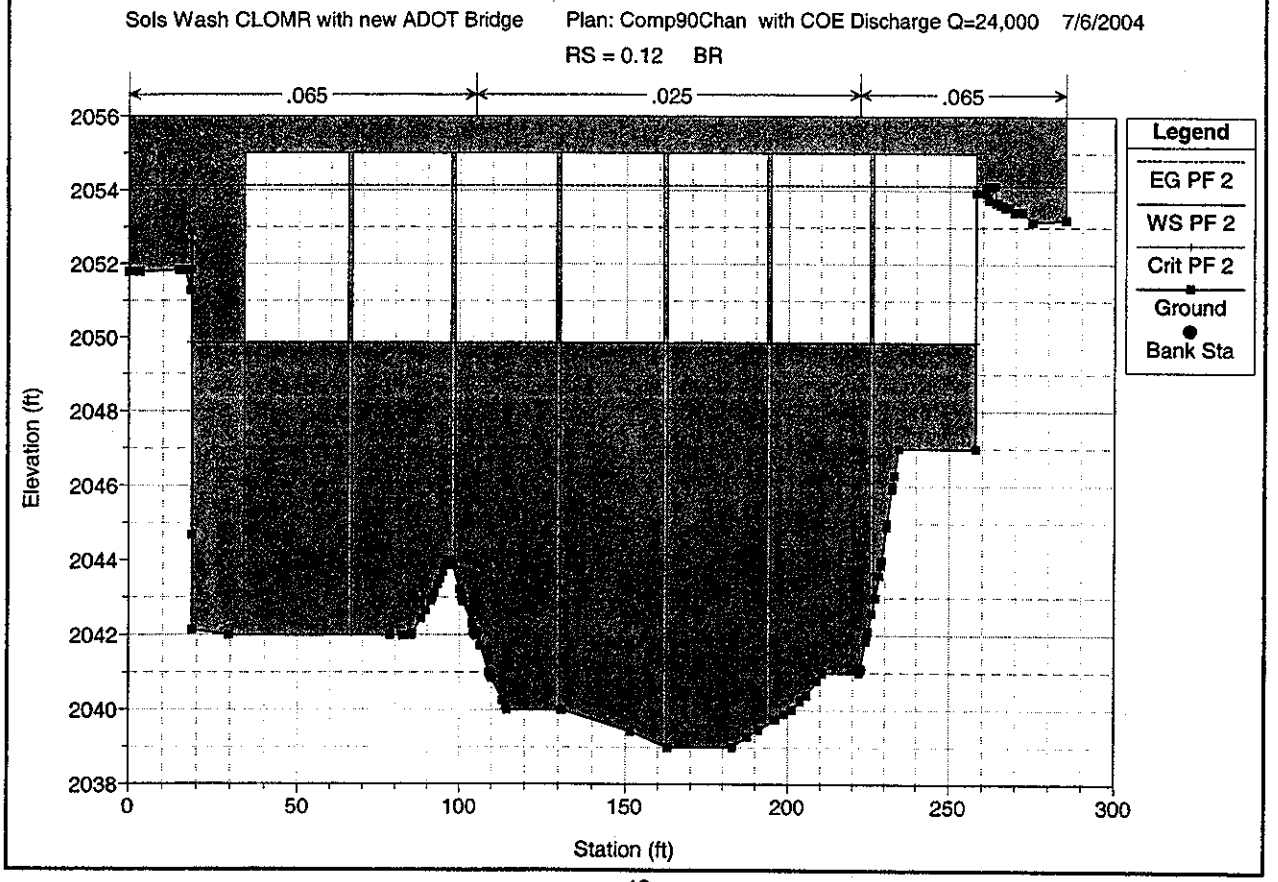

Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.27
.065
.03
.032
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

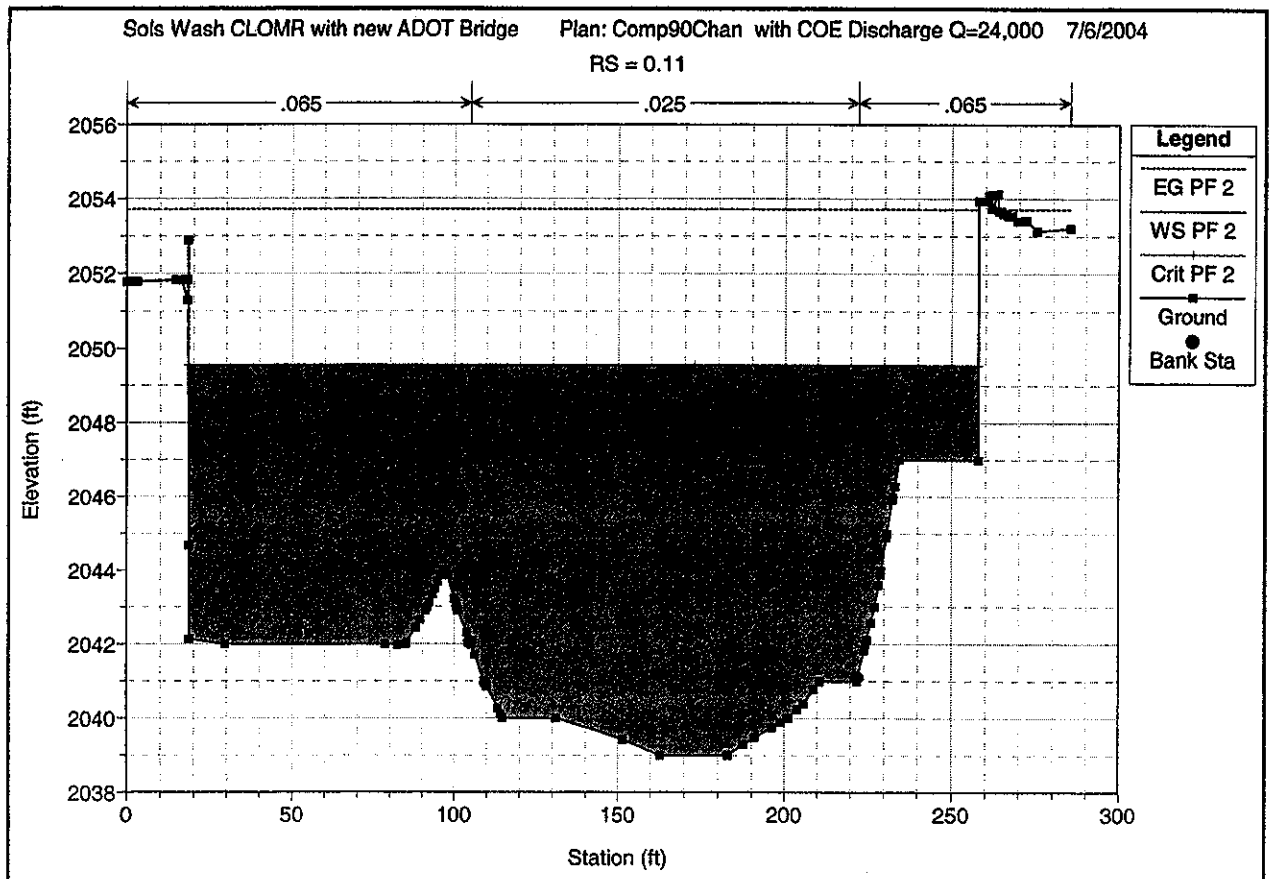

Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.22 Cross Section 0.22 from CBA Study
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

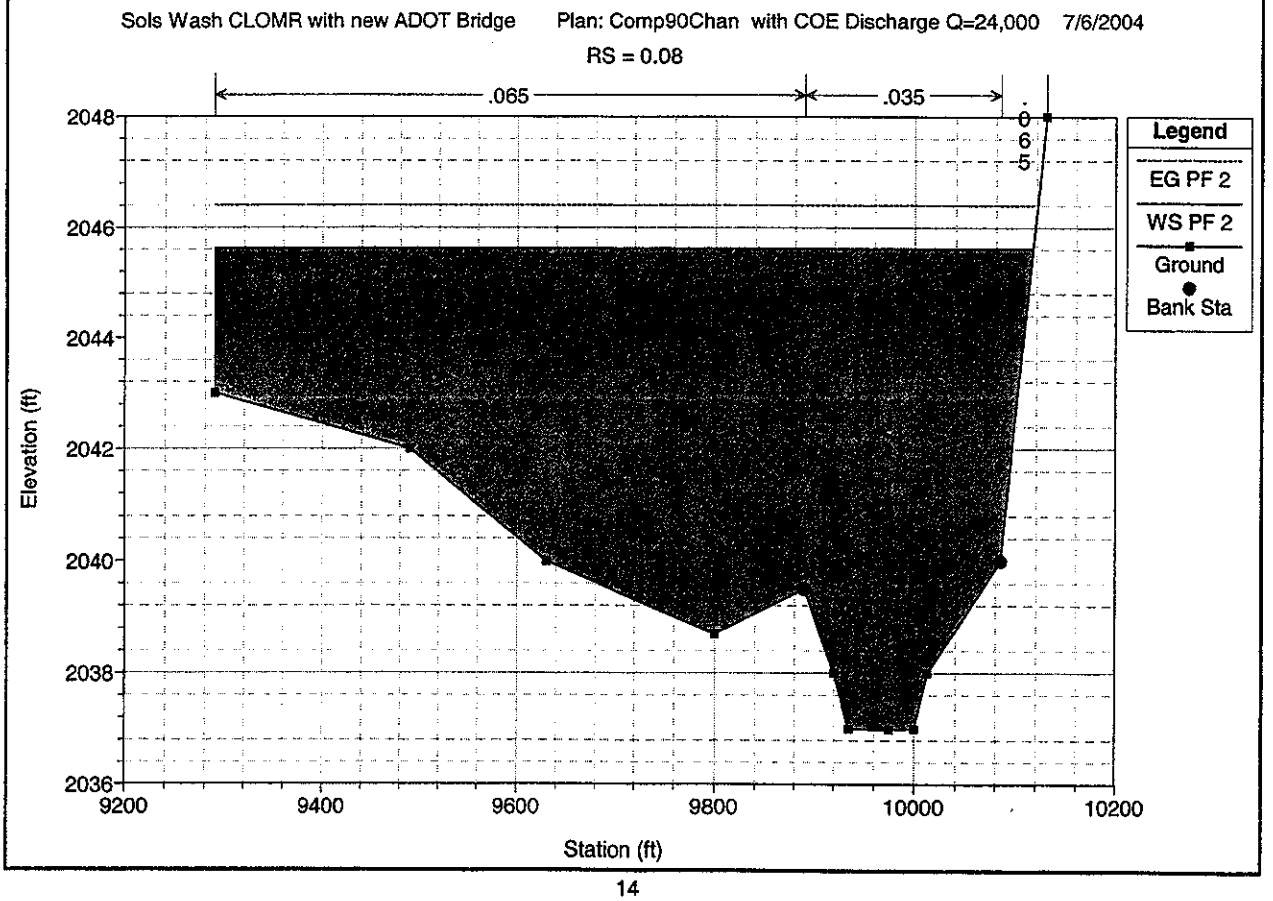

Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.19
.065
.04
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

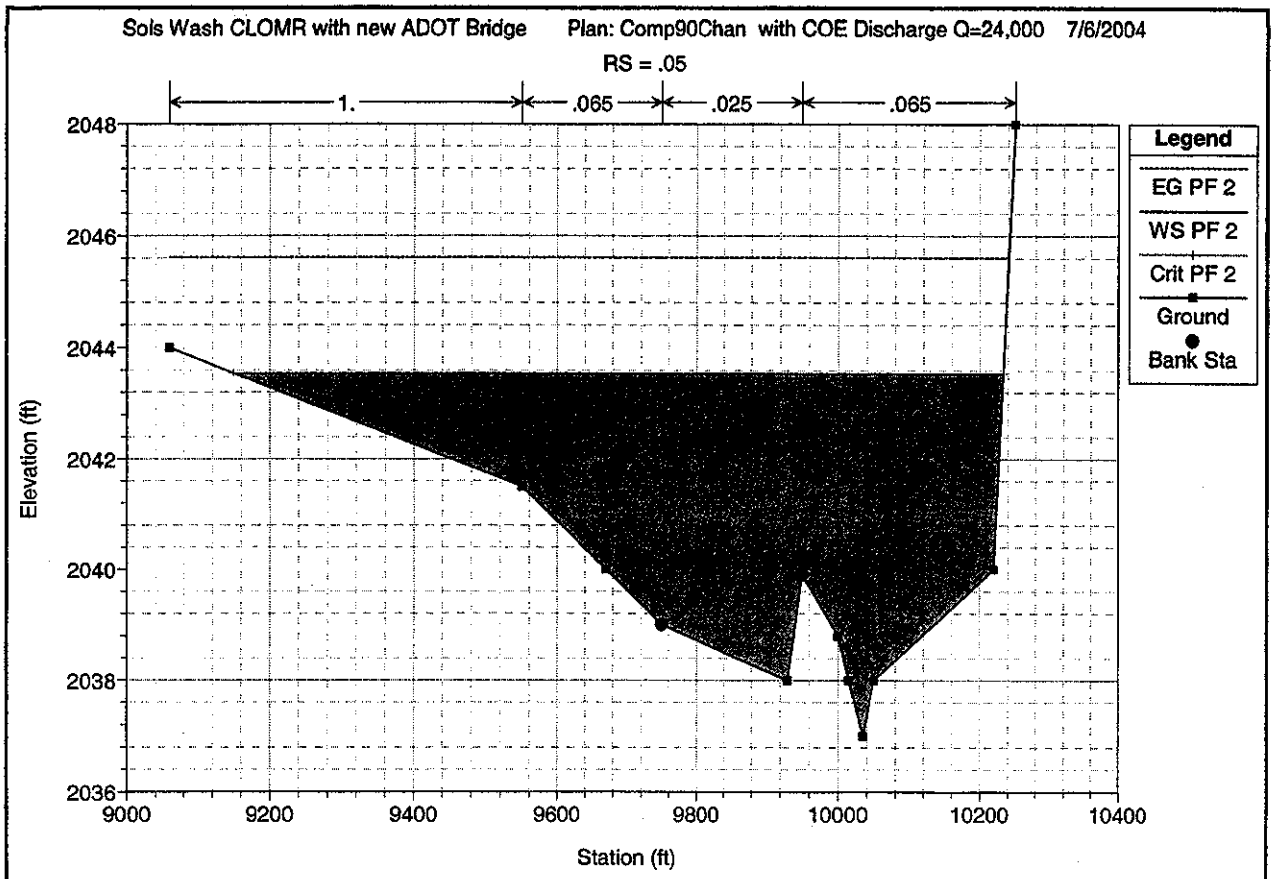

Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = .13
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

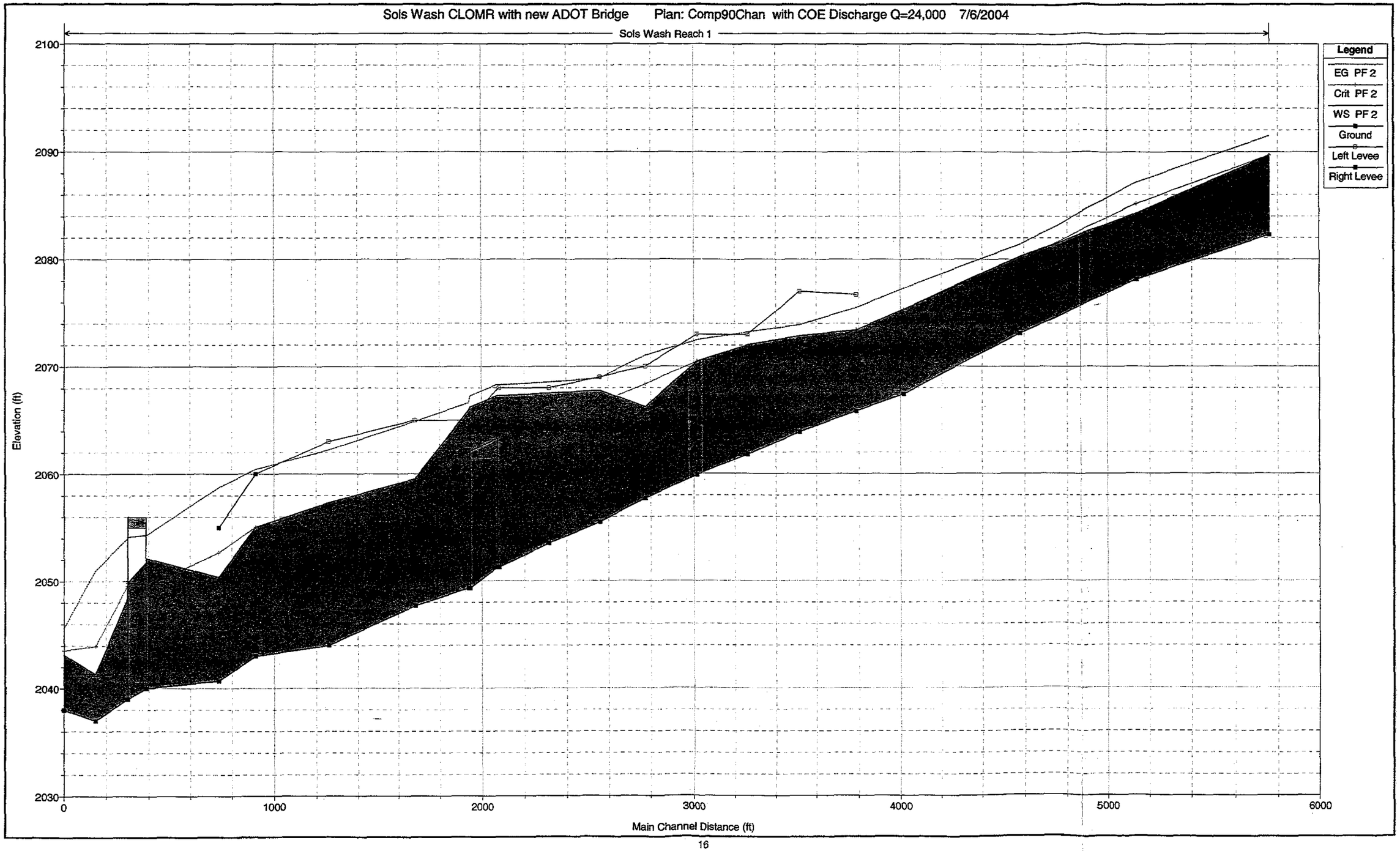

Sols Wash CLOMR with new ADOT Bridge
Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.11
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
2038
0
50
100
150
200
250
300
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = 0.08
.065
.035
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9200
9400
9600
9800
10000
10200
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
RS = .05
1.
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp90Chan with COE Discharge Q=24,000 7/6/2004
Sols Wash Reach 1
Legend
EG PF 2
Crit PF 2
WS PF 2
Ground
Left Levee
Right Levee
Elevation (ft)
2100
2090
2080
2070
2060
2050
2040
2030
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)

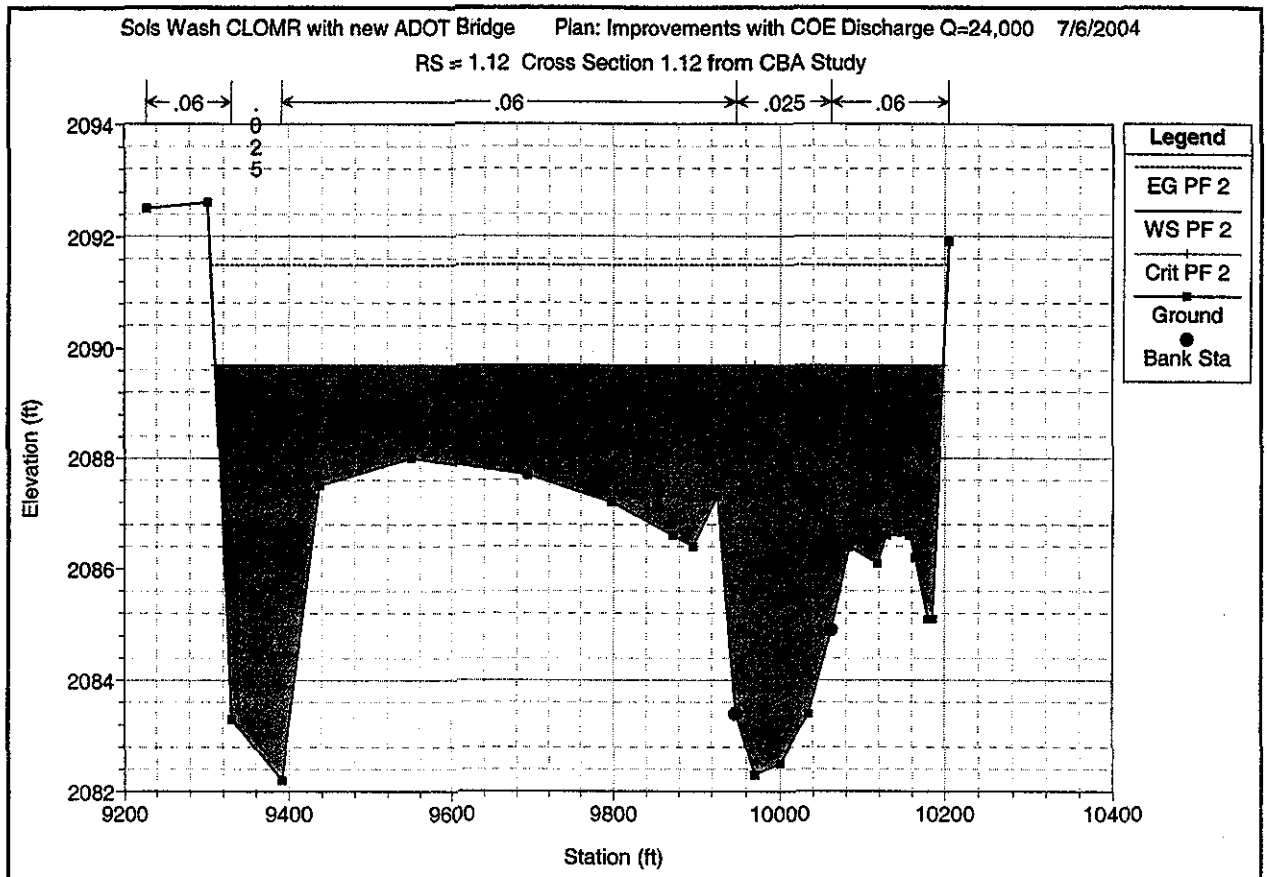
HEC-RAS Plan: Improv Q=24K River: Sols Wash Reach: Reach 1 , Profile: PF 2

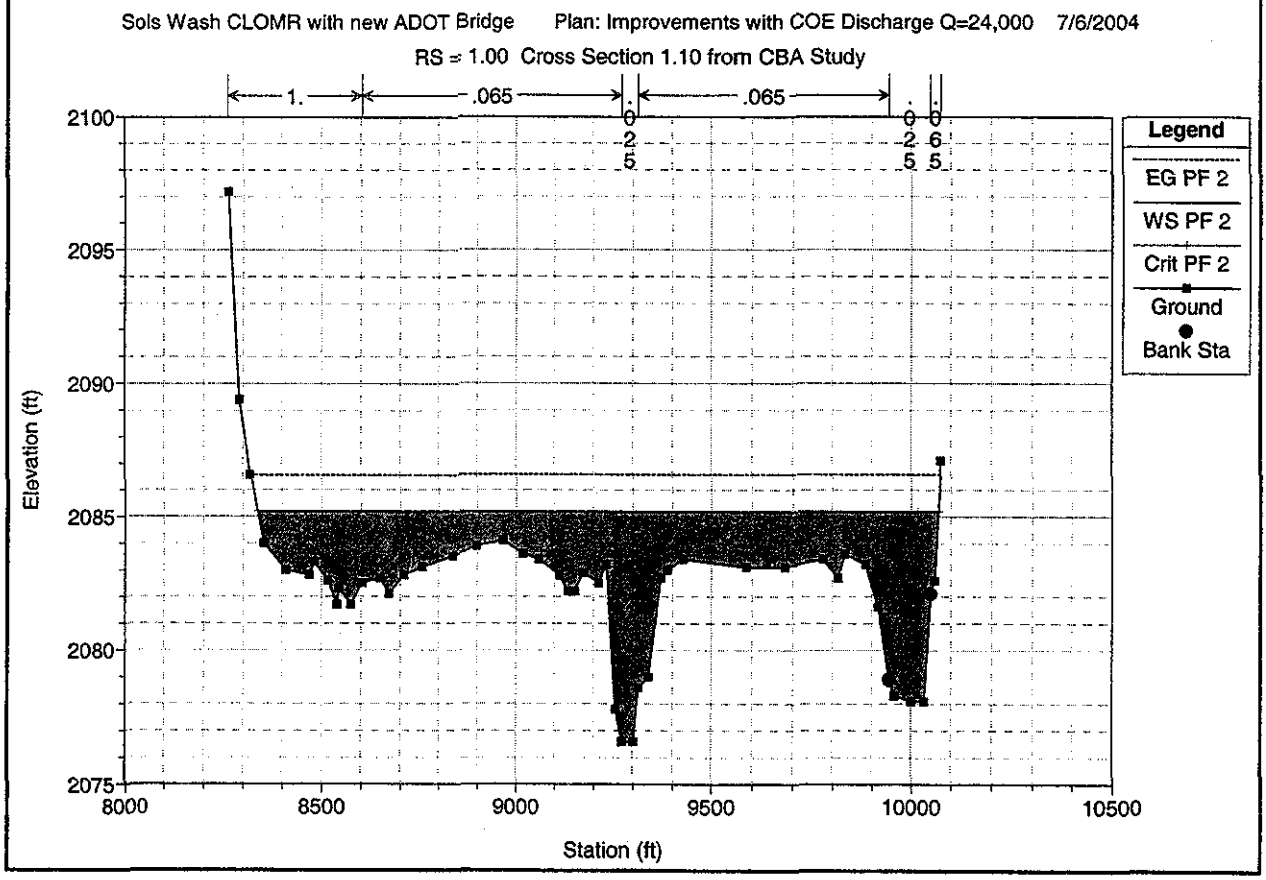
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.02	PF 2	24000.00	2082.30	2089.67	2089.67	2091.49	0.004969	14.74	3097.00	888.01	1.01
Reach 1	1.00	PF 2	24000.00	2078.10	2085.19	2085.19	2086.59	0.004551	14.15	4755.13	1730.14	0.97
Reach 1	0.90	PF 2	24000.00	2073.10	2080.27		2081.40	0.006103	13.07	4287.70	1405.92	0.91
Reach 1	0.79	PF 2	24000.00	2067.42	2075.32	2075.31	2077.27	0.009018	15.60	3290.55	1013.27	1.11
Reach 1	0.76	PF 2	24000.00	2065.84	2073.42	2073.42	2075.49	0.006941	14.54	3012.53	960.34	0.99
Reach 1	0.71	PF 2	24000.00	2063.89	2072.85	2071.63	2073.87	0.002600	10.34	3852.07	850.80	0.63
Reach 1	0.65	PF 2	24000.00	2061.79	2072.02	2071.08	2073.21	0.002392	10.64	3420.39	706.81	0.61
Reach 1	0.61	PF 2	24000.00	2059.91	2070.46	2070.46	2072.46	0.003033	12.21	2606.65	646.89	0.69
Reach 1	0.57	PF 2	24000.00	2057.69	2068.35	2068.35	2070.34	0.002954	12.01	2559.87	668.06	0.69
Reach 1	0.52	PF 2	24000.00	2055.50	2066.57	2066.57	2068.59	0.002999	12.03	2585.64	732.81	0.69
Reach 1	0.48	PF 2	24000.00	2053.51	2066.02	2062.72	2067.67	0.001871	10.65	2641.78	756.21	0.56
Reach 1	0.43	PF 2	24000.00	2051.27	2065.70	2060.67	2067.11	0.001278	9.73	2751.60	345.58	0.47
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	24000.00	2049.33	2059.30	2059.30	2063.71	0.006545	16.85	1425.00	212.20	1.00
Reach 1	0.35	PF 2	24000.00	2047.68	2058.00	2058.00	2059.90	0.004031	13.99	4478.46	1053.67	0.80
Reach 1	0.25	PF 2	24000.00	2044.00	2056.84		2057.42	0.001237	8.67	5937.83	821.43	0.46
Reach 1	0.21	PF 2	24000.00	2043.00	2054.31	2054.31	2056.59	0.005597	14.09	2909.25	599.22	0.82
Reach 1	0.19	PF 2	24000.00	2040.69	2054.58		2054.79	0.000492	5.04	9297.06	1200.00	0.25
Reach 1	0.13	PF 2	24000.00	2040.00	2052.14	2049.54	2054.31	0.001866	13.09	2693.00	267.78	0.68
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	24000.00	2039.00	2049.55	2049.55	2053.72	0.004315	17.73	1900.66	239.51	1.00
Reach 1	0.08	PF 2	24000.00	2036.99	2045.62		2046.40	0.003034	8.99	4484.47	826.62	0.58
Reach 1	0.05	PF 2	24000.00	2038.00	2043.55	2043.55	2045.62	0.006886	14.42	3364.66	1084.32	1.14

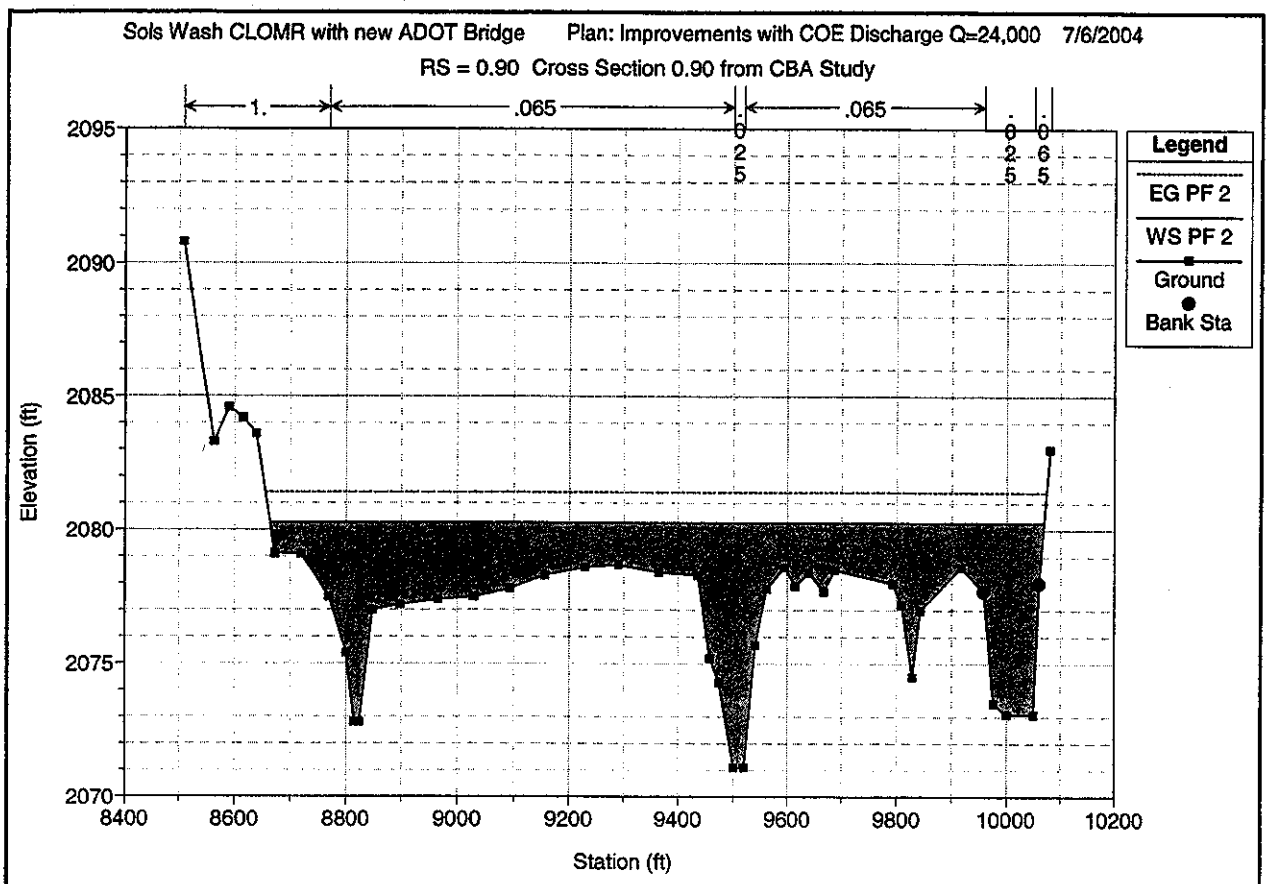
IMPROVEMENTS WEST OF TEGNER WITH
COE Q_{100} = 24,000 CFS
MODEL II Modified

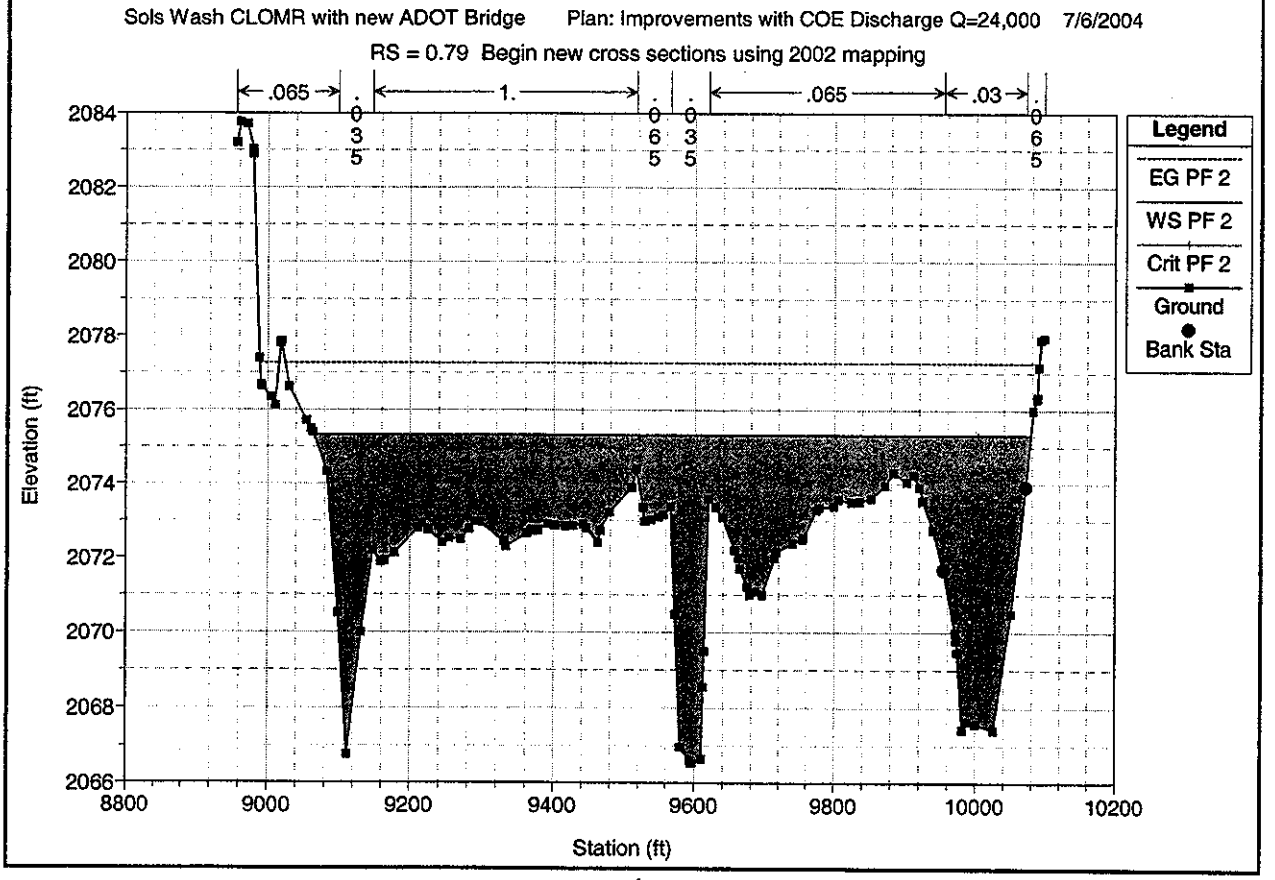
HEC-RAS Plan: Improv Q=24K River: Sols Wash Reach: Reach 1 Profile: PF 2

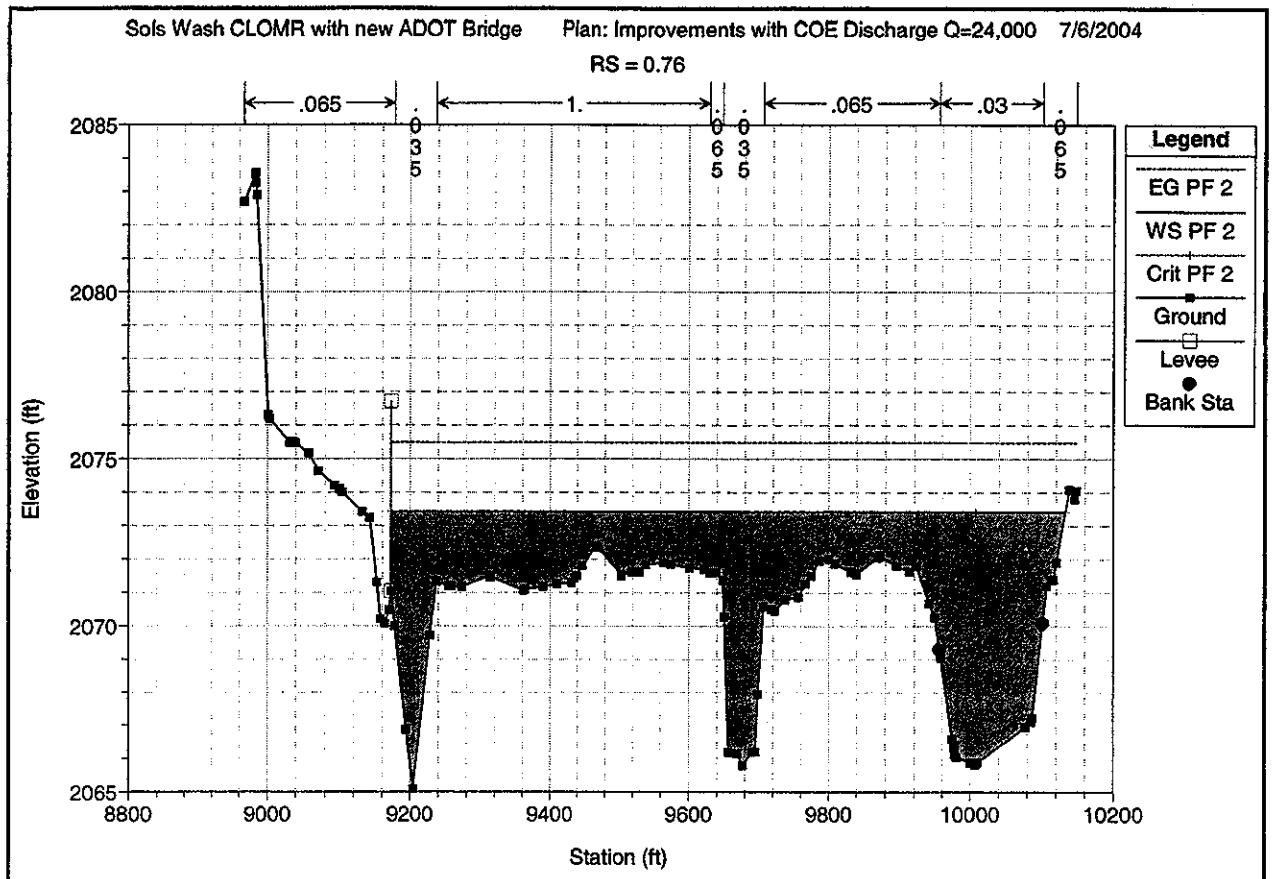
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
	(mi)		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(fps)	(sq ft)	(ft)	
Reach 1	1.82	PF 2	24000.00	2082.30	2089.67	2089.67	2091.49	0.004969	14.74	3097.00	888.01	1.01
Reach 1	1.00	PF 2	24000.00	2078.10	2084.30	2085.19	2087.18	0.009899	18.97	3224.33	1715.01	1.39
Reach 1	0.80	PF 2	24000.00	2073.10	2080.27	2080.01	2081.40	0.006103	13.07	4287.70	1405.92	0.91
Reach 1	0.75	PF 2	24000.00	2067.42	2075.32	2075.31	2077.27	0.009018	15.60	3290.55	1013.27	1.11
Reach 1	0.70	PF 2	24000.00	2065.84	2073.42	2073.42	2075.49	0.006941	14.54	3012.53	960.34	0.99
Reach 1	0.67	PF 2	24000.00	2063.89	2072.85	2071.63	2073.87	0.002600	10.34	3852.07	850.80	0.63
Reach 1	0.64	PF 2	24000.00	2061.79	2072.02	2071.08	2073.21	0.002392	10.64	3420.39	706.81	0.61
Reach 1	0.61	PF 2	24000.00	2059.91	2070.46	2070.46	2072.46	0.003033	12.21	2606.65	646.89	0.69
Reach 1	0.57	PF 2	24000.00	2057.69	2066.24	2068.35	2071.02	0.008798	17.57	1379.38	188.90	1.13
Reach 1	0.42	PF 2	24000.00	2055.50	2064.07	2066.57	2068.98	0.009909	17.95	1411.38	220.21	1.19
Reach 1	0.45	PF 2	24000.00	2053.51	2066.02	2062.72	2067.67	0.001871	10.65	2641.78	756.21	0.56
Reach 1	0.43	PF 2	24000.00	2051.27	2065.70	2060.67	2067.11	0.001278	9.73	2751.60	345.58	0.47
Reach 1	0.42	Bridge										
Reach 1	0.40	PF 2	24000.00	2049.33	2059.30	2059.30	2063.71	0.006545	16.85	1425.00	212.20	1.00
Reach 1	0.35	PF 2	24000.00	2047.68	2056.42	2058.00	2061.40	0.011123	20.59	2815.93	1049.69	1.29
Reach 1	0.27	PF 2	24000.00	2044.00	2056.84	2053.94	2057.42	0.001237	8.67	5937.83	821.43	0.46
Reach 1	0.22	PF 2	24000.00	2043.00	2054.31	2054.31	2056.59	0.005597	14.09	2909.25	599.22	0.82
Reach 1	0.18	PF 2	24000.00	2040.69	2054.58	2049.88	2054.79	0.000492	5.04	9297.06	1200.00	0.25
Reach 1	0.13	PF 2	24000.00	2040.00	2052.14	2049.54	2054.31	0.001866	13.09	2693.00	267.78	0.68
Reach 1	0.12	Bridge										
Reach 1	0.11	PF 2	24000.00	2039.00	2048.42	2049.55	2054.00	0.006714	20.37	1630.18	239.48	1.23
Reach 1	0.06	PF 2	24000.00	2036.99	2041.35	2043.96	2051.01	0.091198	28.23	1248.12	556.91	2.75
Reach 1	0.05	PF 2	24000.00	2036.00	2043.16	2043.55	2045.68	0.009242	15.82	2956.70	1006.36	1.30

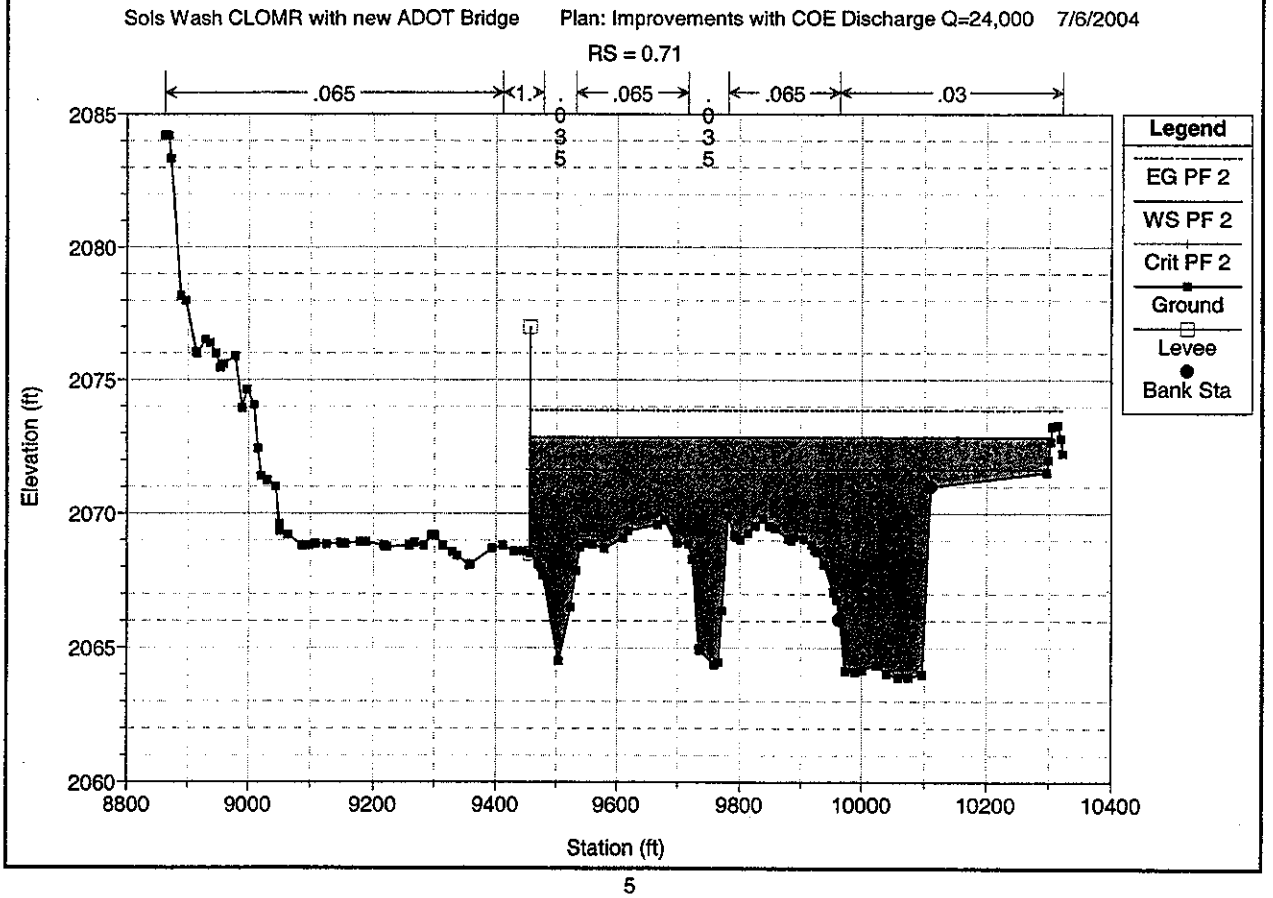

Sols Wash CLOMR with new ADOT Bridge Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 1.12 Cross Section 1.12 from CBA Study
.06
.025
.06
.06
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

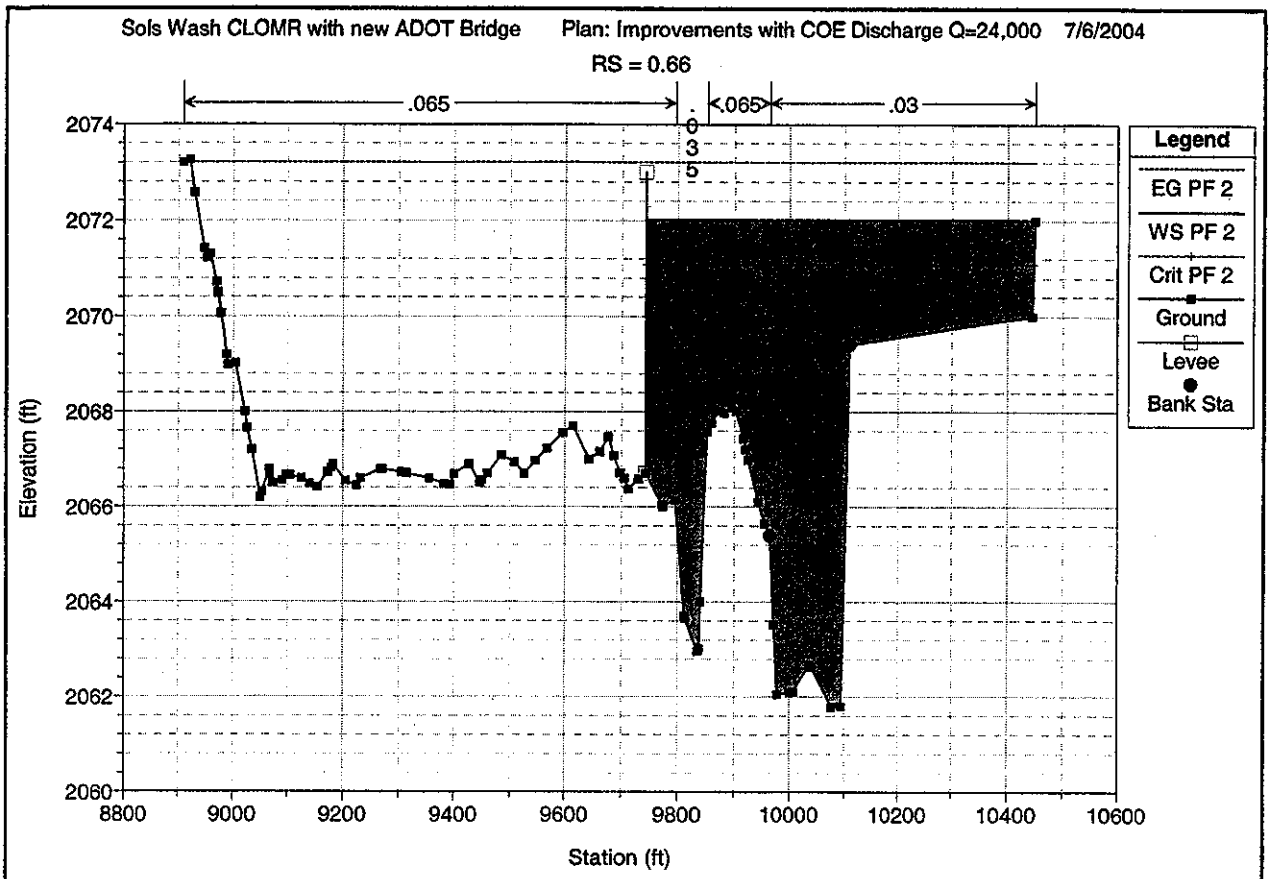

Sols Wash CLOMR with new ADOT Bridge Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 1.00 Cross Section 1.10 from CBA Study
1.
.065
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

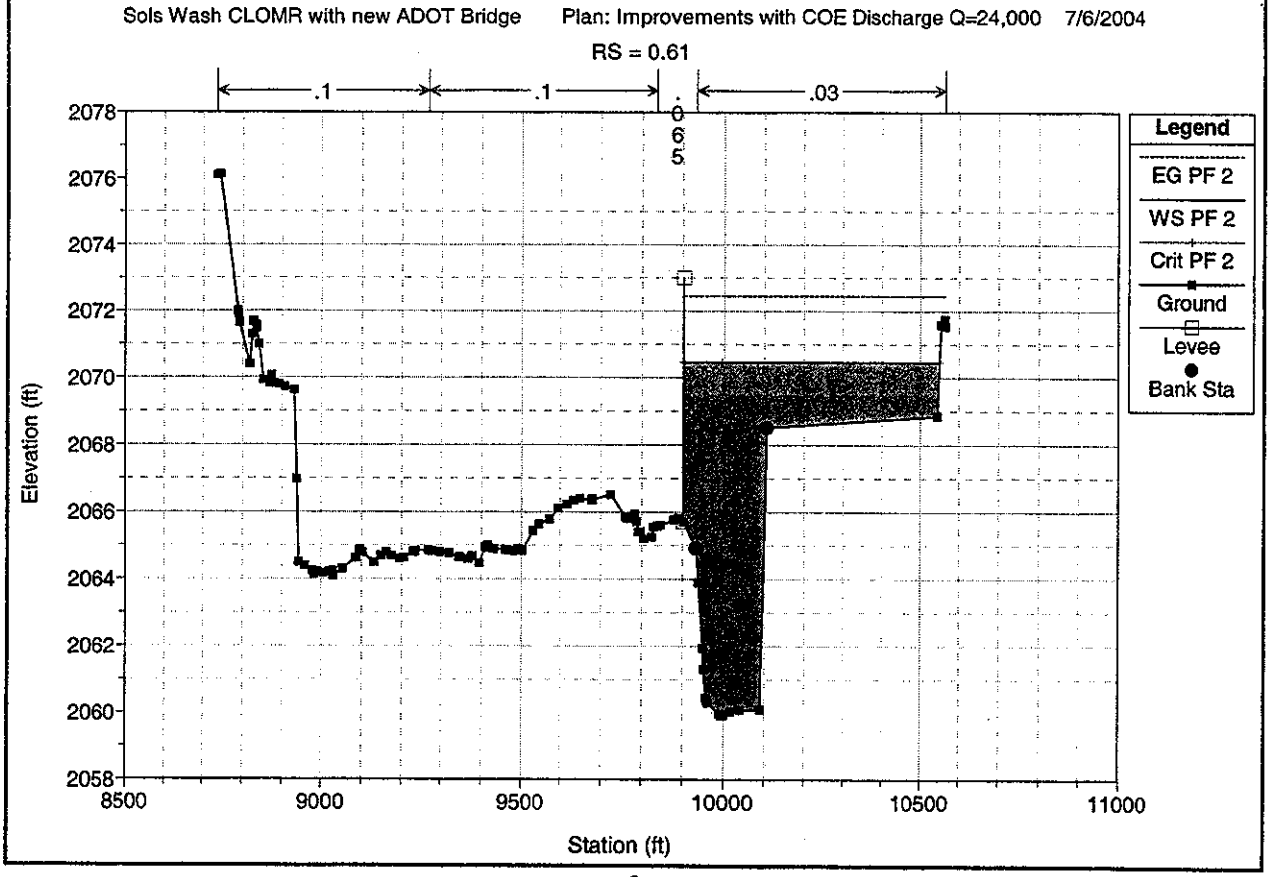

Sols Wash CLOMR with new ADOT Bridge Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.90 Cross Section 0.90 from CBA Study
1.
.065
.025
.065
.025
.065
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
2095
2090
2085
2080
2075
2070
8400
8600
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

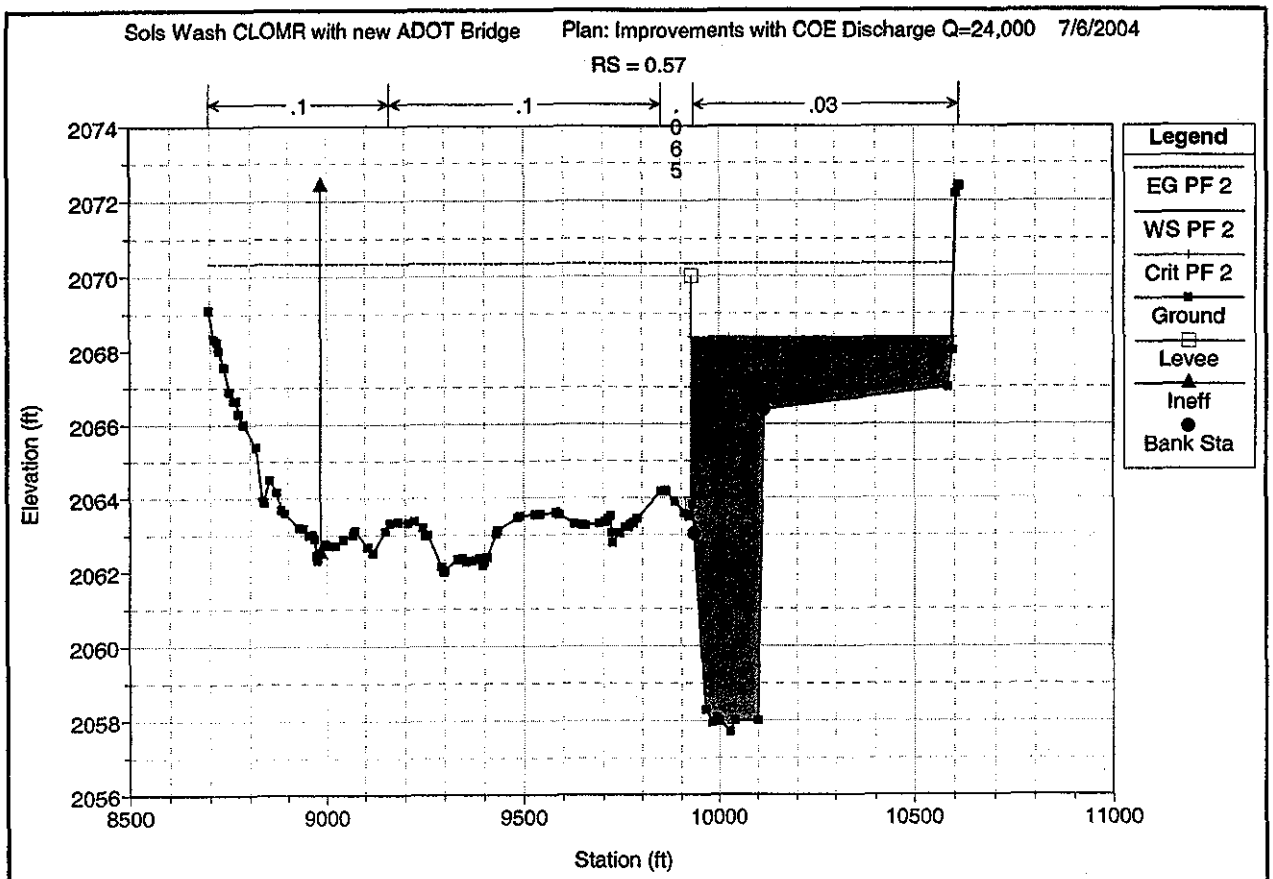

Sols Wash CLOMR with new ADOT Bridge Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.79 Begin new cross sections using 2002 mapping
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2084
2082
2080
2078
2076
2074
2072
2070
2068
2066
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

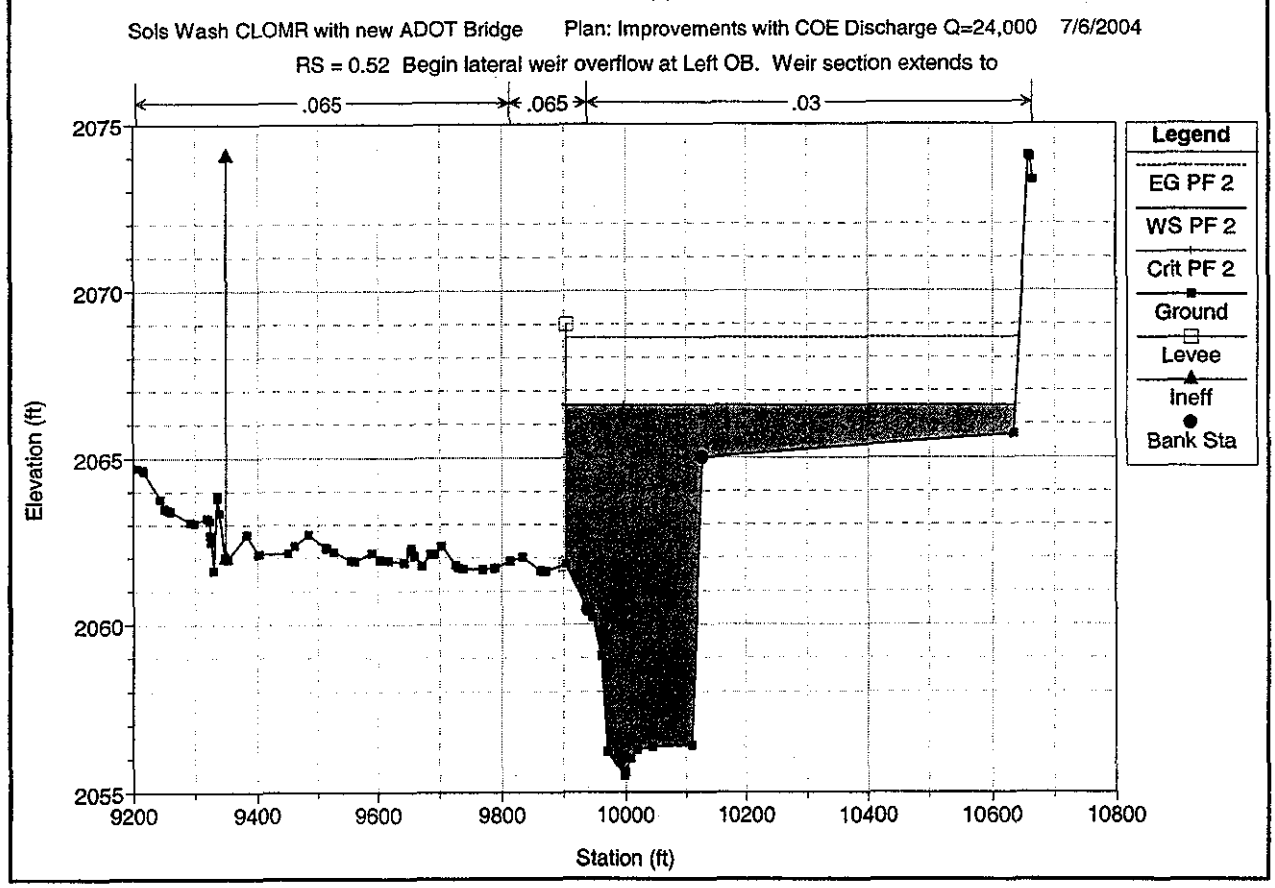

Sols Wash CLOMR with new ADOT Bridge
Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.76
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.71
.065
1.
.035
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.66
.065
.065
.03
.035
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

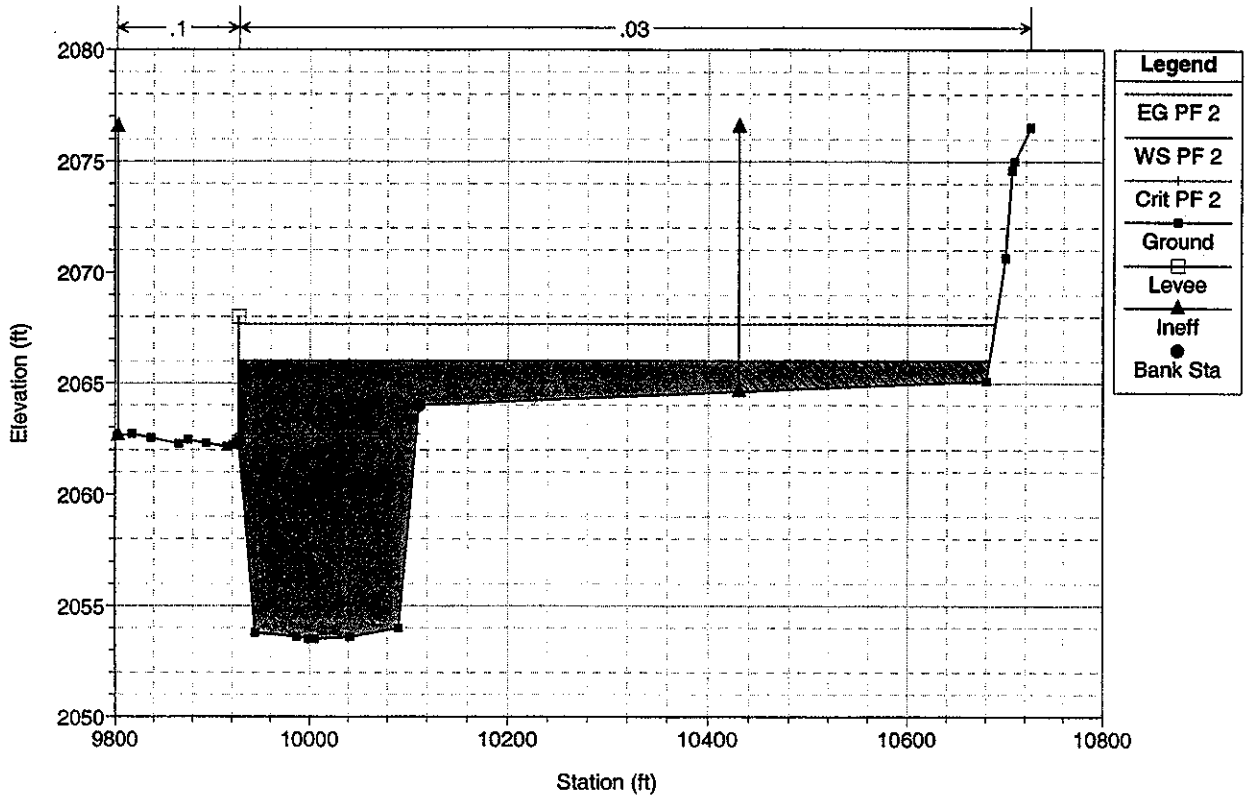

Sols Wash CLOMR with new ADOT Bridge
Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.61
.1
.1
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.57
.1
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
2058
2056
8500
9000
9500
10000
10500
11000


Sols Wash CLOMR with new ADOT Bridge
Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.52 Begin lateral weir overflow at Left OB. Weir section extends to
.065
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2075
2070
2065
2060
2055
9200
9400
9600
9800
10000
10200
10400
10600
10800

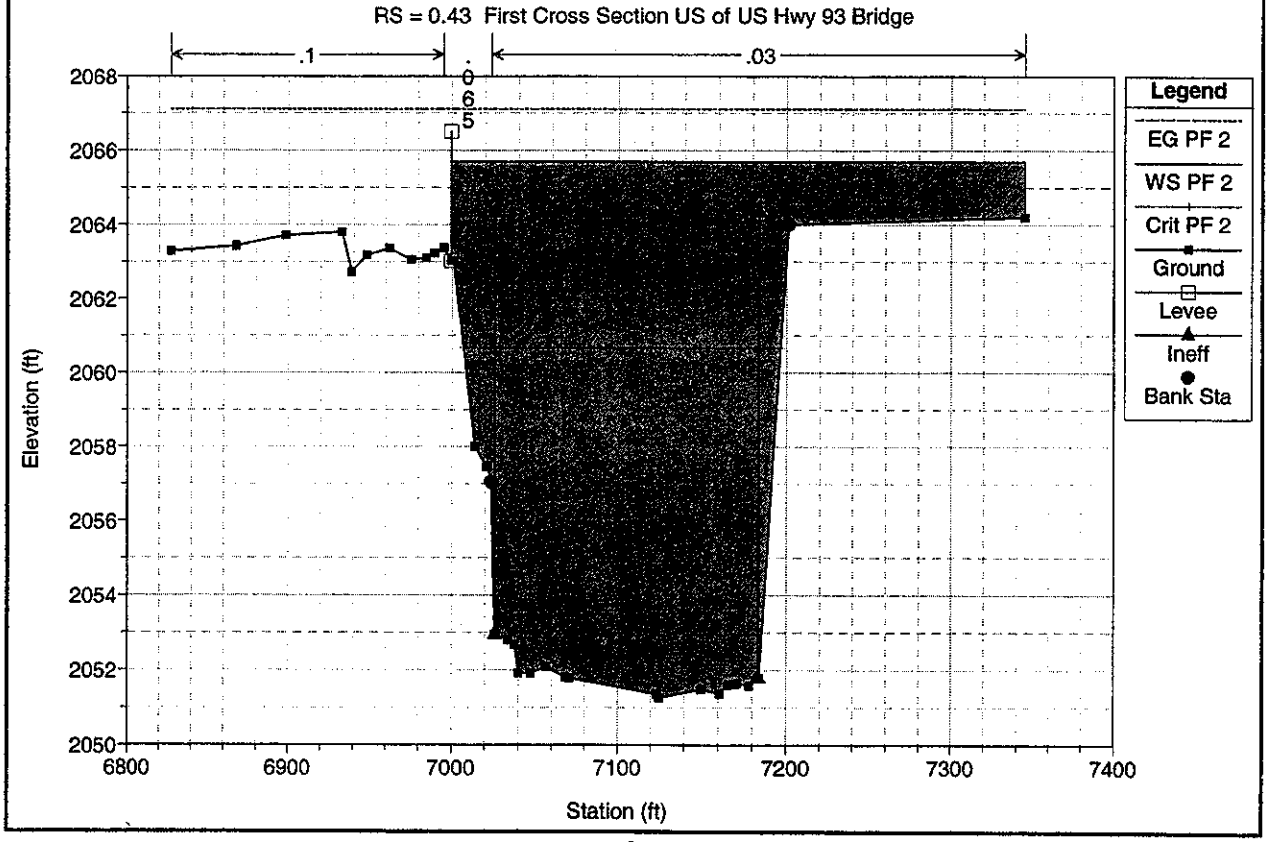
Sols Wash CLOMR with new ADOT Bridge Plan: Improvements with COE Discharge Q=24,000 7/6/2004

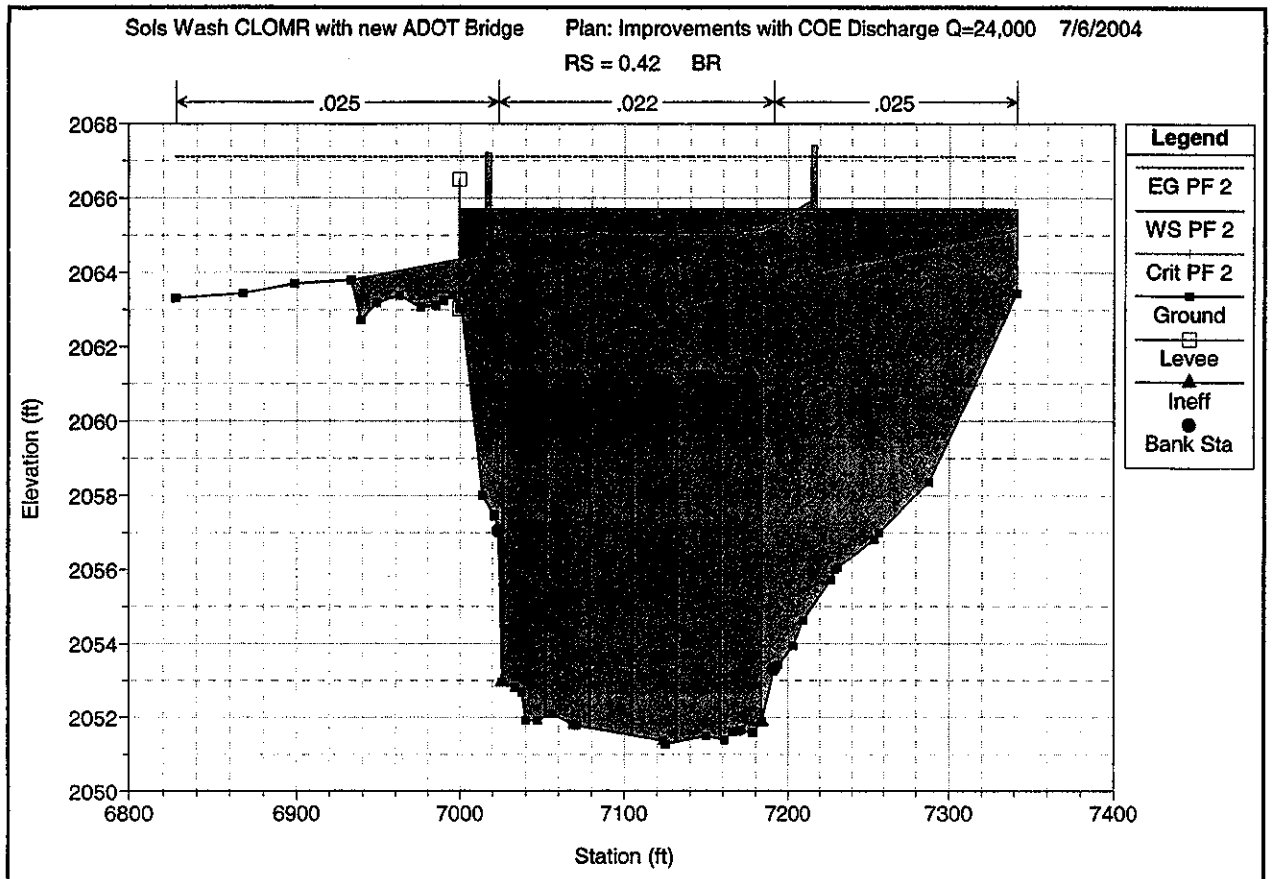
RS = 0.48 Lateral Weir Overflow at Left OB

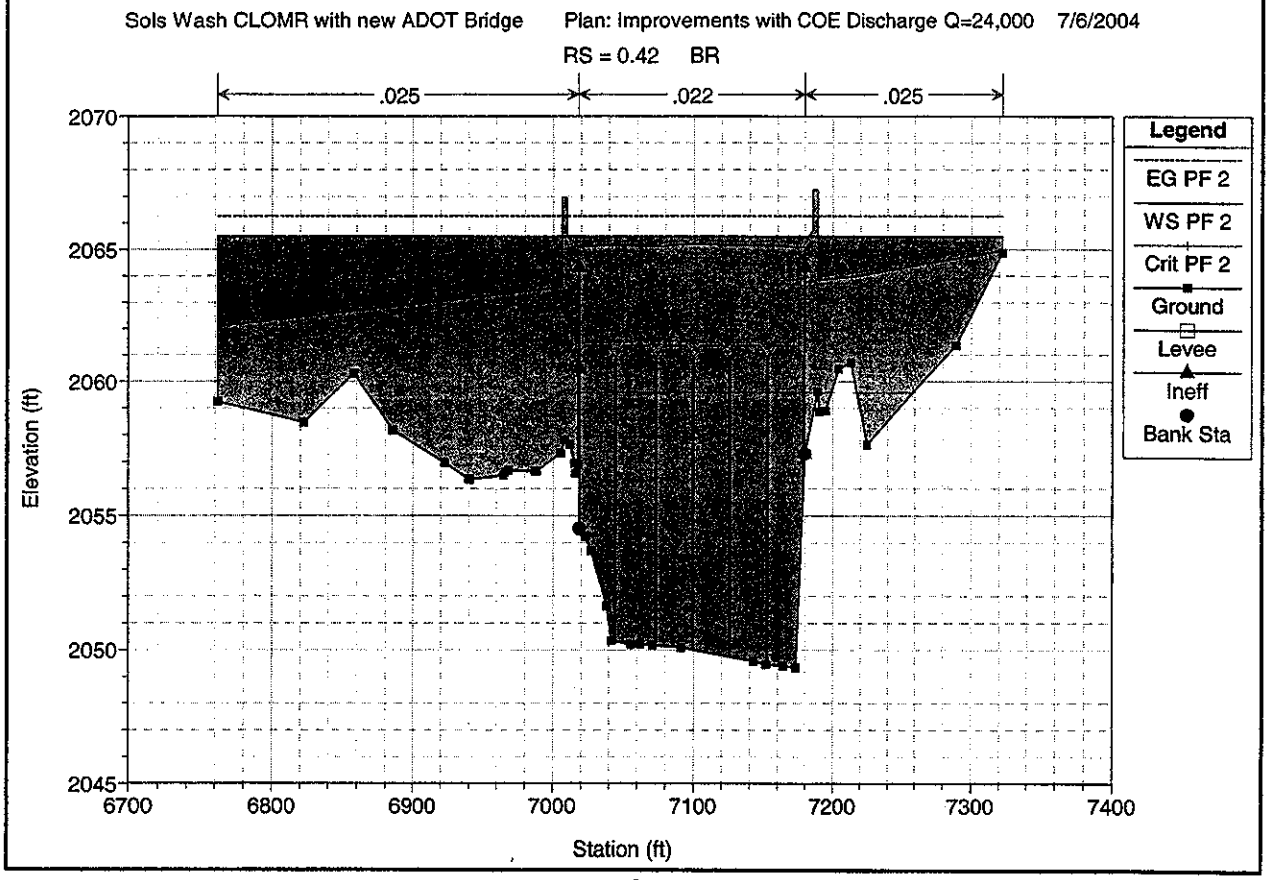


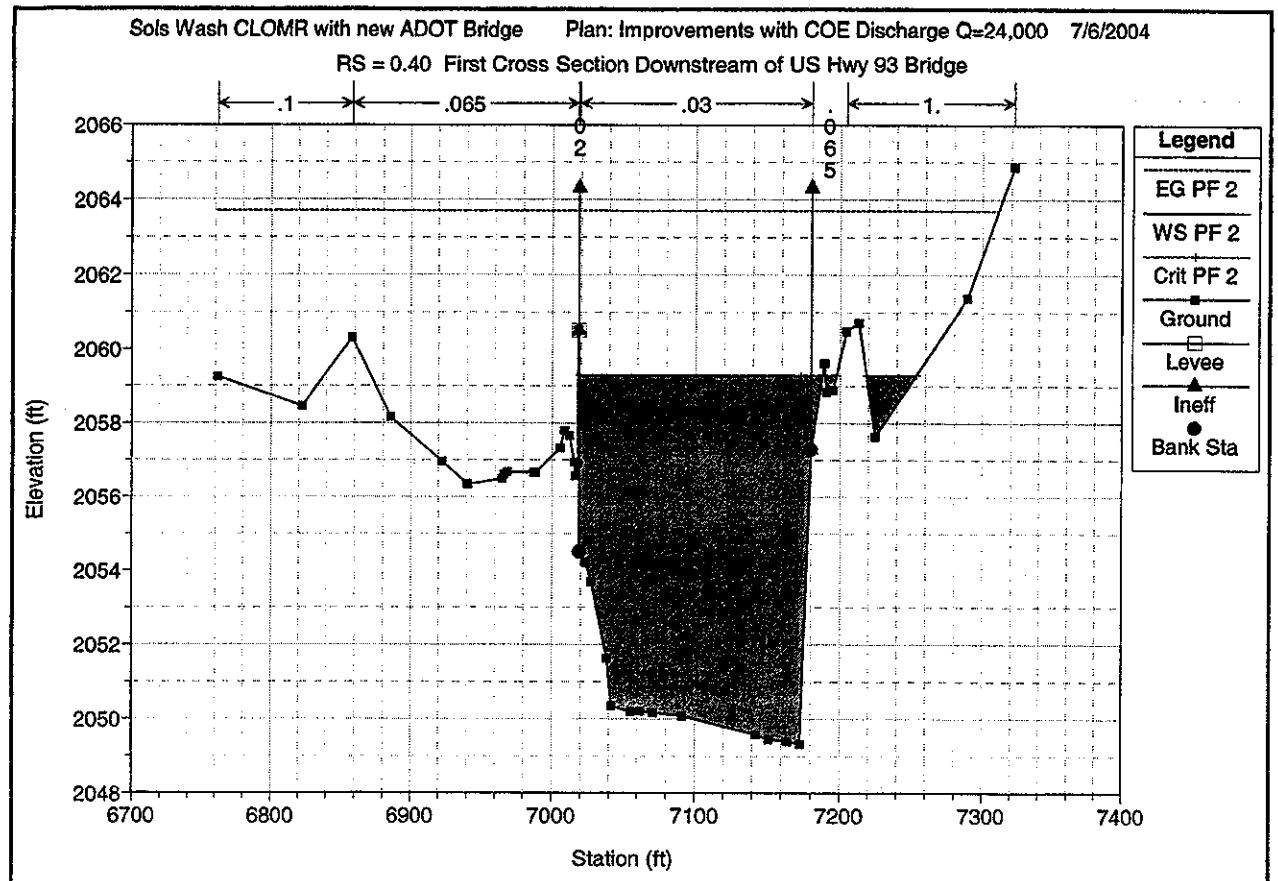
Sols Wash CLOMR with new ADOT Bridge Plan: Improvements with COE Discharge Q=24,000 7/6/2004

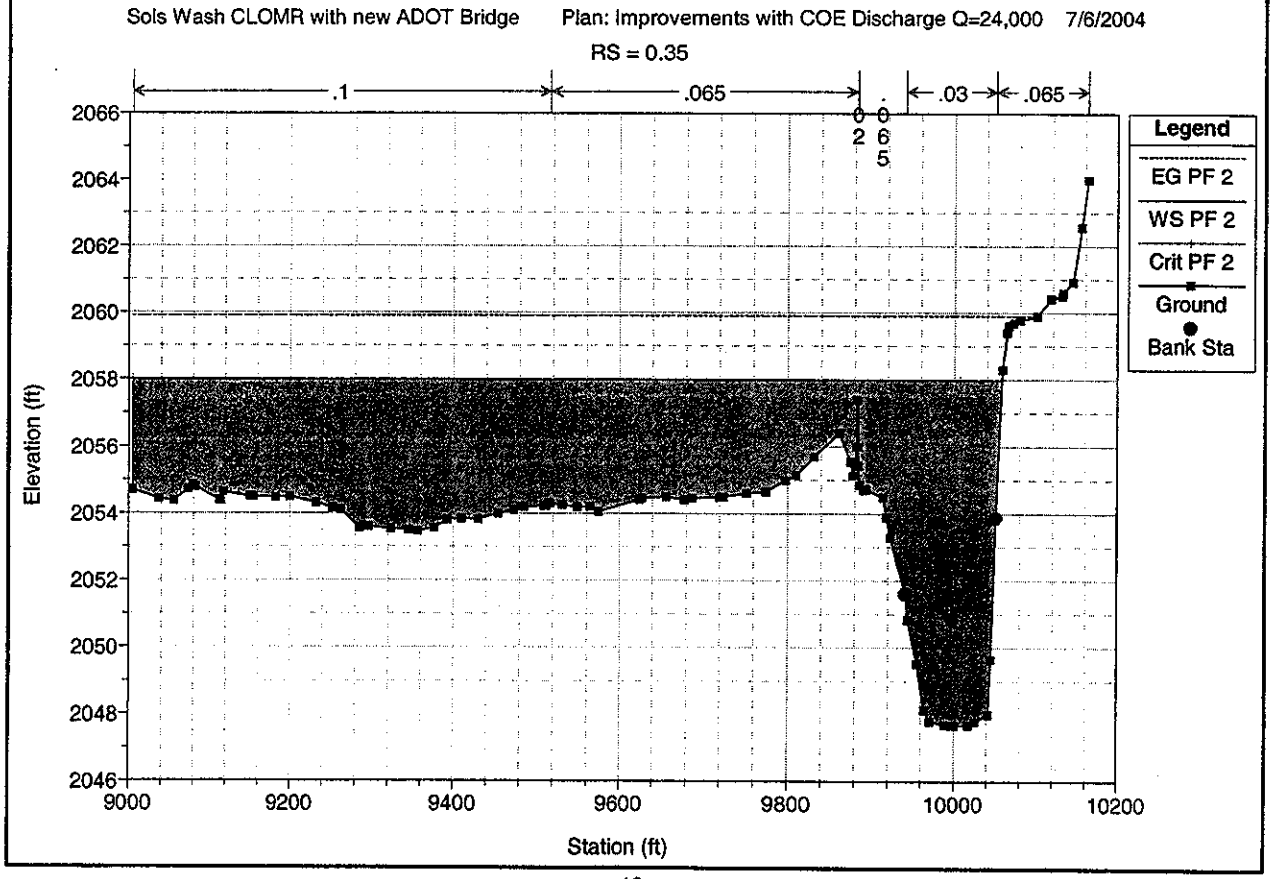
RS = 0.43 First Cross Section US of US Hwy 93 Bridge

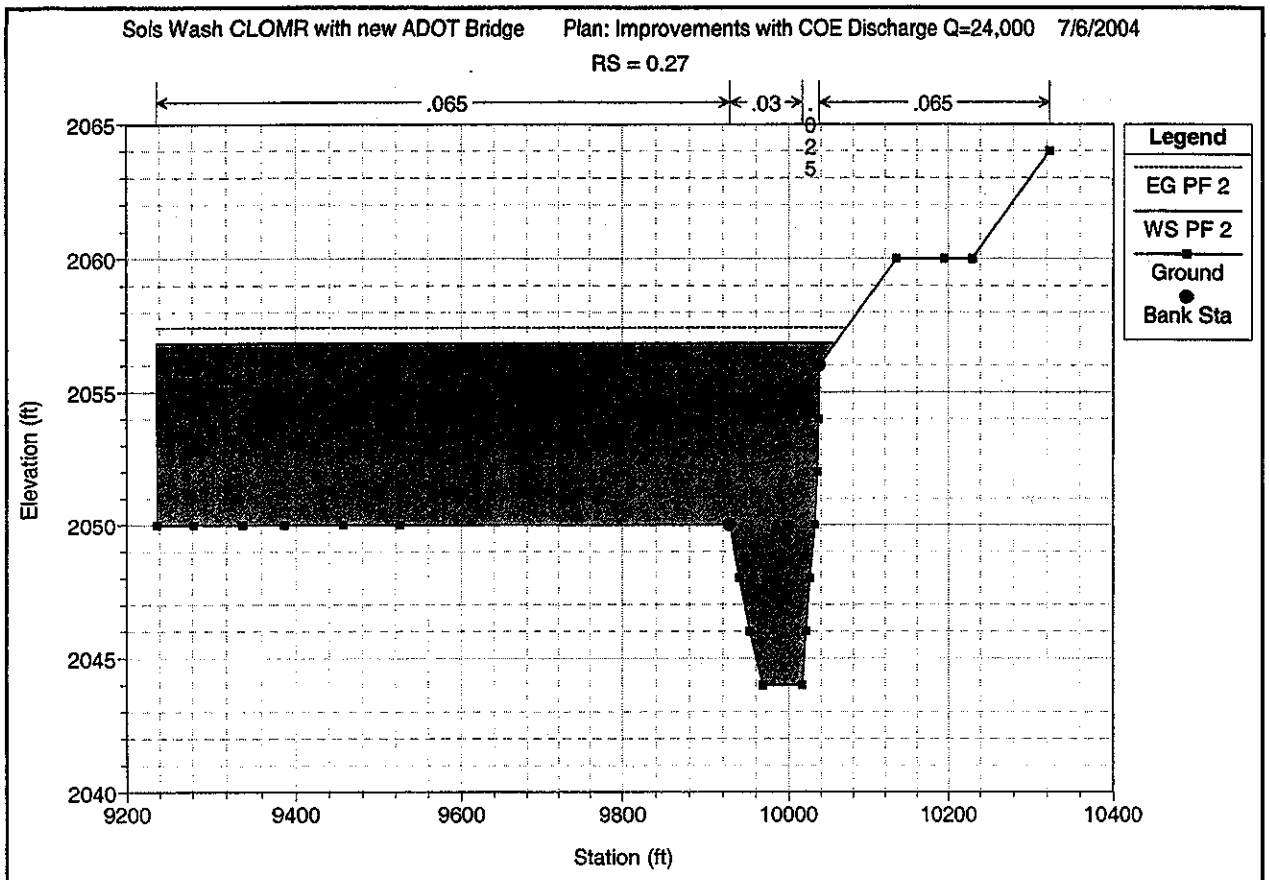


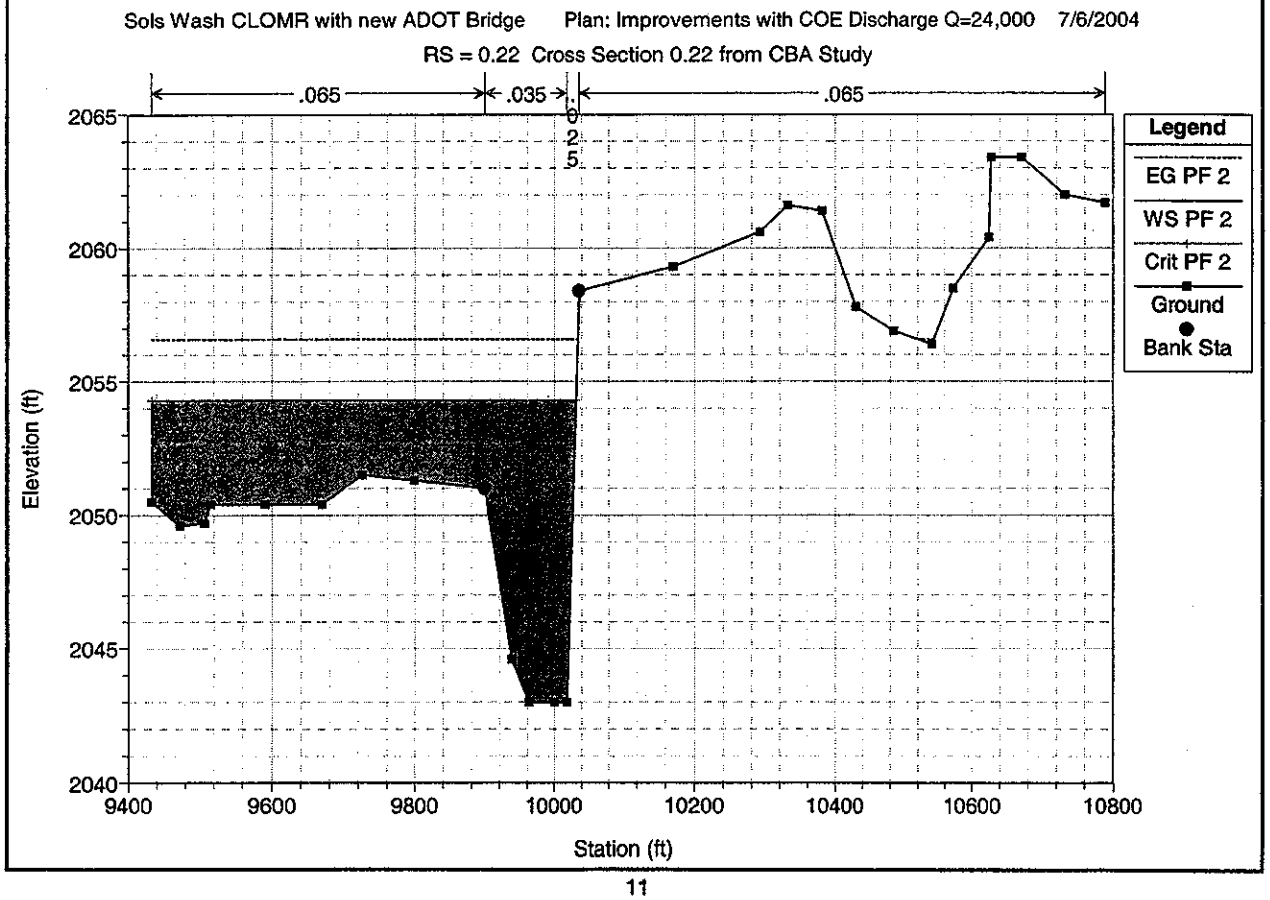

Sols Wash CLOMR with new ADOT Bridge
Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2068
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

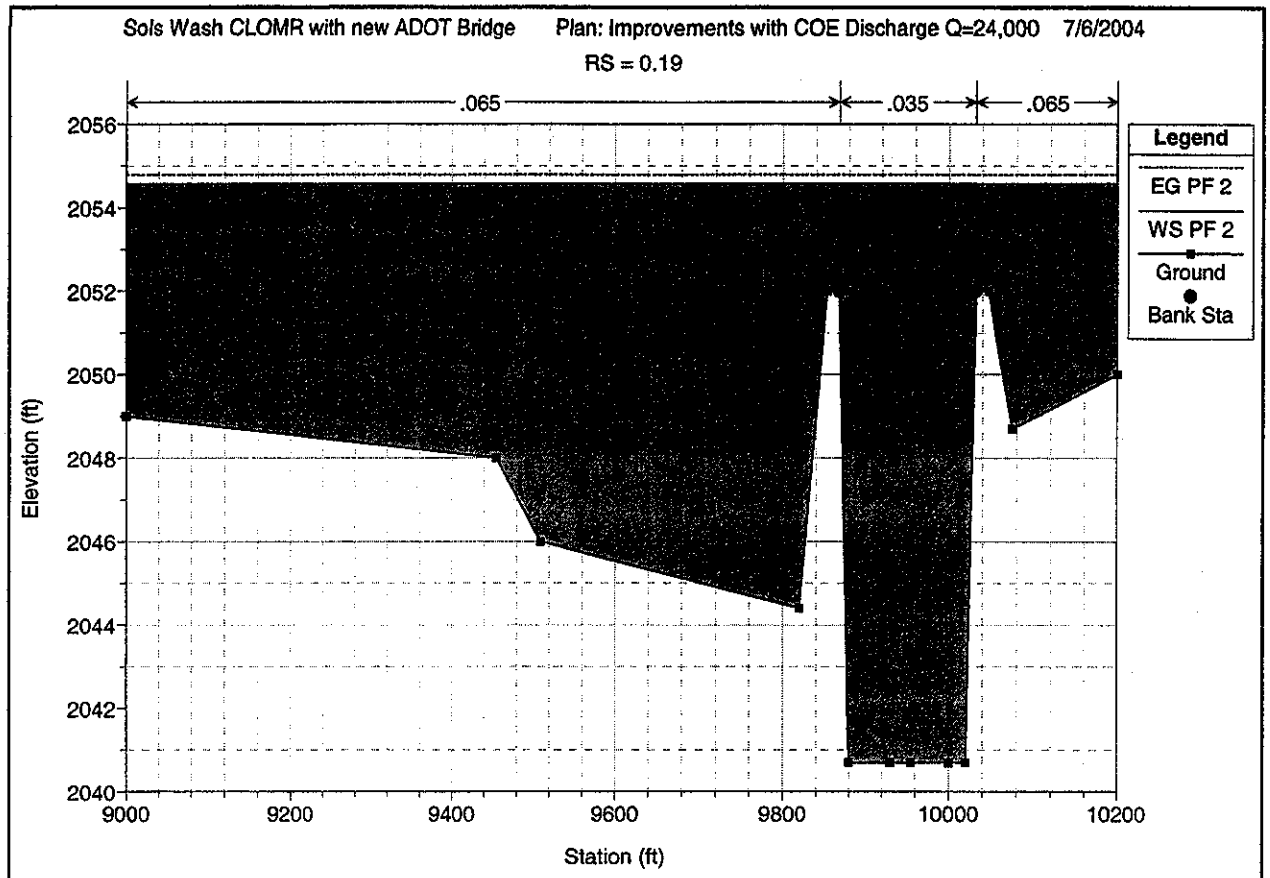

Sols Wash CLOMR with new ADOT Bridge
Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2070
2065
2060
2055
2050
2045
6700
6800
6900
7000
7100
7200
7300
7400
Station (ft)

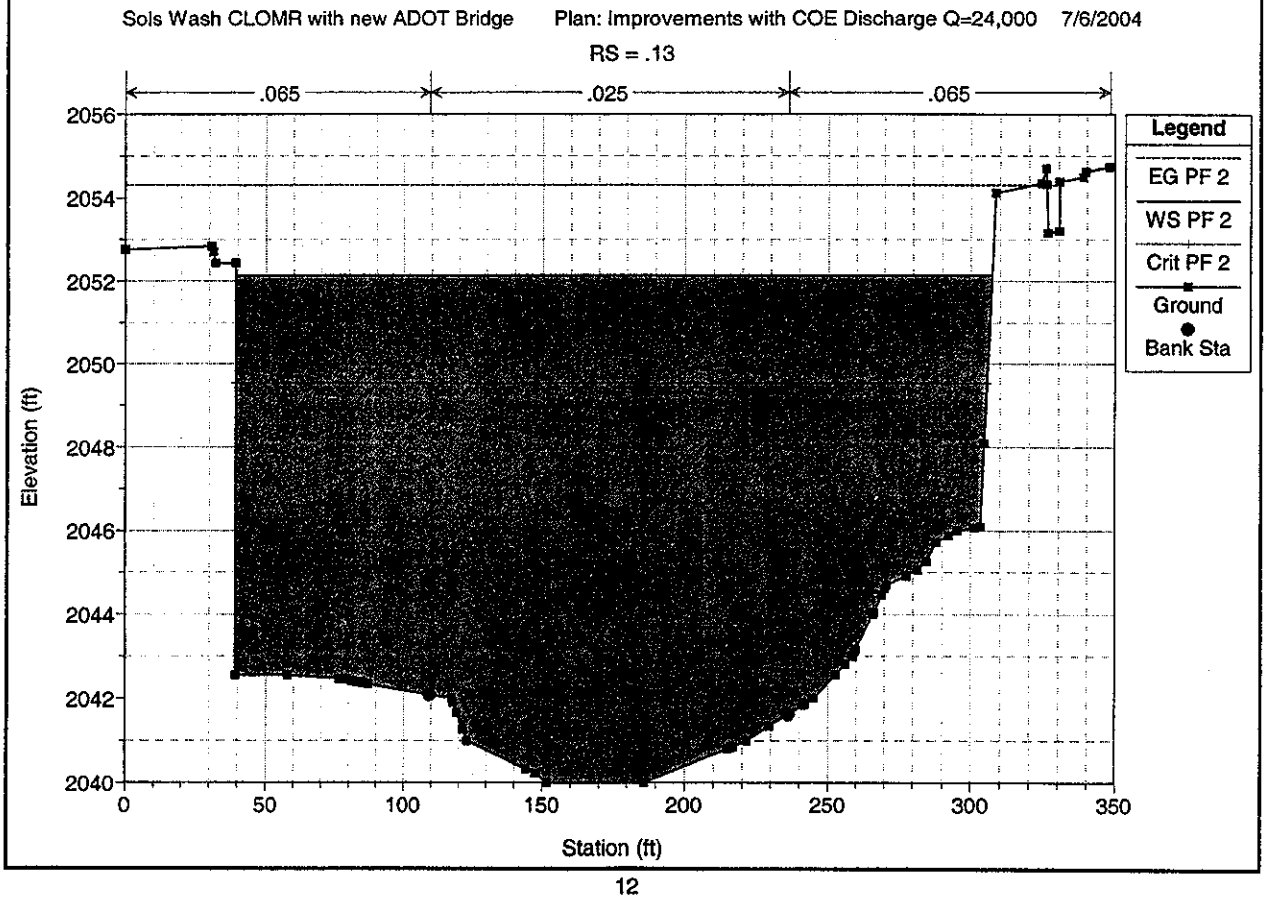

Sols Wash CLOMR with new ADOT Bridge Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.40 First Cross Section Downstream of US Hwy 93 Bridge
.1
.065
.03
.065
1.
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

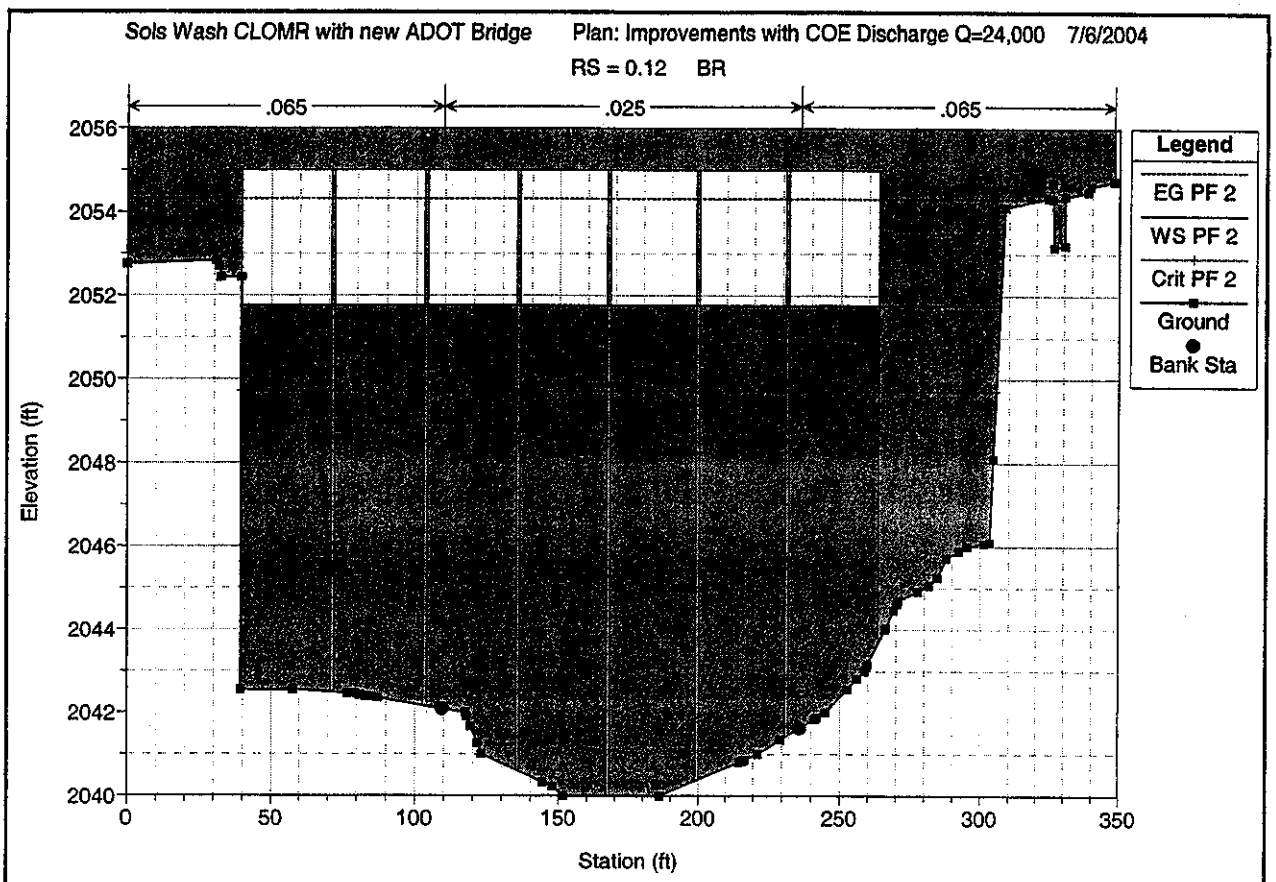

Sols Wash CLOMR with new ADOT Bridge Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.35
.1
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

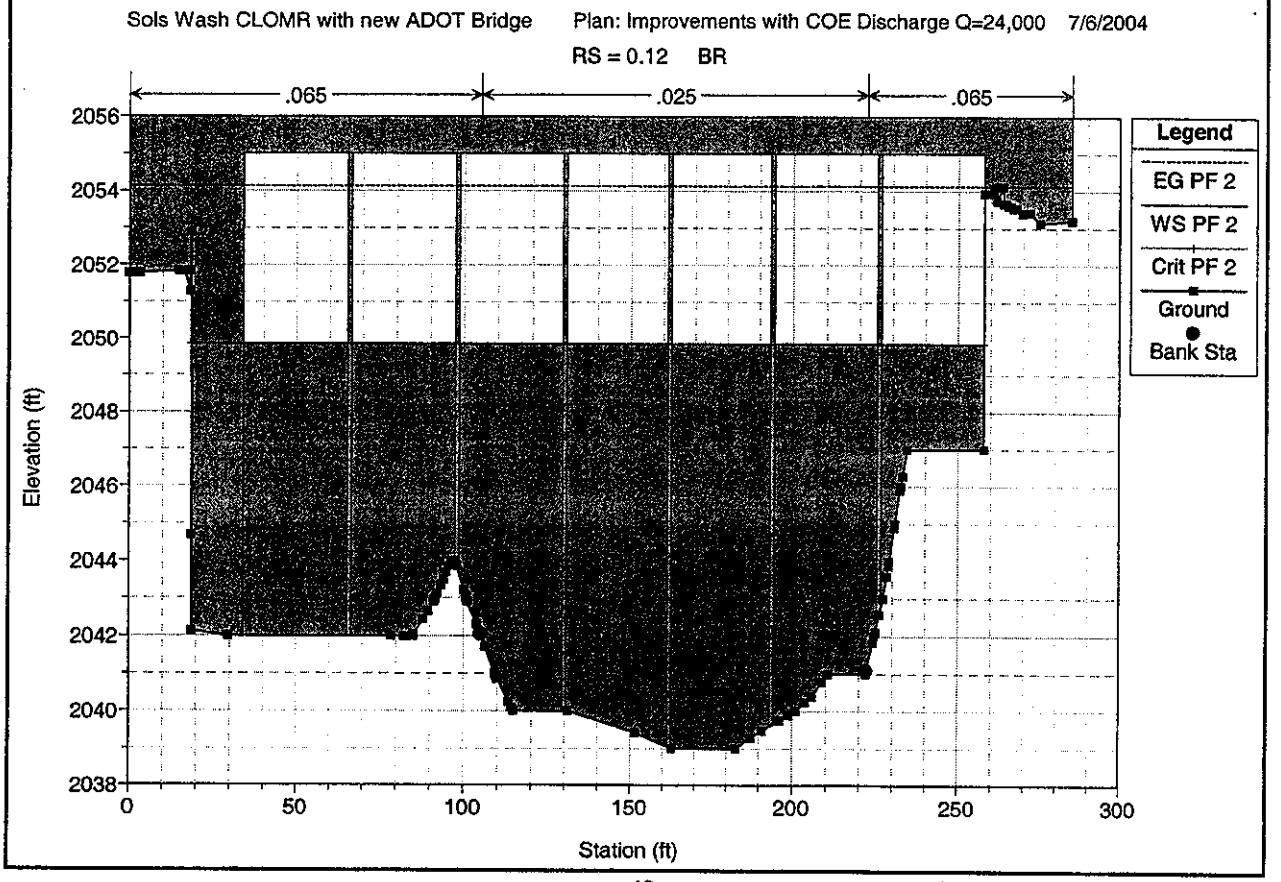

Sols Wash CLOMR with new ADOT Bridge Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.27
.065
.03
.065
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

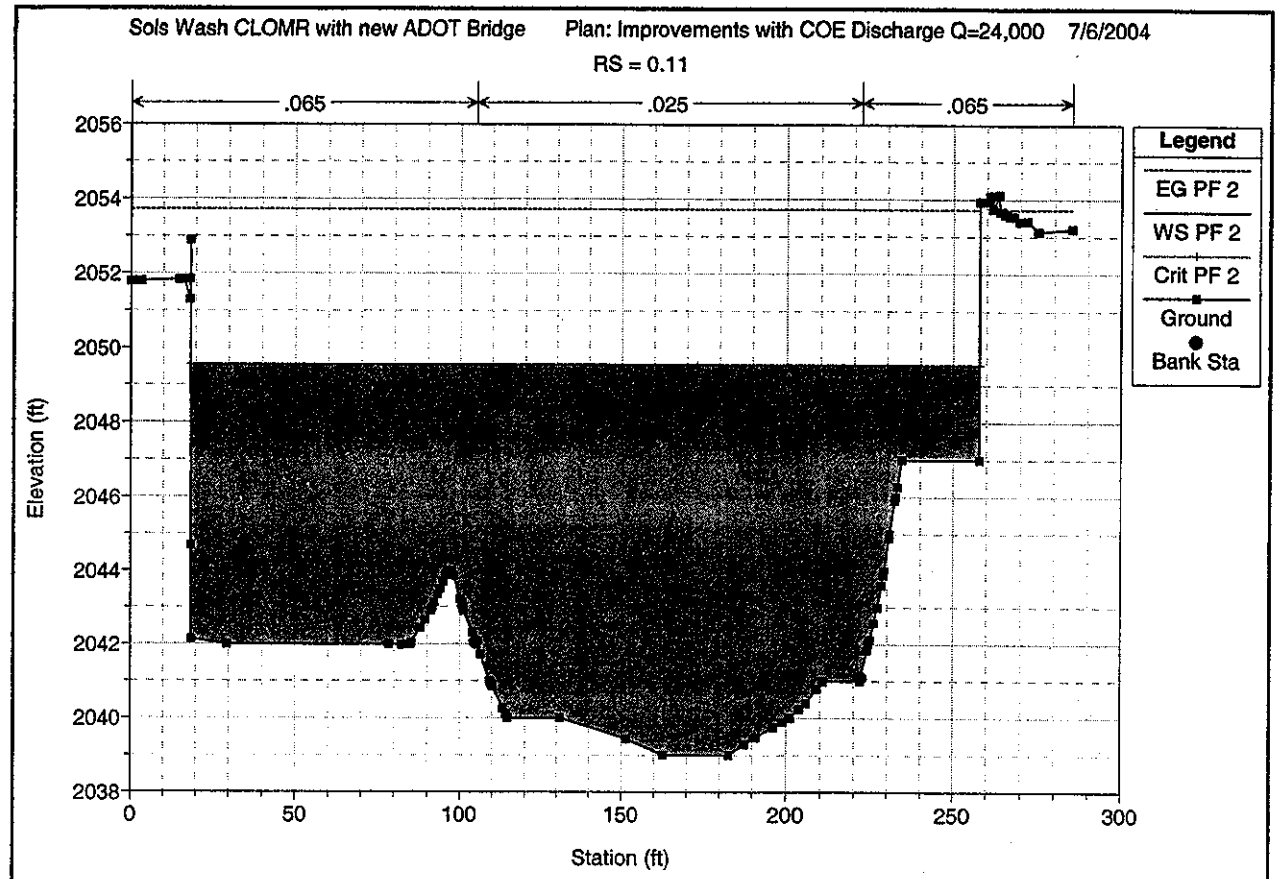

Sols Wash CLOMR with new ADOT Bridge Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.22 Cross Section 0.22 from CBA Study
.065
.035
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

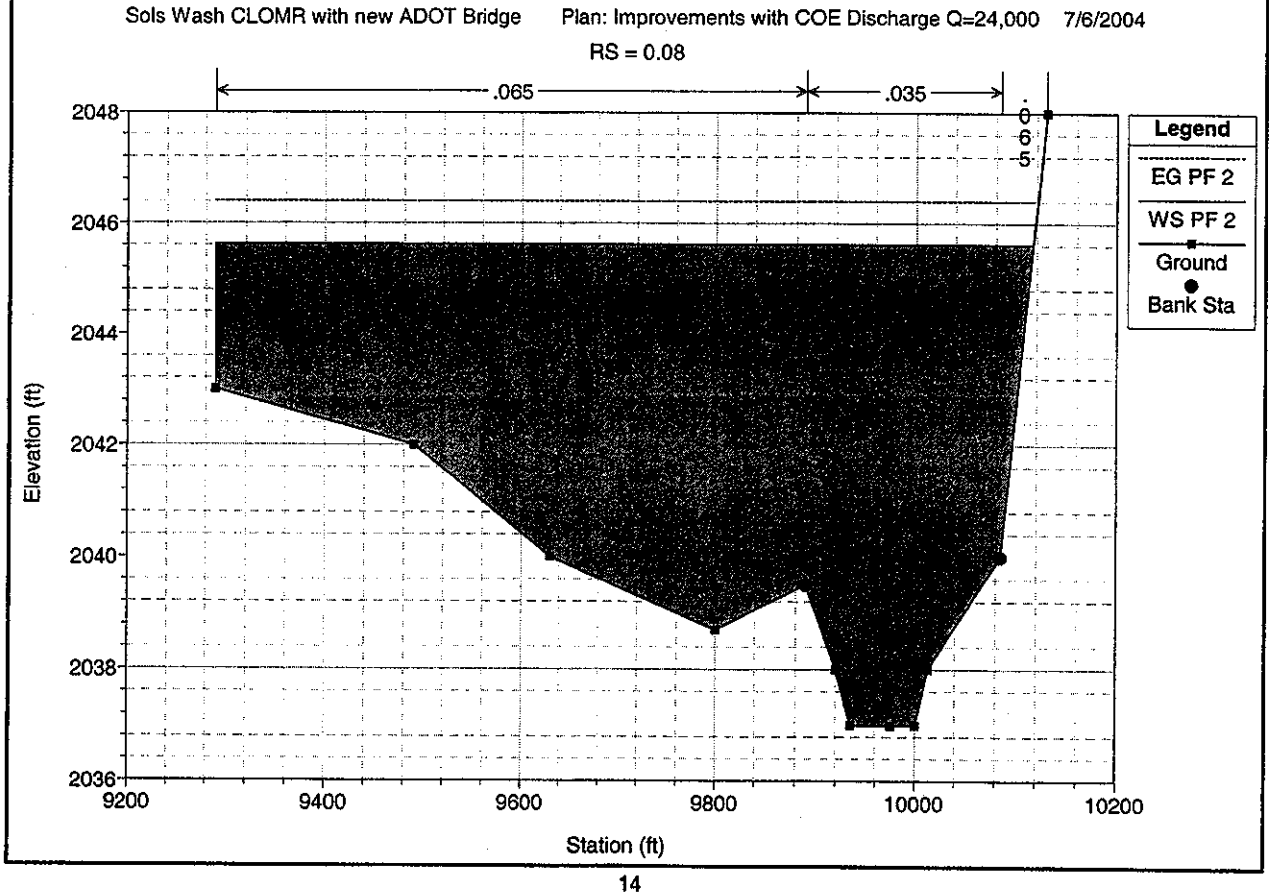

Sols Wash CLOMR with new ADOT Bridge Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.19
.065
.035
.065
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
9000
9200
9400
9600
9800
10000
10200
Station (ft)

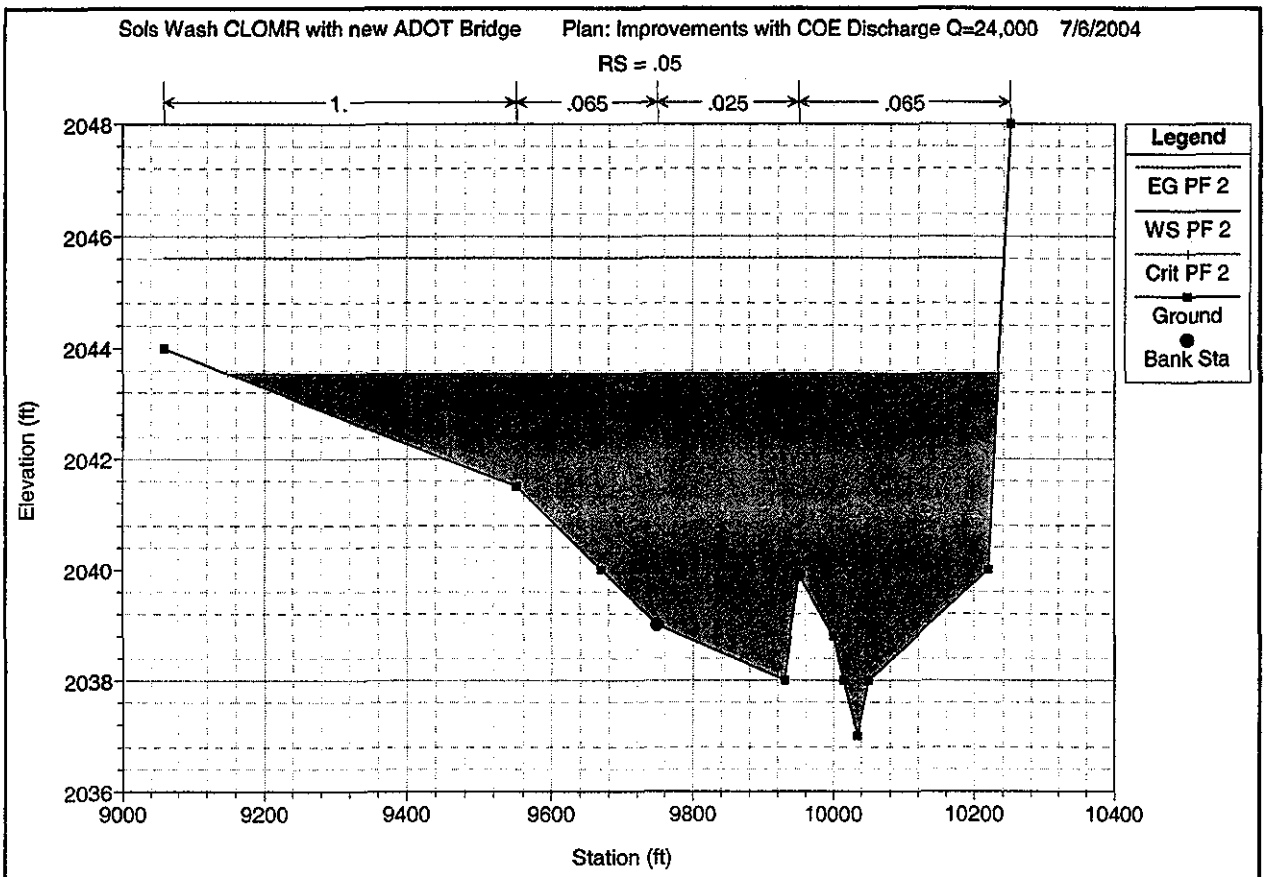

Sols Wash CLOMR with new ADOT Bridge Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = .13
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
0
50
100
150
200
250
300
350
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.11
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
2038
0
50
100
150
200
250
300
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = 0.08
.065
.035
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9200
9400
9600
9800
10000
10200
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Improvements with COE Discharge Q=24,000 7/6/2004
RS = .05
1.
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

HEC-RAS Plan: Improv Q=24K River: Sols Wash Reach: Reach 1 Profile: PF 2

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	24000.00	2082.30	2089.67	2089.67	2091.49	0.004959	14.74	3097.00	888.01	1.01
Reach 1	1.00	PF 2	24000.00	2078.10	2084.30	2085.19	2087.18	0.009899	18.97	3224.33	1715.01	1.39
Reach 1	0.90	PF 2	24000.00	2073.10	2080.27	2080.01	2081.40	0.006103	13.07	4287.70	1405.92	0.91
Reach 1	0.79	PF 2	24000.00	2067.42	2075.32	2075.31	2077.27	0.009018	15.60	3290.55	1013.27	1.11
Reach 1	0.76	PF 2	24000.00	2065.84	2073.42	2073.42	2075.49	0.006941	14.54	3012.53	960.34	0.99
Reach 1	0.71	PF 2	24000.00	2063.89	2072.85	2071.63	2073.87	0.002600	10.34	3852.07	850.80	0.63
Reach 1	0.66	PF 2	24000.00	2061.79	2072.02	2071.08	2073.21	0.002392	10.64	3420.39	706.81	0.61
Reach 1	0.61	PF 2	24000.00	2059.91	2070.46	2070.46	2072.46	0.003033	12.21	2606.65	646.89	0.69
Reach 1	0.57	PF 2	24000.00	2057.69	2066.24	2068.35	2071.02	0.008798	17.57	1379.38	188.90	1.13
Reach 1	0.52	PF 2	24000.00	2055.50	2064.07	2066.57	2068.98	0.009909	17.95	1411.38	220.21	1.19
Reach 1	0.48	PF 2	24000.00	2053.51	2066.02	2062.72	2067.67	0.001871	10.65	2641.78	756.21	0.56
Reach 1	0.43	PF 2	24000.00	2051.27	2065.70	2060.67	2067.11	0.001278	9.73	2751.60	345.58	0.47
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	24000.00	2049.33	2059.30	2059.30	2063.71	0.006545	16.85	1425.00	212.20	1.00
Reach 1	0.35	PF 2	24000.00	2047.68	2056.42	2058.00	2061.40	0.011123	20.59	2815.93	1049.69	1.29
Reach 1	0.27	PF 2	24000.00	2044.00	2056.84	2053.94	2057.42	0.001237	8.67	5937.83	821.43	0.46
Reach 1	0.22	PF 2	24000.00	2043.00	2054.31	2054.31	2056.59	0.005597	14.09	2909.25	599.22	0.82
Reach 1	0.19	PF 2	24000.00	2040.69	2054.58	2049.88	2054.79	0.000492	5.04	9297.06	1200.00	0.25
Reach 1	.13	PF 2	24000.00	2040.00	2052.14	2049.54	2054.31	0.001866	13.09	2693.00	267.78	0.68
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	24000.00	2039.00	2048.42	2049.55	2054.00	0.006714	20.37	1630.18	239.48	1.23
Reach 1	0.08	PF 2	24000.00	2036.99	2041.35	2043.96	2051.01	0.091198	28.23	1248.12	556.91	2.75
Reach 1	.05	PF 2	24000.00	2038.00	2043.16	2043.55	2045.68	0.009242	15.82	2956.70	1006.36	1.30

HEC-RAS Plan: Base Q=24K River: Sols Wash Reach: Reach 1 Profile: PF 2

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(fps)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	24000.00	2082.30	2089.71	2089.71	2091.49	0.004845	14.60	3122.26	880.00	1.00
Reach 1	1.00	PF 2	24000.00	2078.10	2085.38	2085.38	2087.35	0.005184	15.40	3078.82	854.89	1.04
Reach 1	0.90	PF 2	24000.00	2073.10	2080.71	2080.71	2082.73	0.007806	15.44	2776.31	681.00	1.04
Reach 1	0.79	PF 2	24000.00	2067.42	2075.34	2075.31	2077.27	0.008931	15.55	3305.15	1013.61	1.11
Reach 1	0.68	PF 2	24000.00	2065.84	2073.29	2073.29	2075.43	0.007361	14.79	2953.23	981.15	1.02
Reach 1	0.71	PF 2	24000.00	2063.89	2072.82		2073.73	0.002483	10.07	4310.90	842.00	0.61
Reach 1	0.65	PF 2	24000.00	2061.79	2072.15		2073.14	0.002117	9.98	4025.46	630.00	0.57
Reach 1	0.61	PF 2	24000.00	2059.91	2069.24	2069.24	2072.16	0.005163	14.56	2445.87	469.00	0.89
Reach 1	0.57	PF 2	24000.00	2057.69	2068.39		2070.61	0.003178	12.49	2460.95	337.00	0.71
Reach 1	0.52	PF 2	24000.00	2055.50	2068.34		2069.72	0.001644	9.98	3005.03	321.00	0.52
Reach 1	0.49	PF 2	24000.00	2053.51	2067.72		2069.26	0.001357	9.96	2411.24	185.00	0.49
Reach 1	0.43	PF 2	24000.00	2051.27	2067.54	2060.67	2068.74	0.000885	8.82	2796.96	190.00	0.40
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	24000.00	2049.33	2063.57	2059.27	2065.57	0.001760	11.36	2114.62	180.00	0.55
Reach 1	0.35	PF 2	24000.00	2047.68	2059.65	2059.65	2064.12	0.005227	17.72	1682.74	200.00	0.93
Reach 1	0.27	PF 2	24000.00	2044.00	2056.82		2060.67	0.004765	16.98	1886.00	229.54	0.91
Reach 1	0.22	PF 2	24000.00	2043.00	2055.14	2055.14	2058.79	0.006564	16.11	1883.04	273.19	0.90
Reach 1	0.19	PF 2	24000.00	2040.69	2054.23		2054.92	0.001021	7.27	4398.23	480.00	0.36
Reach 1	0.13	PF 2	24000.00	2040.00	2052.14	2049.54	2054.31	0.001866	13.09	2693.00	267.78	0.68
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	24000.00	2039.00	2049.55	2049.55	2053.72	0.004315	17.73	1900.66	239.51	1.00
Reach 1	0.08	PF 2	24000.00	2036.99	2045.62		2046.40	0.003034	8.99	4484.47	826.62	0.58
Reach 1	0.05	PF 2	24000.00	2038.00	2043.55	2043.55	2045.62	0.006886	14.42	3364.66	1084.32	1.14

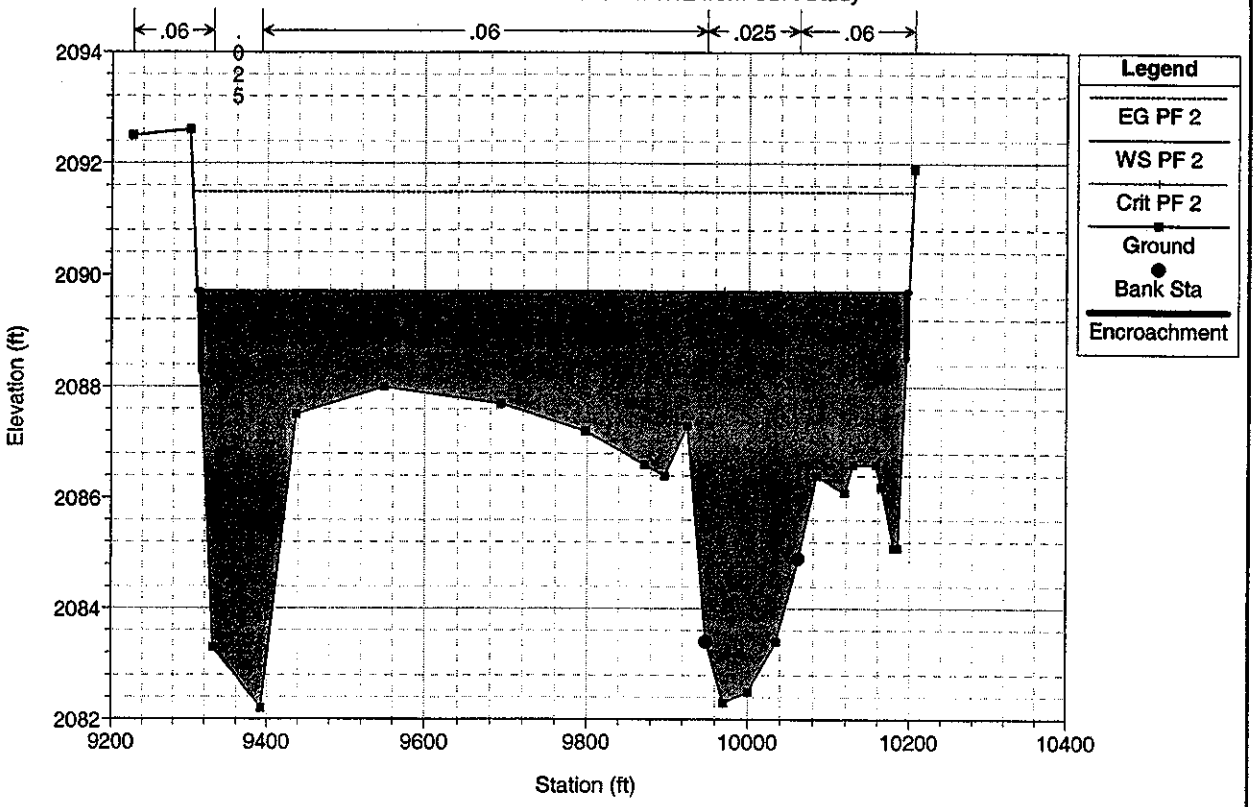
BASE MODEL WITH COE Q_{100} = 24,000 CFS

HEC-RAS Plan: Base Q=24K River: Sols Wash Reach: Reach 1 Profile: PF 2

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	24000.00	2082.30	2089.71	2089.71	2091.49	0.004845	14.60	3122.26	880.00	1.00
Reach 1	1.00	PF 2	24000.00	2078.10	2084.71	2085.38	2087.56	0.008177	18.07	2506.91	852.51	1.28
Reach 1	0.90	PF 2	24000.00	2073.10	2080.65	2080.71	2082.73	0.008130	15.66	2732.75	681.00	1.06
Reach 1	0.79	PF 2	24000.00	2067.42	2075.34	2075.31	2077.27	0.008931	15.55	3305.15	1013.61	1.11
Reach 1	0.76	PF 2	24000.00	2065.84	2073.29	2073.29	2075.43	0.007361	14.79	2953.23	981.15	1.02
Reach 1	0.71	PF 2	24000.00	2063.89	2072.82	2071.35	2073.73	0.002483	10.07	4310.90	842.00	0.61
Reach 1	0.66	PF 2	24000.00	2061.79	2072.15		2073.14	0.002117	9.98	4025.46	630.00	0.57
Reach 1	0.61	PF 2	24000.00	2059.91	2069.24	2069.24	2072.16	0.005163	14.56	2445.87	469.00	0.89
Reach 1	0.57	PF 2	24000.00	2057.69	2068.39	2066.96	2070.61	0.003178	12.49	2460.95	337.00	0.71
Reach 1	0.52	PF 2	24000.00	2055.50	2068.34		2069.72	0.001644	9.98	3005.03	321.00	0.52
Reach 1	0.48	PF 2	24000.00	2053.51	2067.72		2069.26	0.001357	9.96	2411.24	185.00	0.49
Reach 1	0.45	PF 2	24000.00	2051.27	2067.54	2060.67	2068.74	0.000685	8.82	2796.96	190.00	0.40
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	24000.00	2049.33	2063.57	2059.27	2065.57	0.001760	11.36	2114.62	180.00	0.55
Reach 1	0.35	PF 2	24000.00	2047.68	2059.65	2059.65	2064.12	0.005227	17.72	1682.74	200.00	0.93
Reach 1	0.27	PF 2	24000.00	2044.00	2056.82	2056.31	2060.67	0.004765	16.98	1886.00	229.54	0.91
Reach 1	0.22	PF 2	24000.00	2043.00	2055.14	2055.14	2058.79	0.006564	16.11	1883.04	273.19	0.90
Reach 1	0.19	PF 2	24000.00	2040.69	2054.23	2048.54	2054.92	0.001021	7.27	4398.35	480.00	0.36
Reach 1	.13	PF 2	24000.00	2040.00	2052.14	2049.54	2054.31	0.001866	13.09	2693.00	267.78	0.68
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	24000.00	2039.00	2048.42	2049.55	2054.00	0.006714	20.37	1630.18	239.48	1.23
Reach 1	0.08	PF 2	24000.00	2036.99	2041.35	2043.96	2051.01	0.091198	28.23	1248.12	556.91	2.75
Reach 1	.05	PF 2	24000.00	2038.00	2043.16	2043.55	2045.68	0.009242	15.82	2956.70	1006.36	1.30

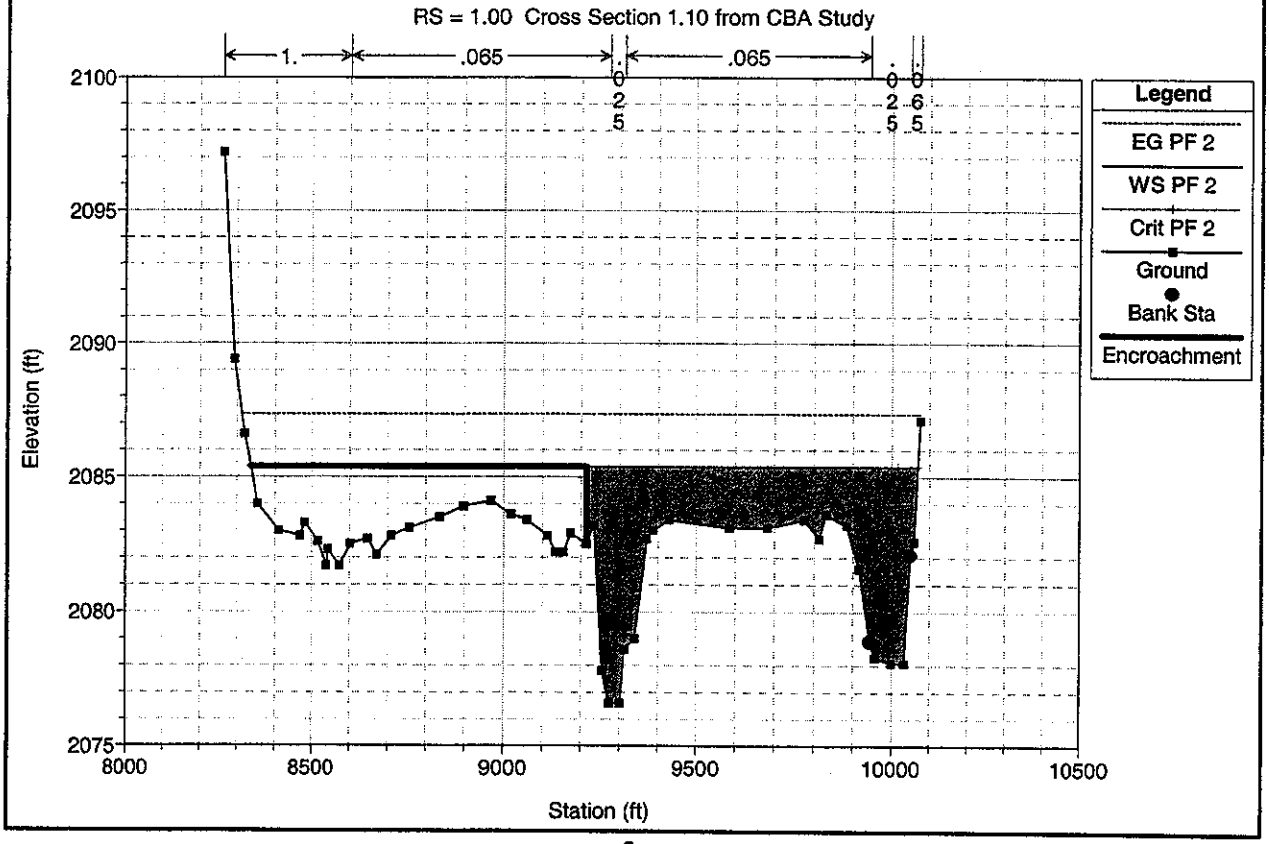
Sols Wash CLOMR with new ADOT Bridge Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004

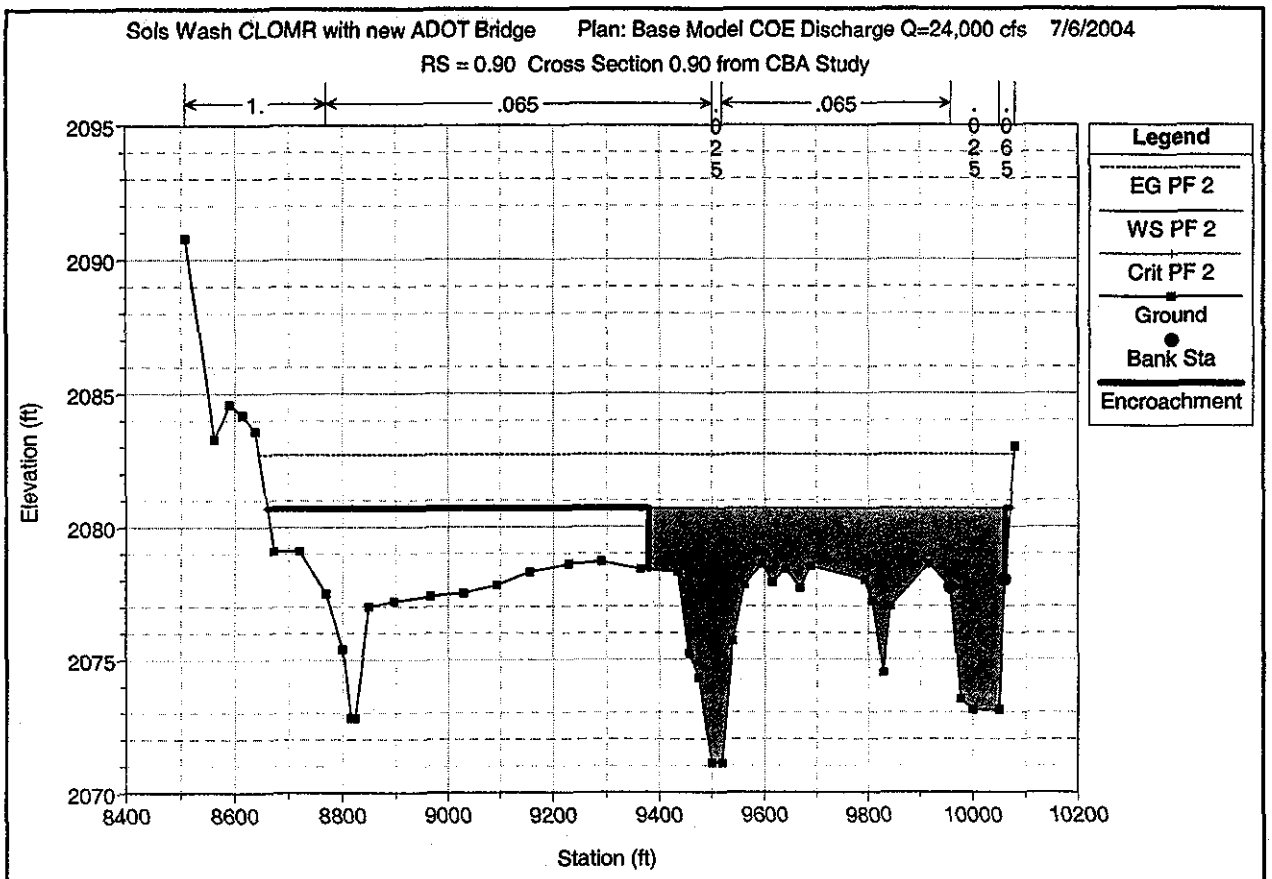
RS = 1.12 Cross Section 1.12 from CBA Study

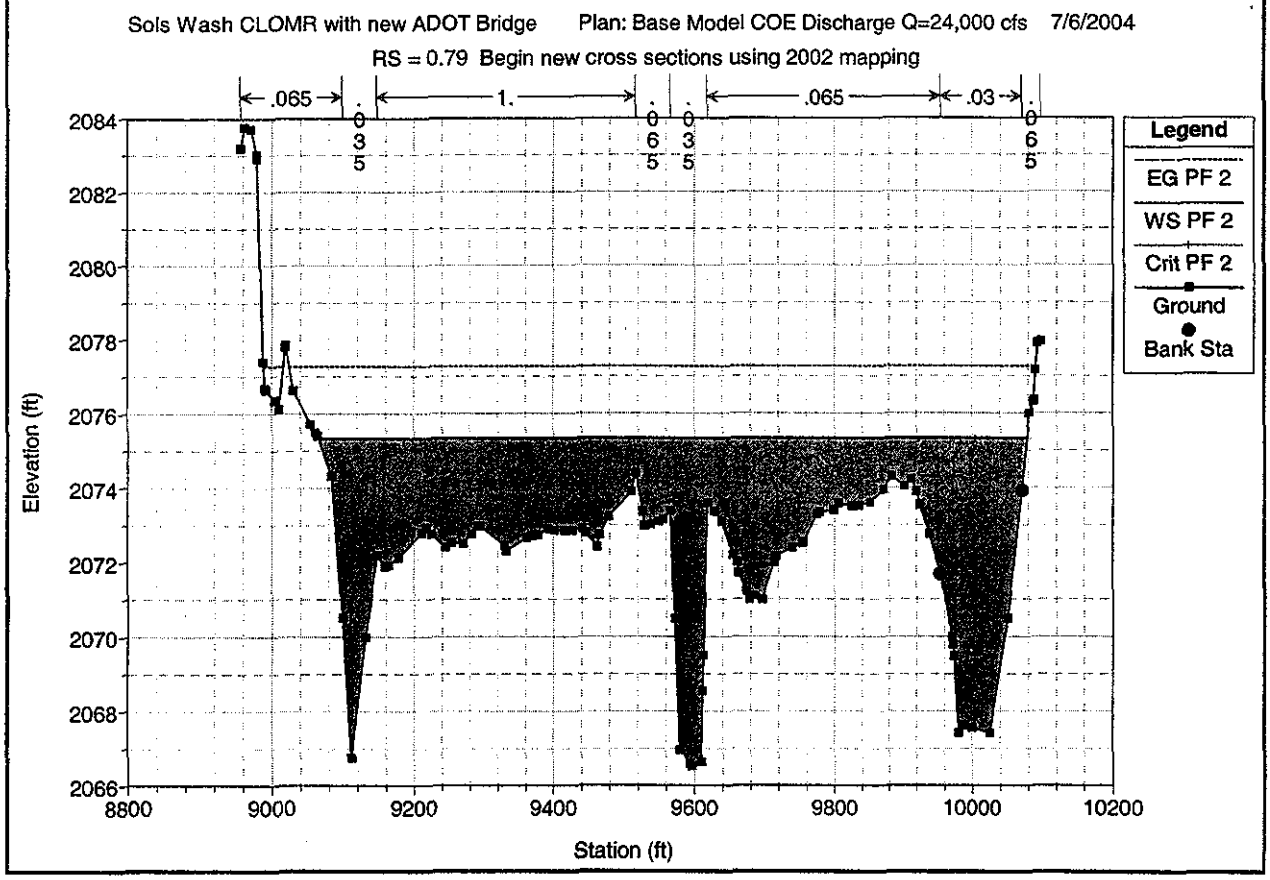


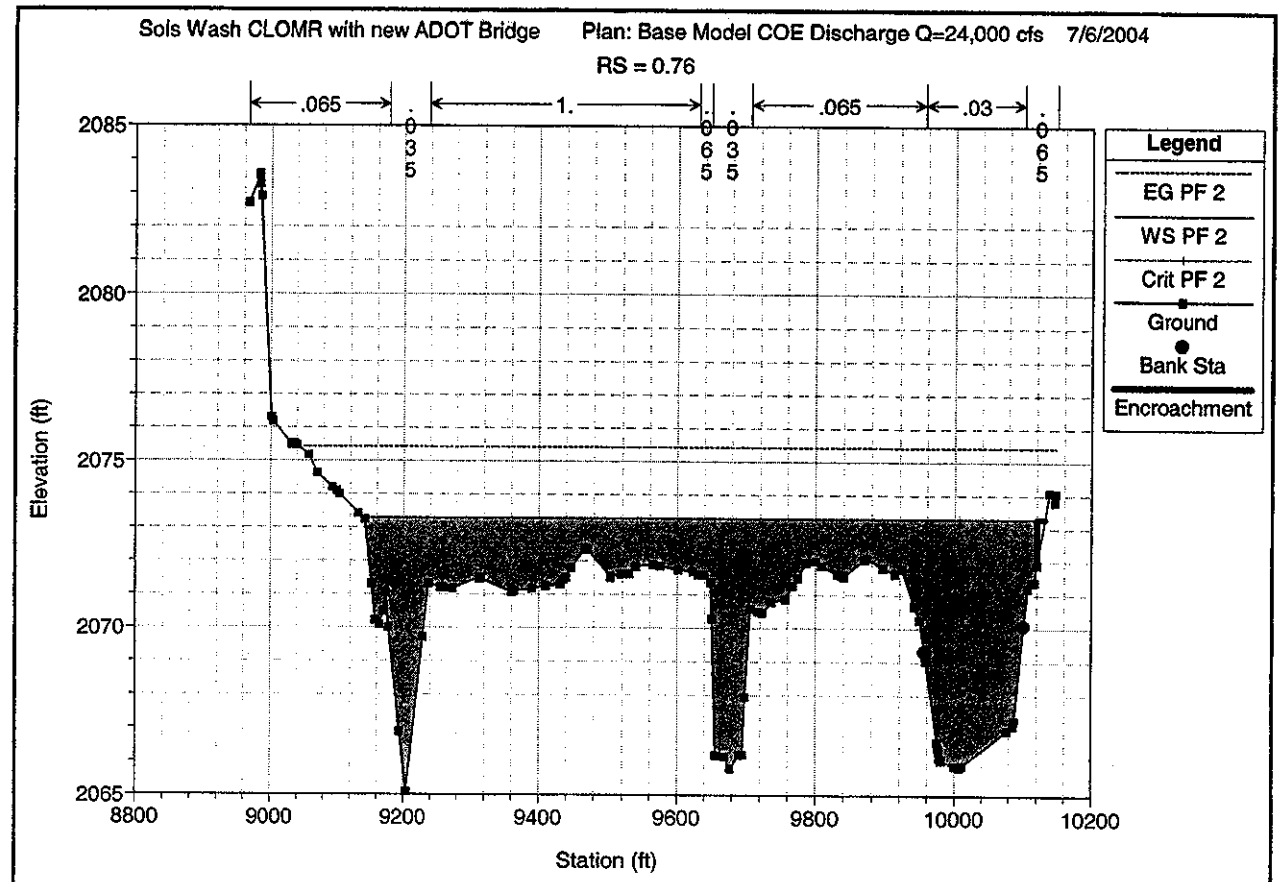
Sols Wash CLOMR with new ADOT Bridge Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004

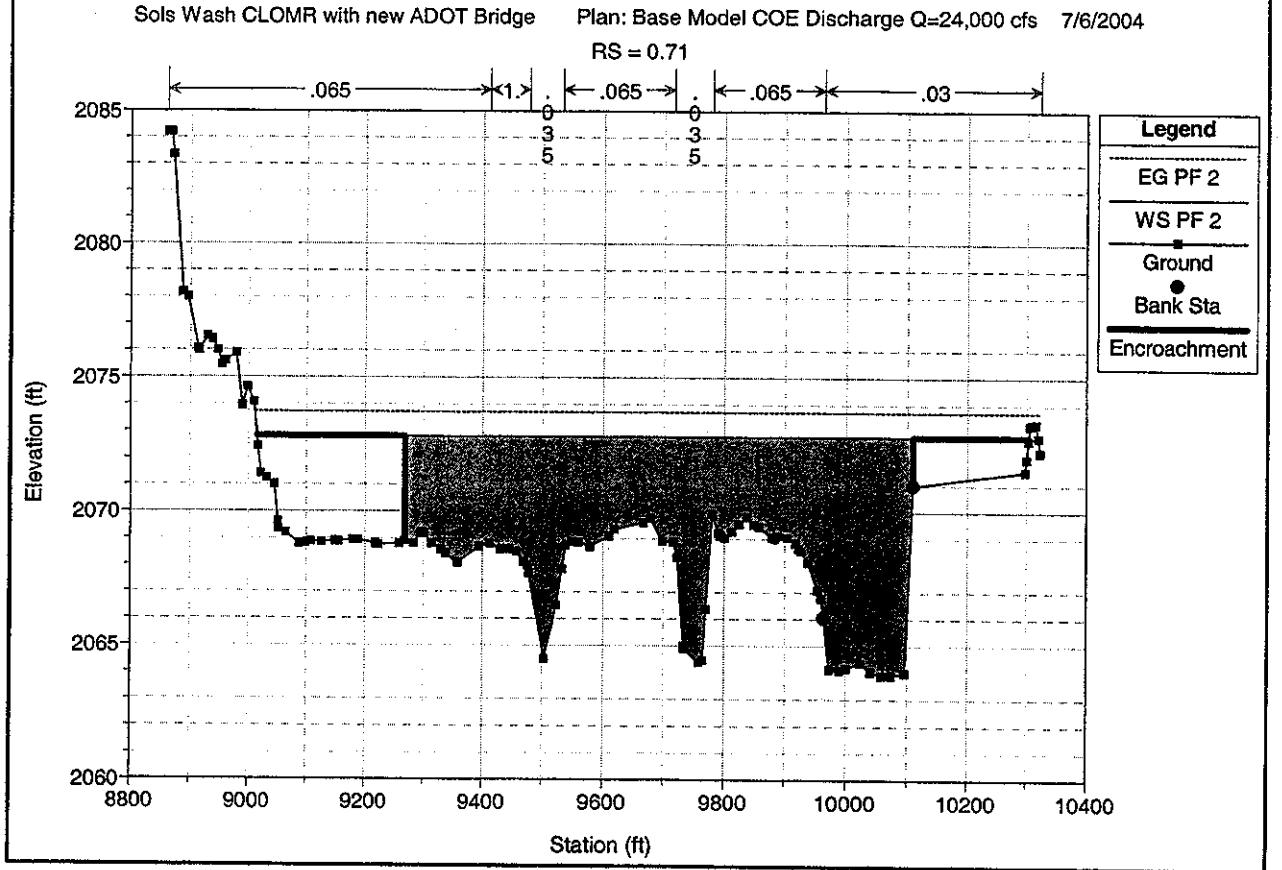
RS = 1.00 Cross Section 1.10 from CBA Study

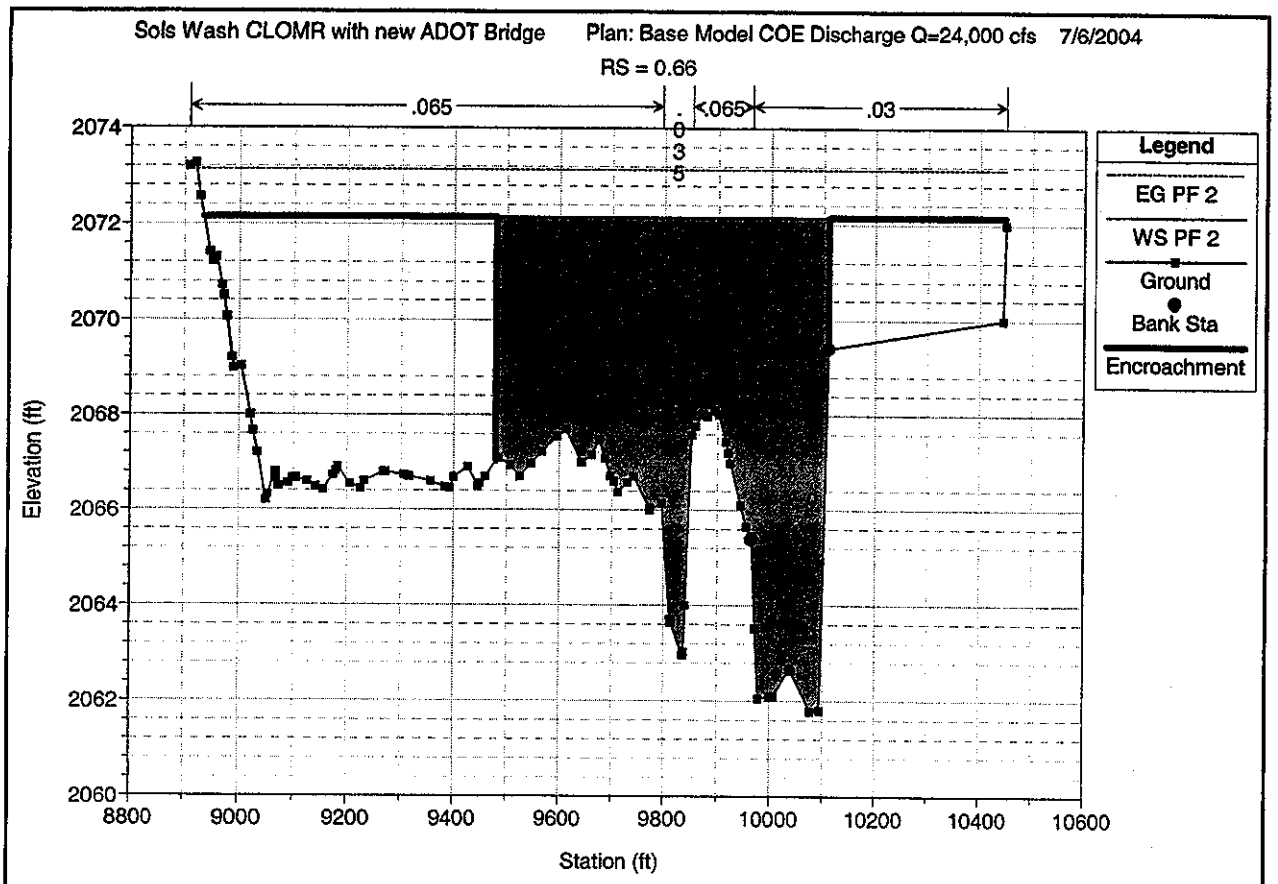


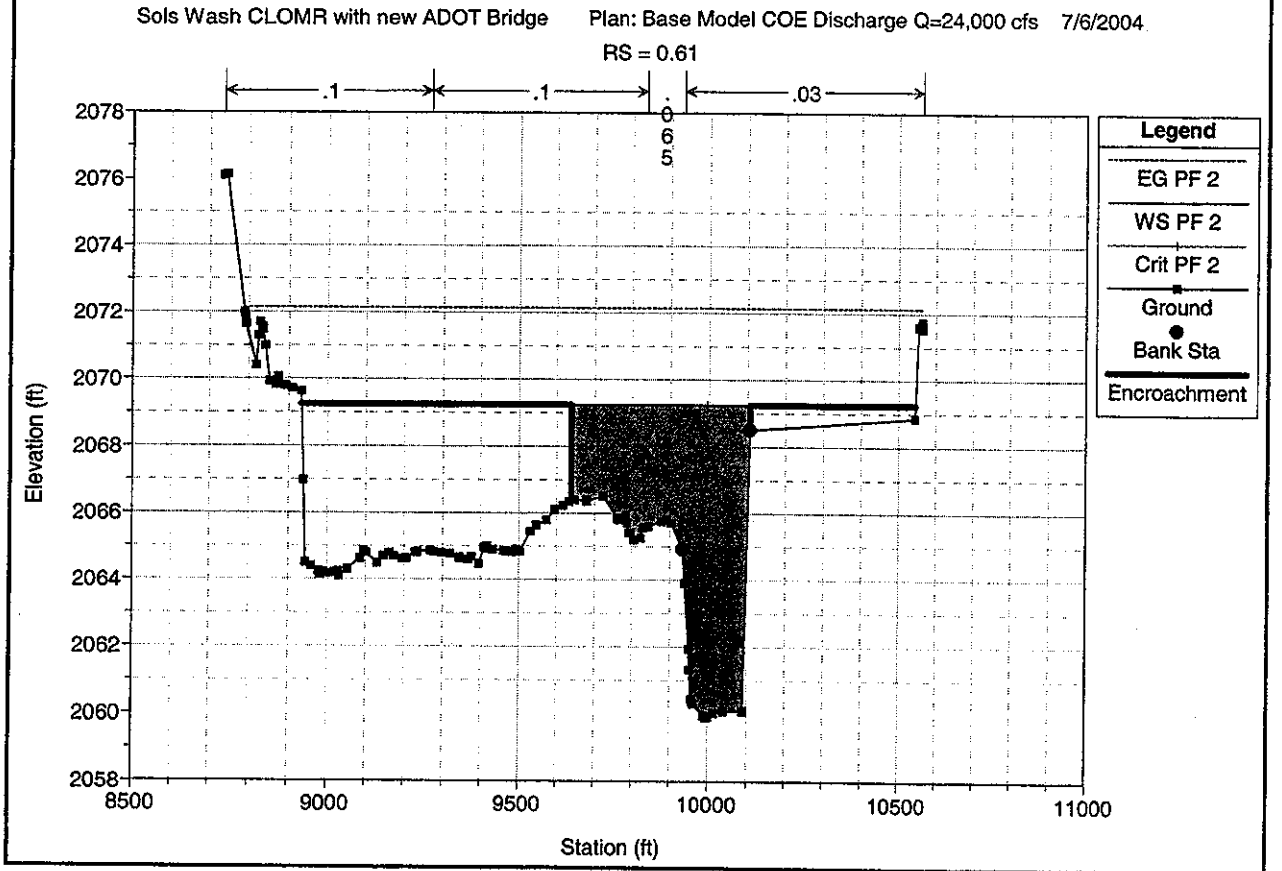

Sols Wash CLOMR with new ADOT Bridge Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.90 Cross Section 0.90 from CBA Study
1.
.065
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

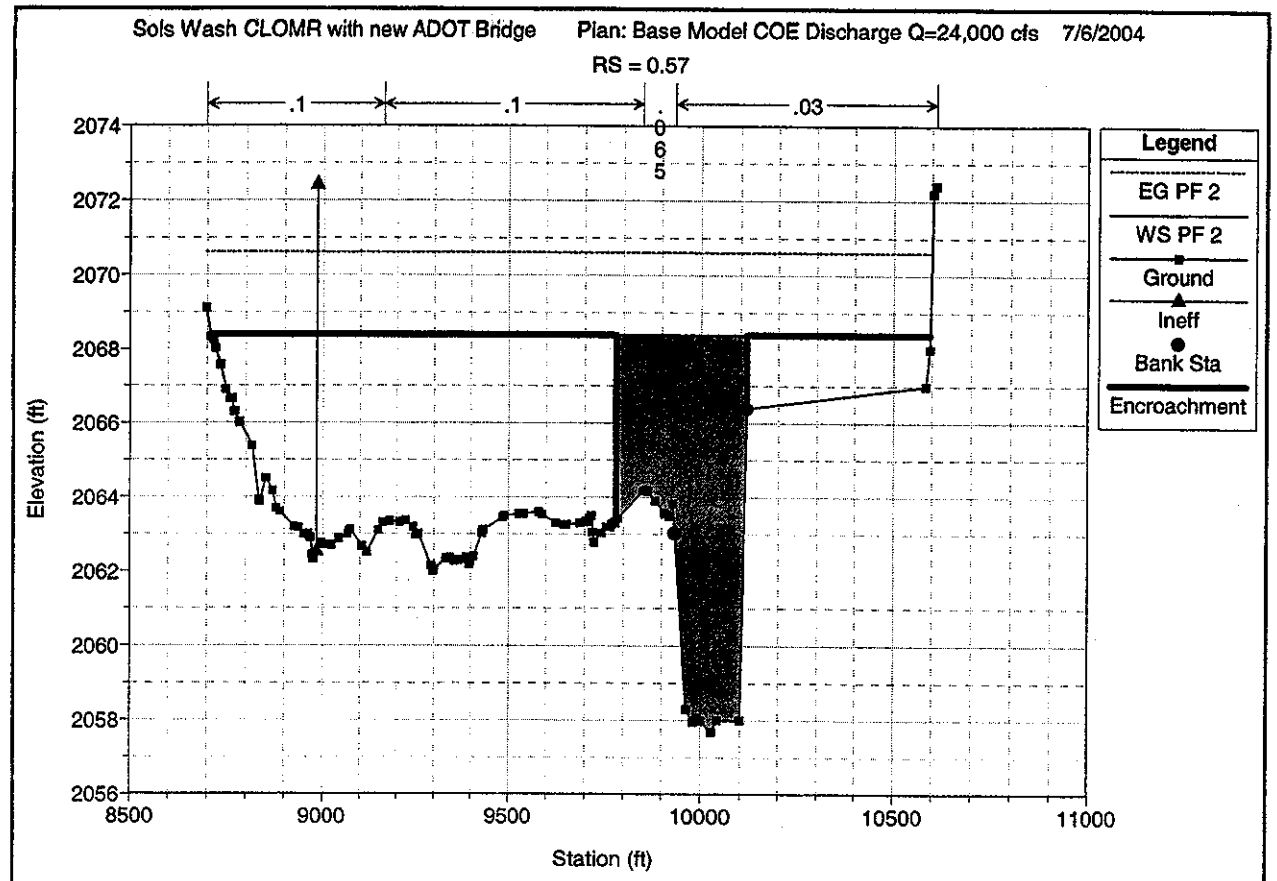

Sols Wash CLOMR with new ADOT Bridge Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.79 Begin new cross sections using 2002 mapping
.065
.035
1.
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

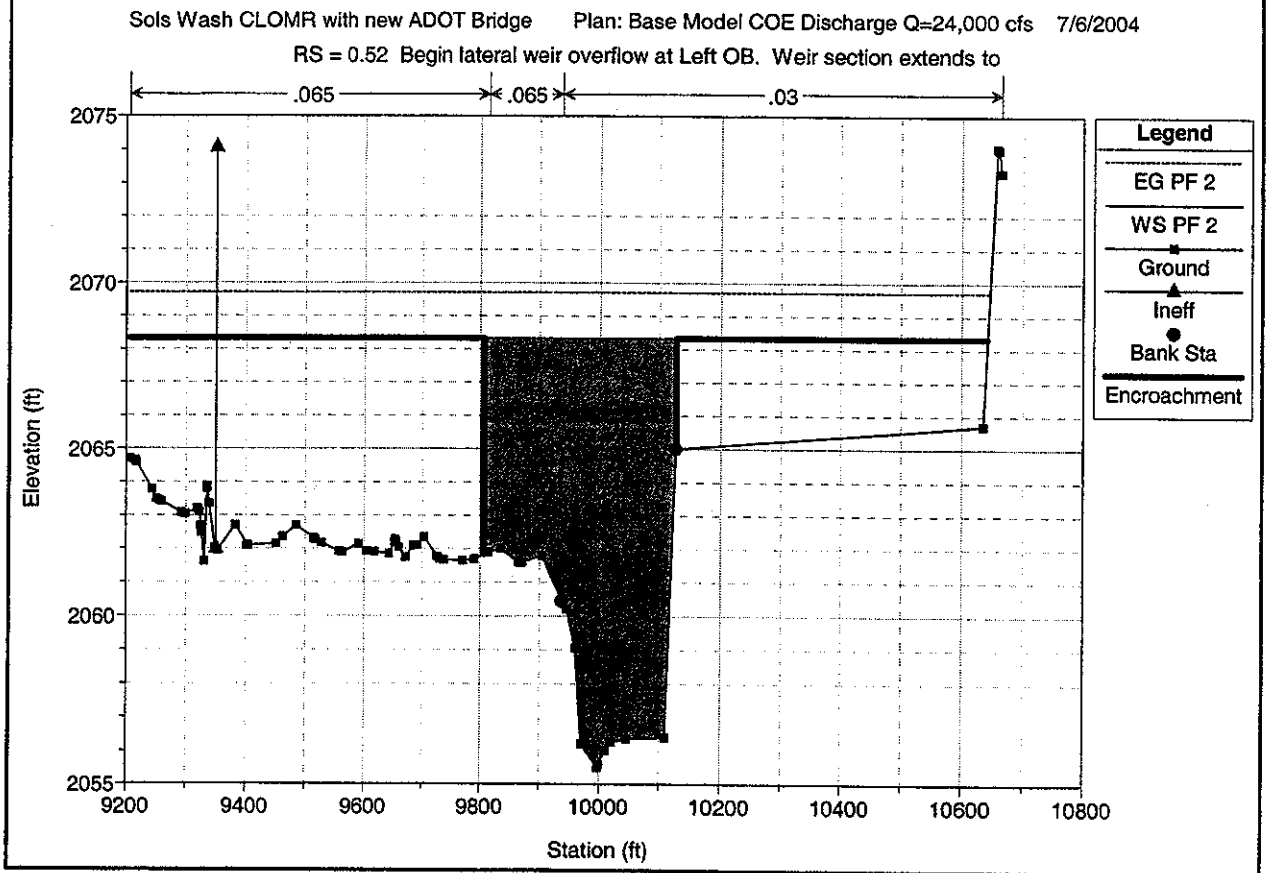

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.76
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2085
2080
2075
2070
2065
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.71
.065
1.
.035
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2085
2080
2075
2070
2065
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.66
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)

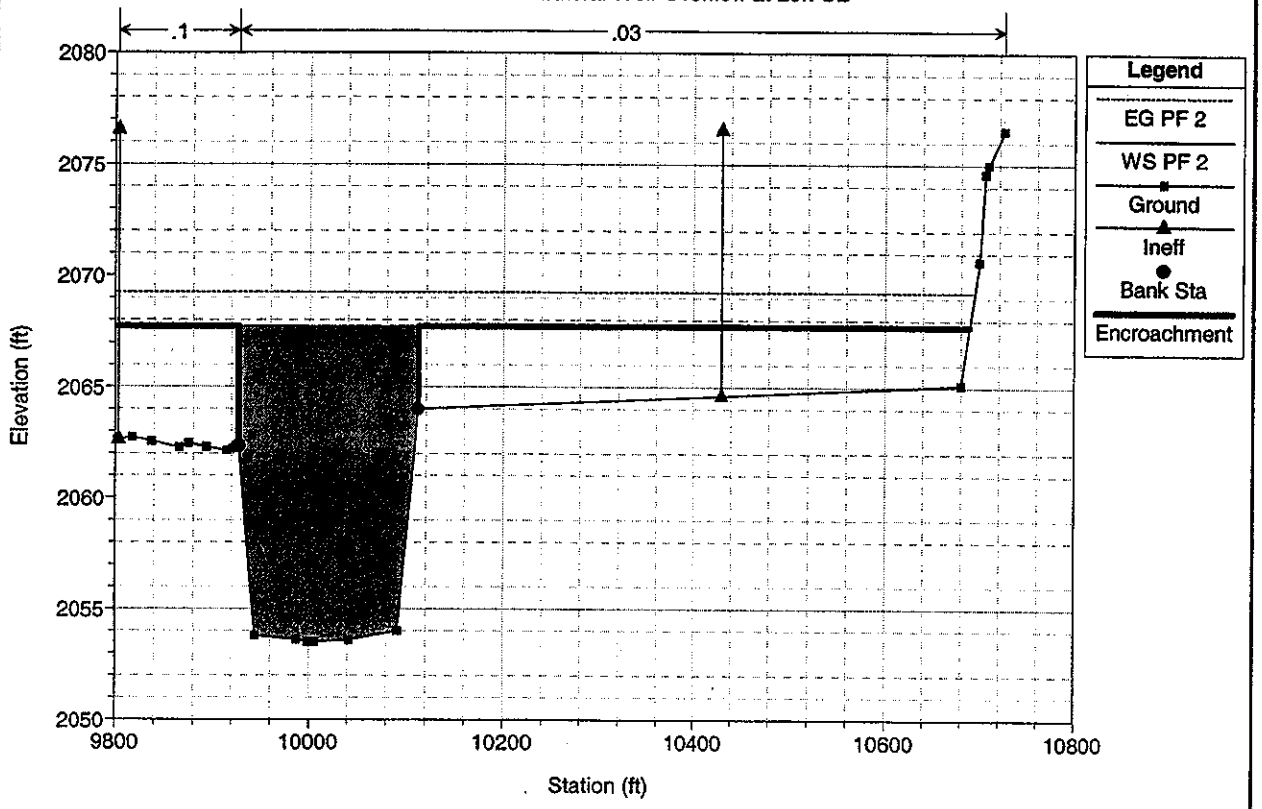

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.61
.1
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs
7/6/2004
RS = 0.57
.1
.1
.065
.03
Legend
EG PF 2
WS PF 2
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
2058
2056
8500
9000
9500
10000
10500
11000


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs
7/6/2004
RS = 0.52 Begin lateral weir overflow at Left OB. Weir section extends to
.065
.065
.03
Legend
EG PF 2
WS PF 2
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
Station (ft)
2075
2070
2065
2060
2055
9200
9400
9600
9800
10000
10200
10400
10600
10800

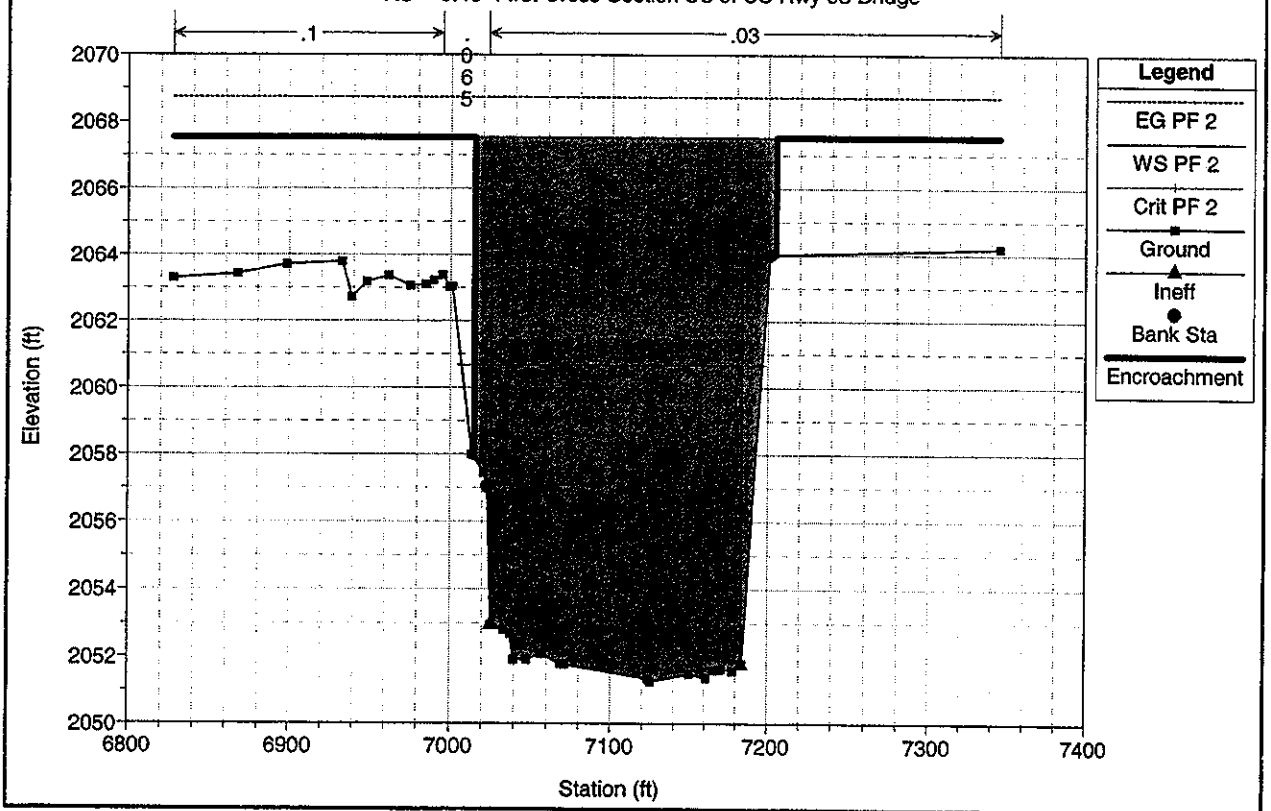
Sols Wash CLOMR with new ADOT Bridge Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004

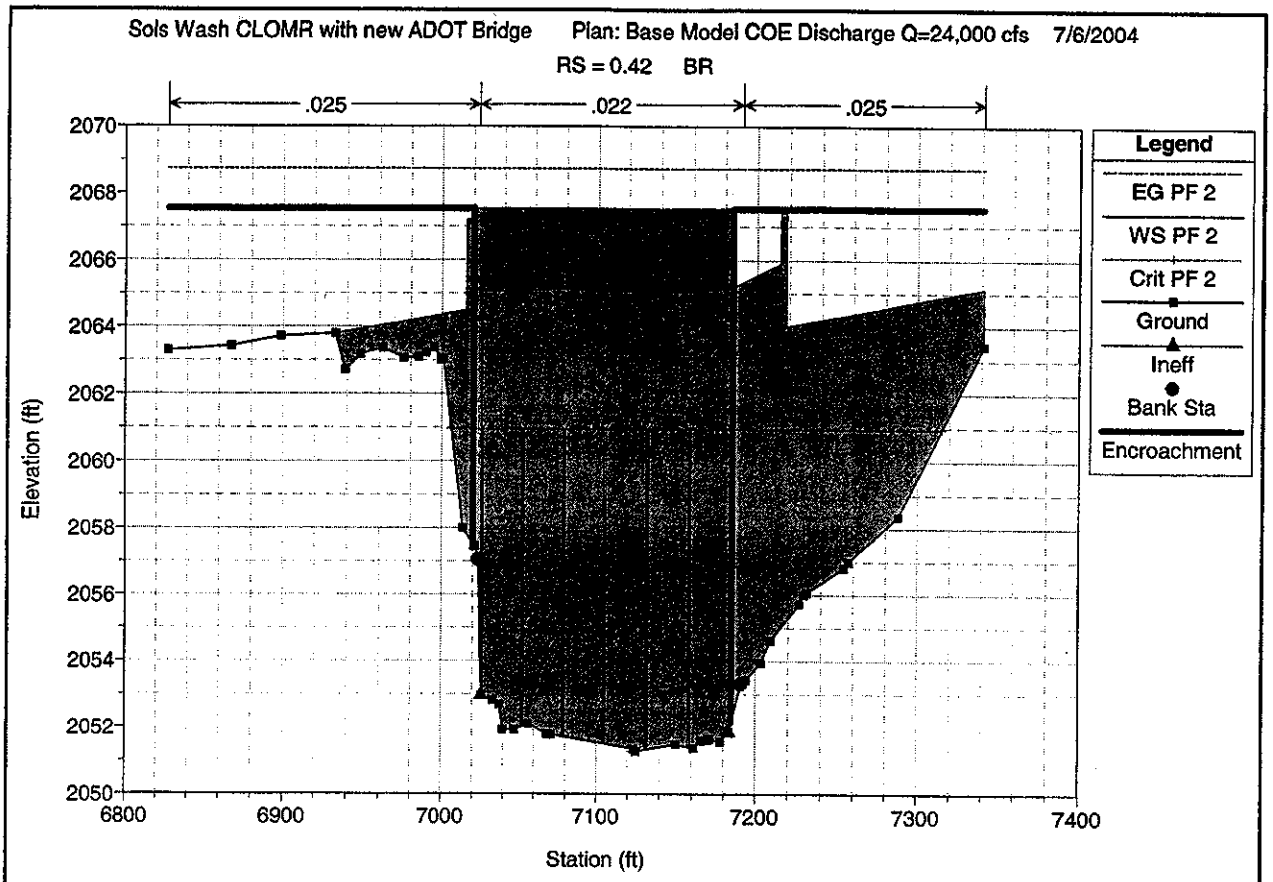
RS = 0.48 Lateral Weir Overflow at Left OB

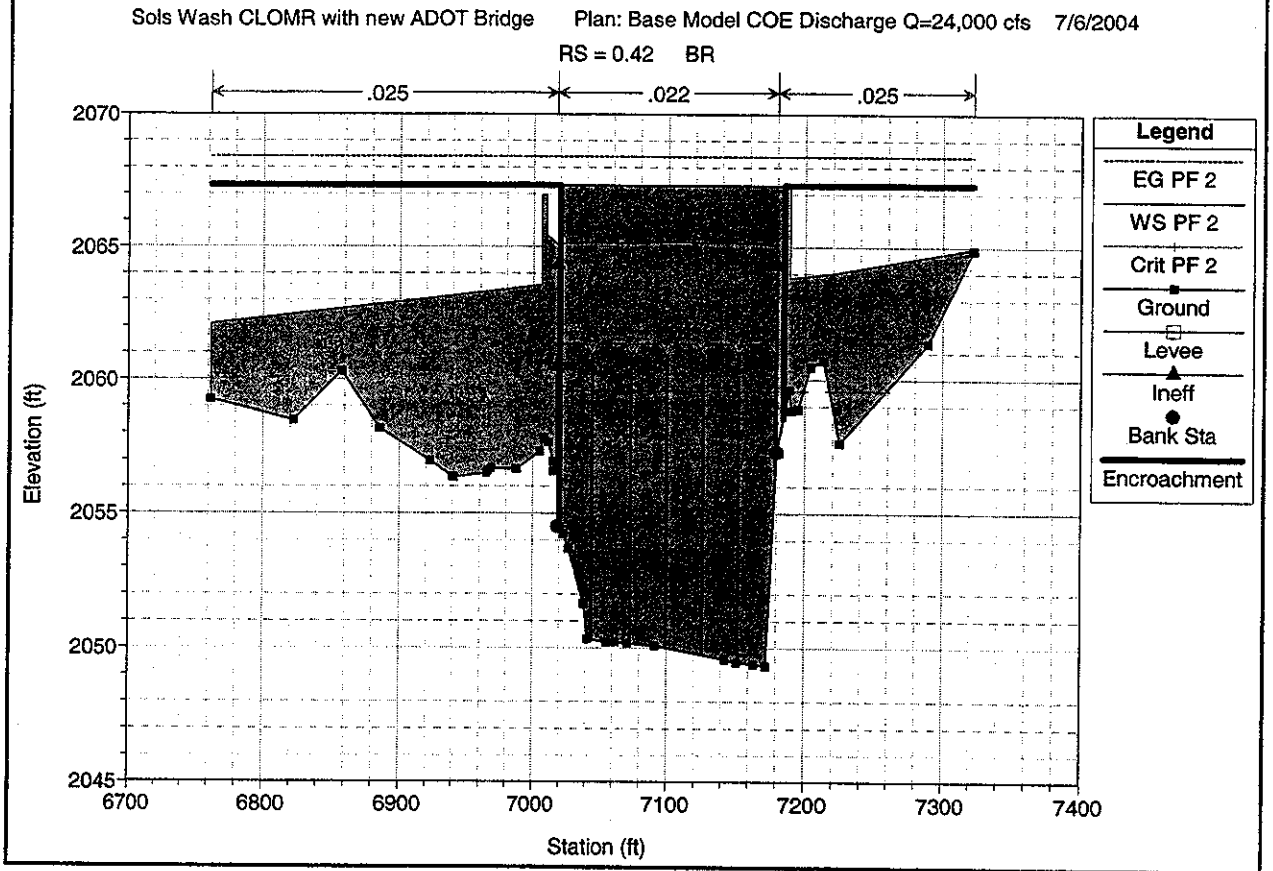


Sols Wash CLOMR with new ADOT Bridge Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004

RS = 0.43 First Cross Section US of US Hwy 93 Bridge

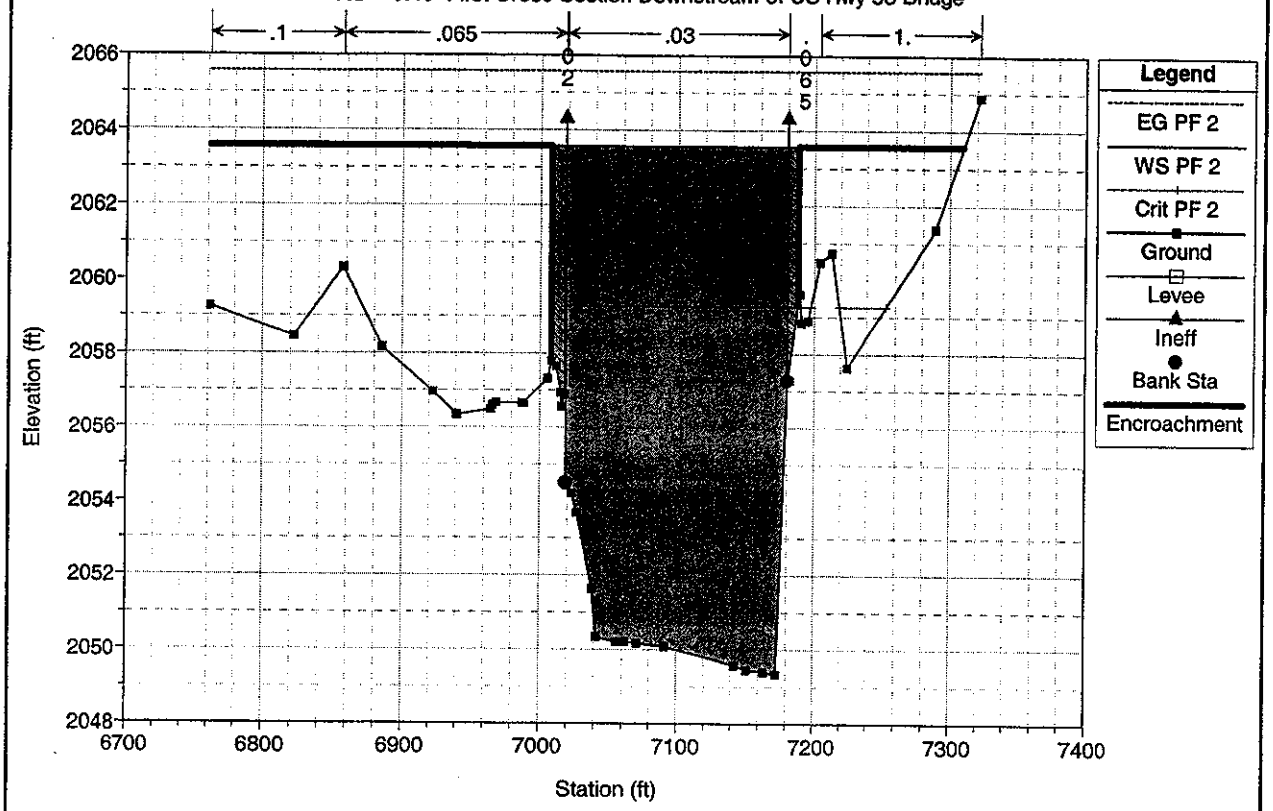



Sols Wash CLOMR with new ADOT Bridge Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.42 BR
.025
.022
.025
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Ineff
Bank Sta
Encroachment


Sols Wash CLOMR with new ADOT Bridge Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.42 BR
.025
.022
.025
Elevation (ft)
Station (ft)
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Encroachment

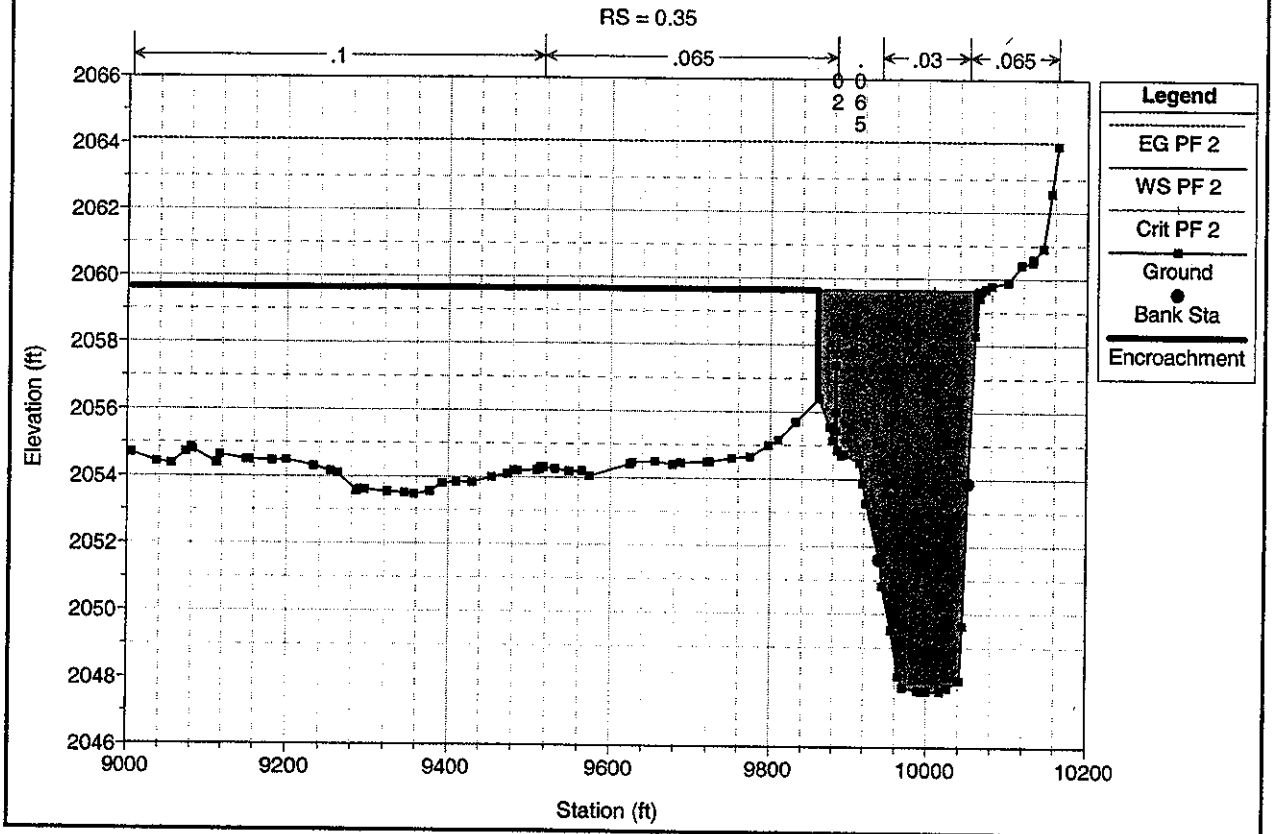
Sols Wash CLOMR with new ADOT Bridge Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004

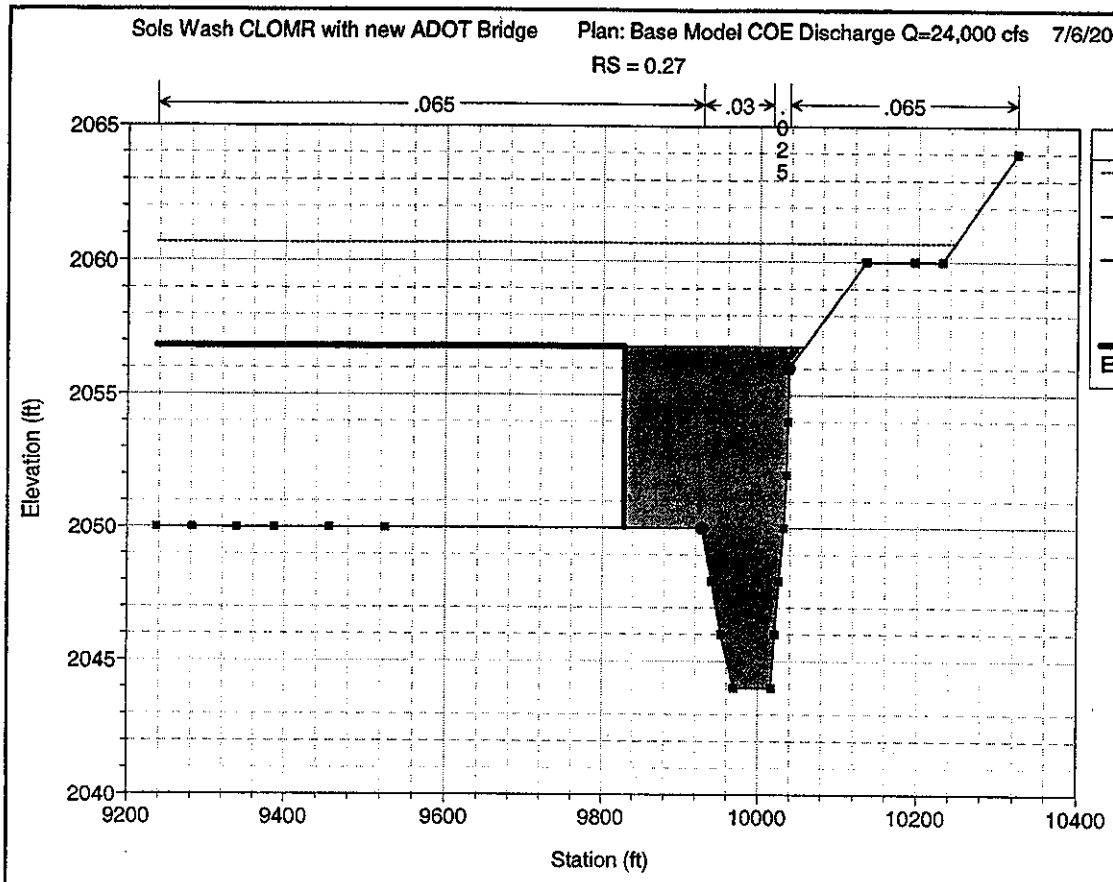
RS = 0.40 First Cross Section Downstream of US Hwy 93 Bridge

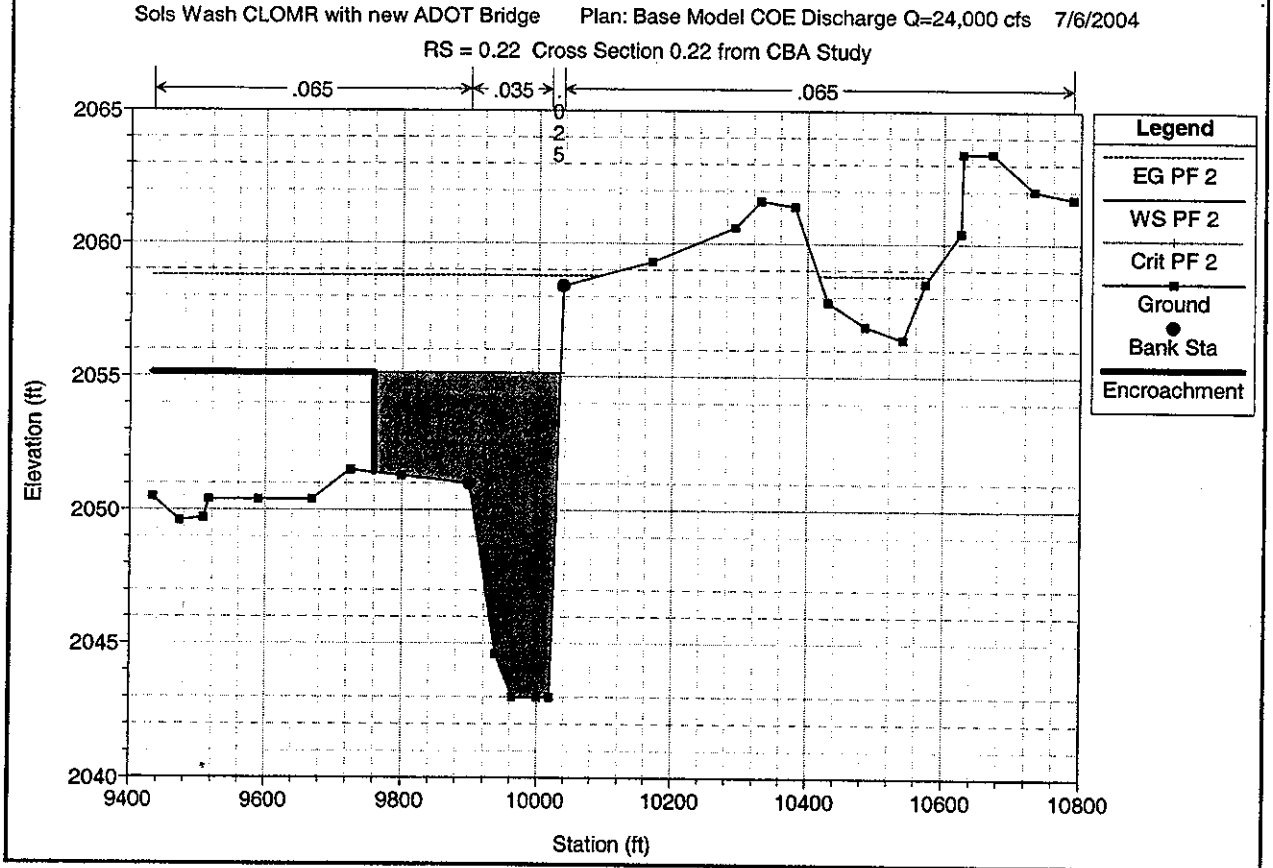


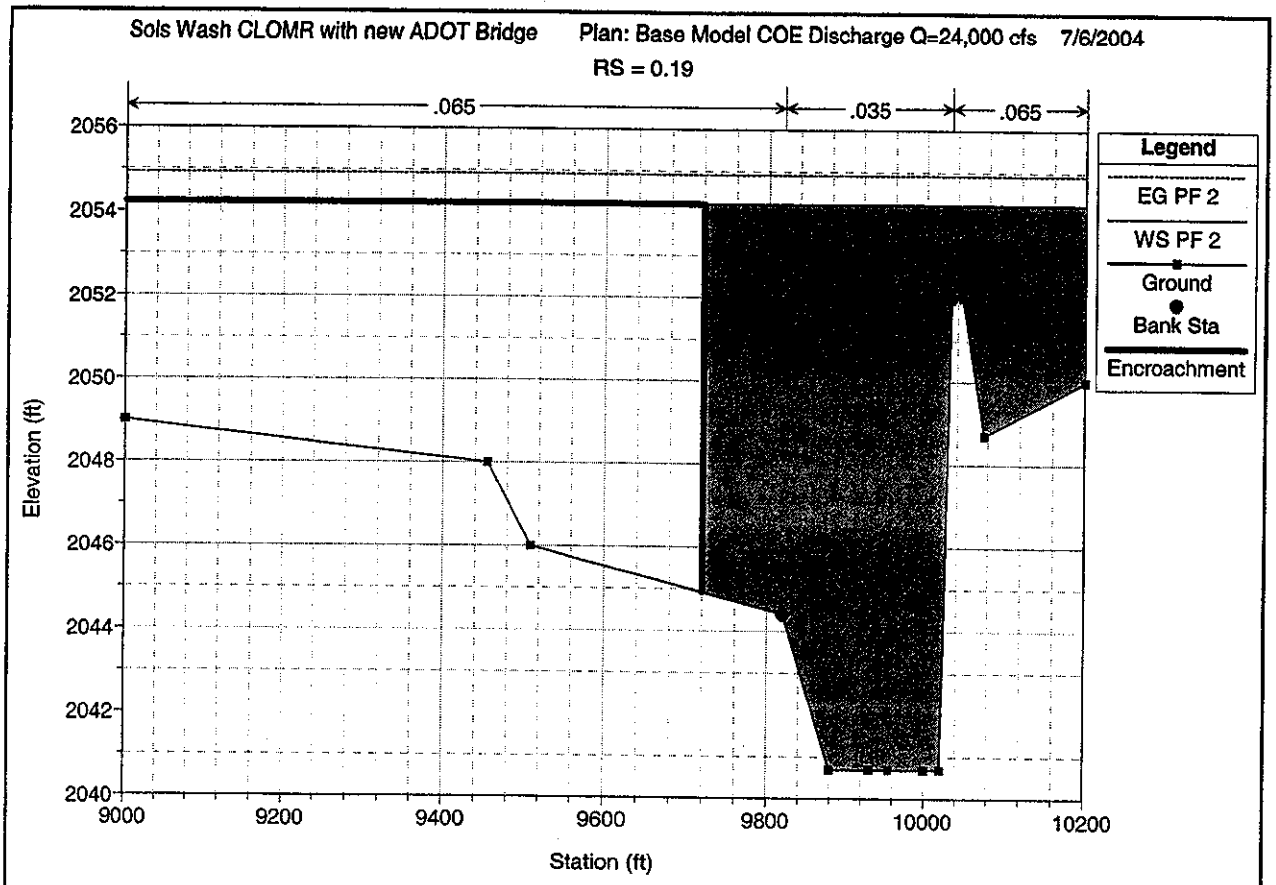
Sols Wash CLOMR with new ADOT Bridge Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004

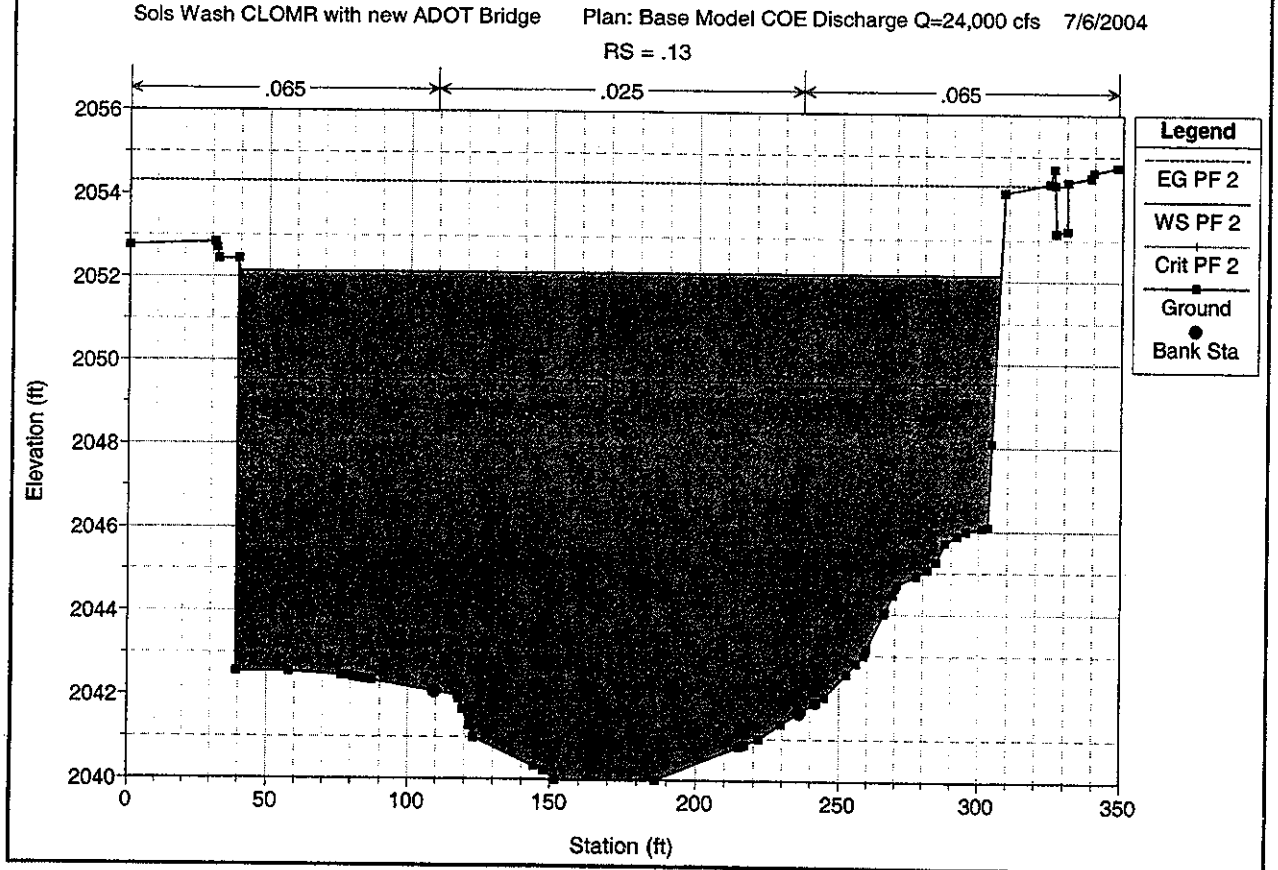
RS = 0.35

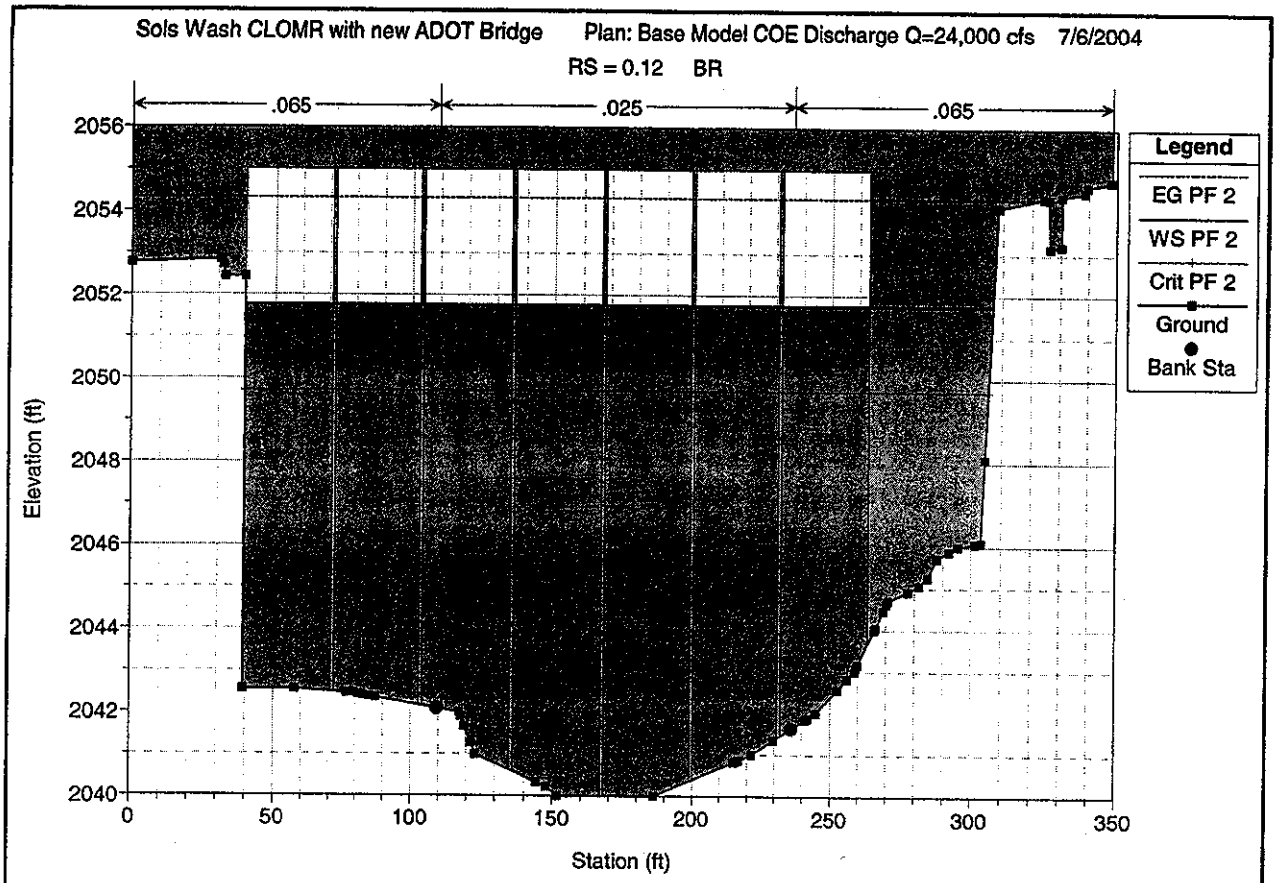


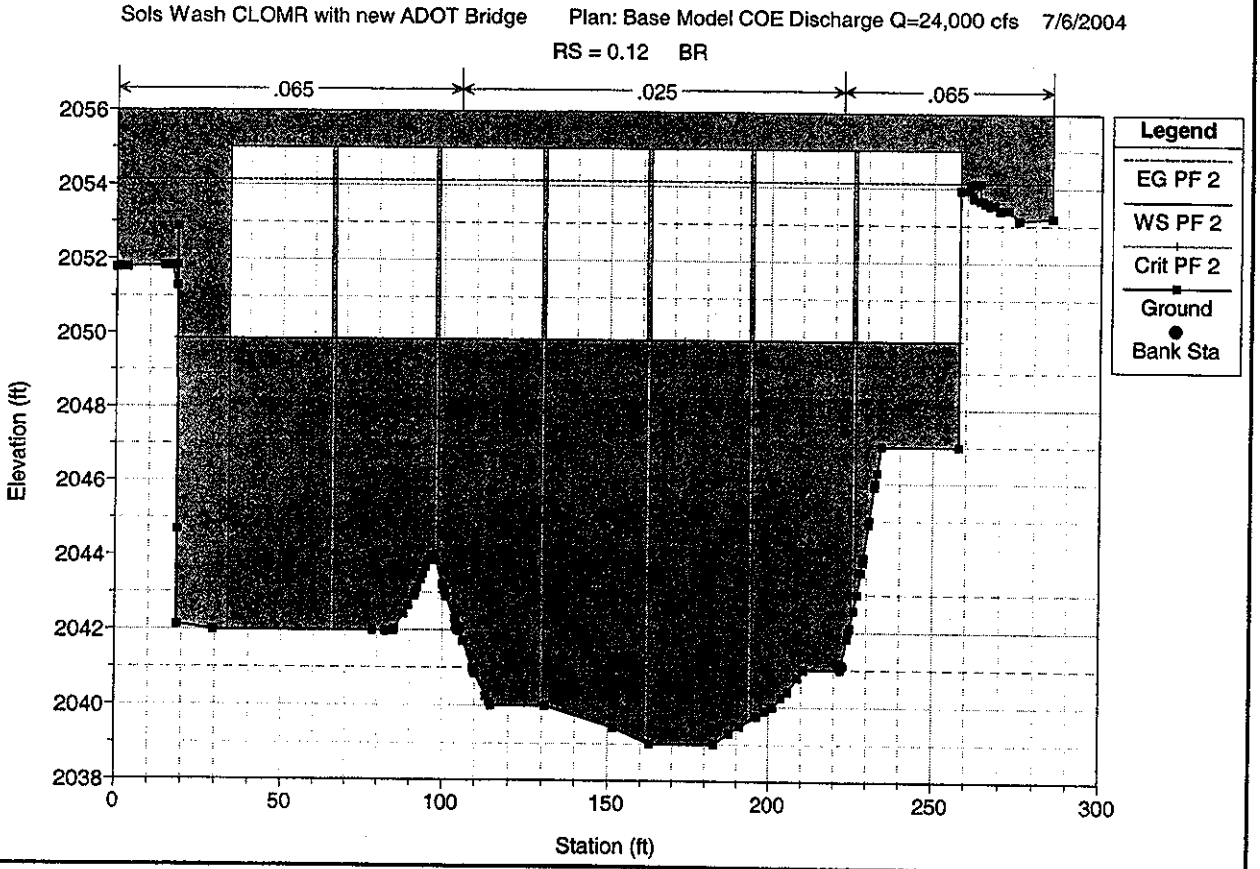

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.27
.065
.03
.025
.065
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2065
2060
2055
2050
2045
2040
9200
9400
9600
9800
10000
10200
10400
Station (ft)

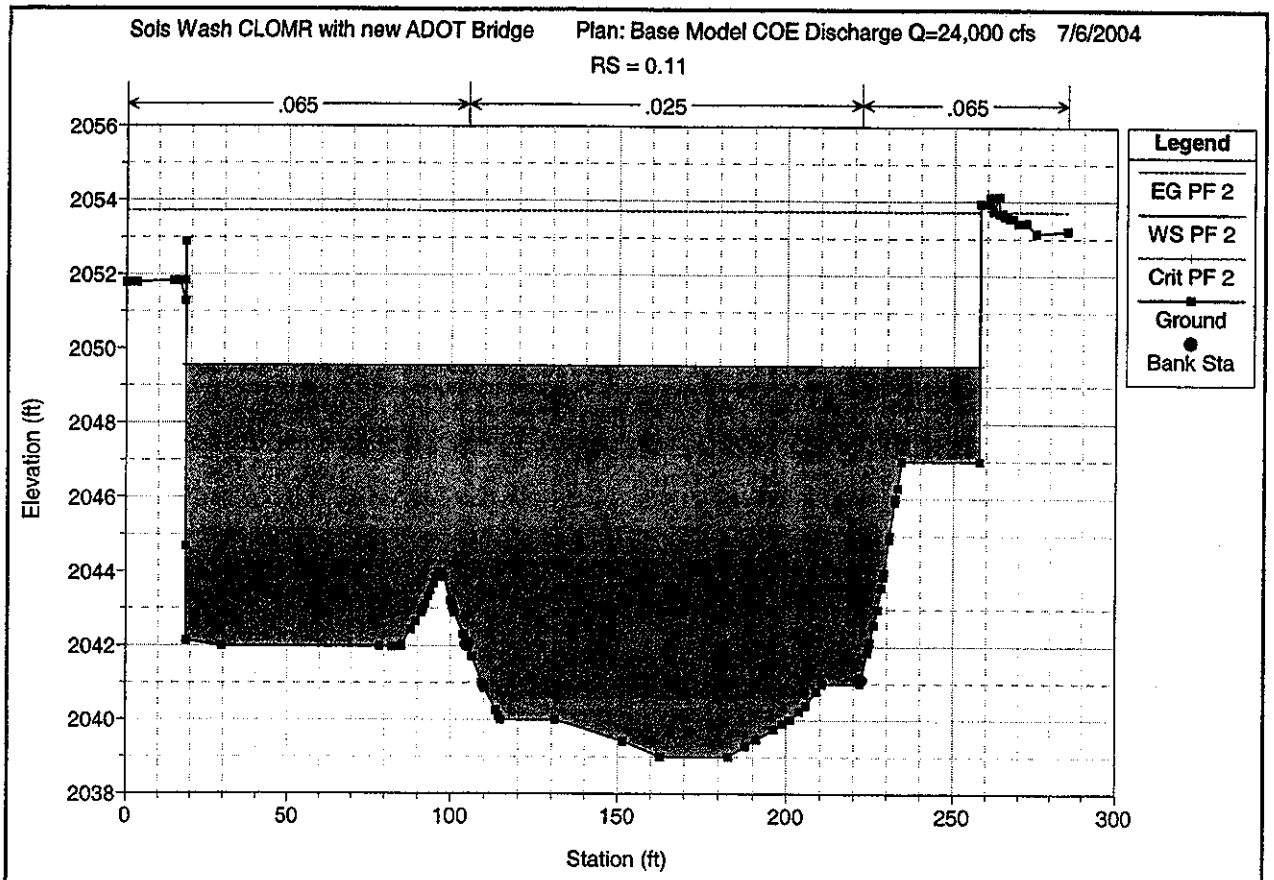

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.22 Cross Section 0.22 from CBA Study
.065
.035
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2065
2060
2055
2050
2045
2040
9400
9600
9800
10000
10200
10400
10600
10800
Station (ft)

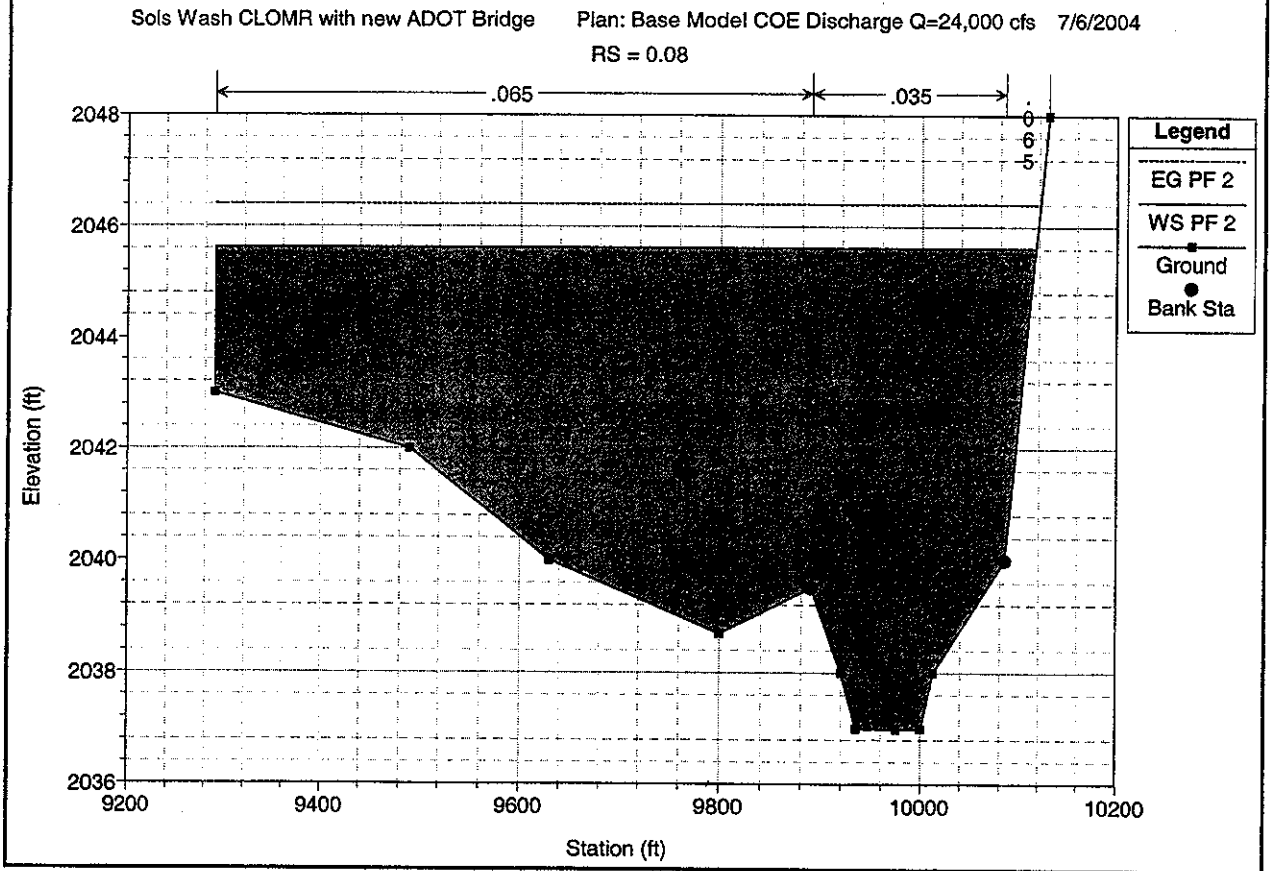

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.19
.065
.035
.065
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
9000
9200
9400
9600
9800
10000
10200
Station (ft)

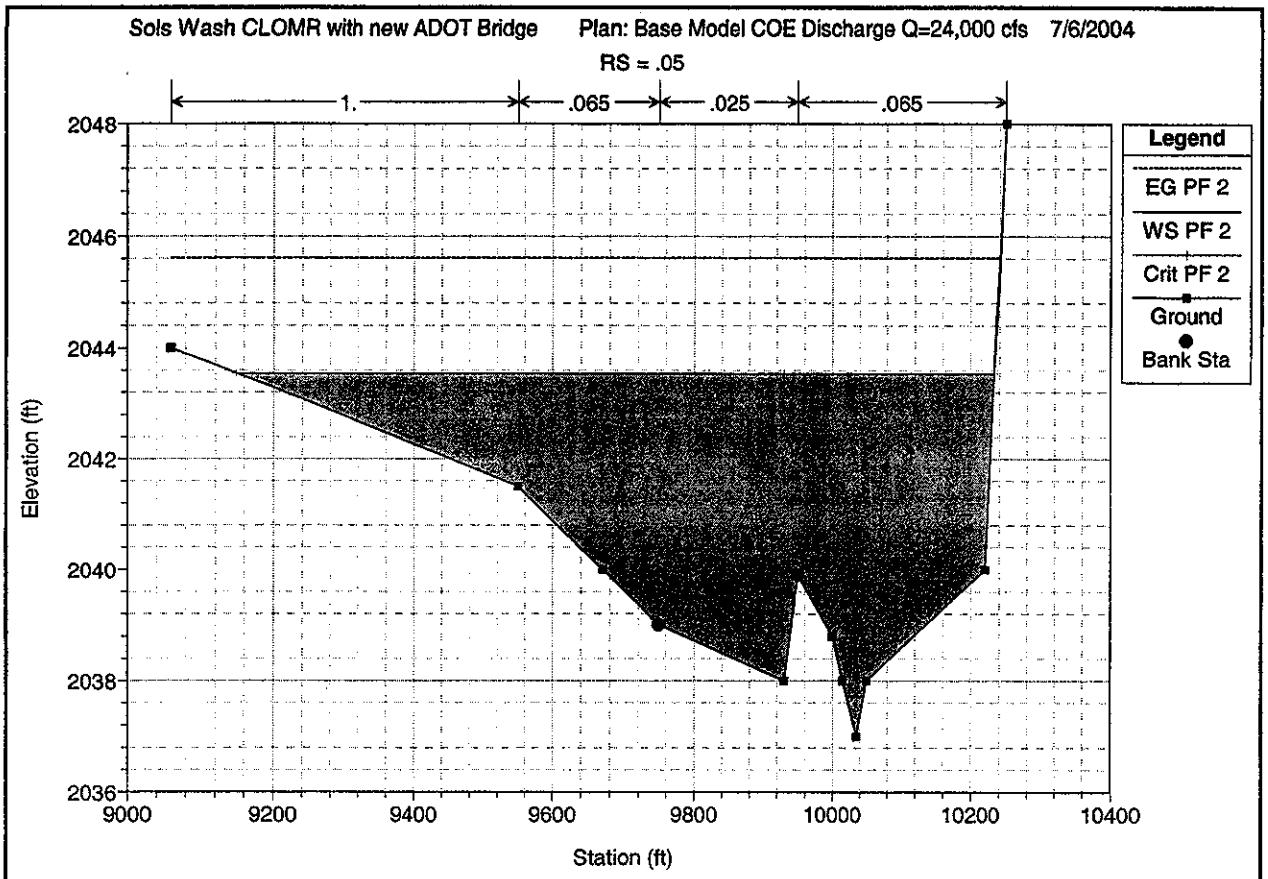

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = .13
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
0
50
100
150
200
250
300
350
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.11
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
2038
0
50
100
150
200
250
300
Station (ft)

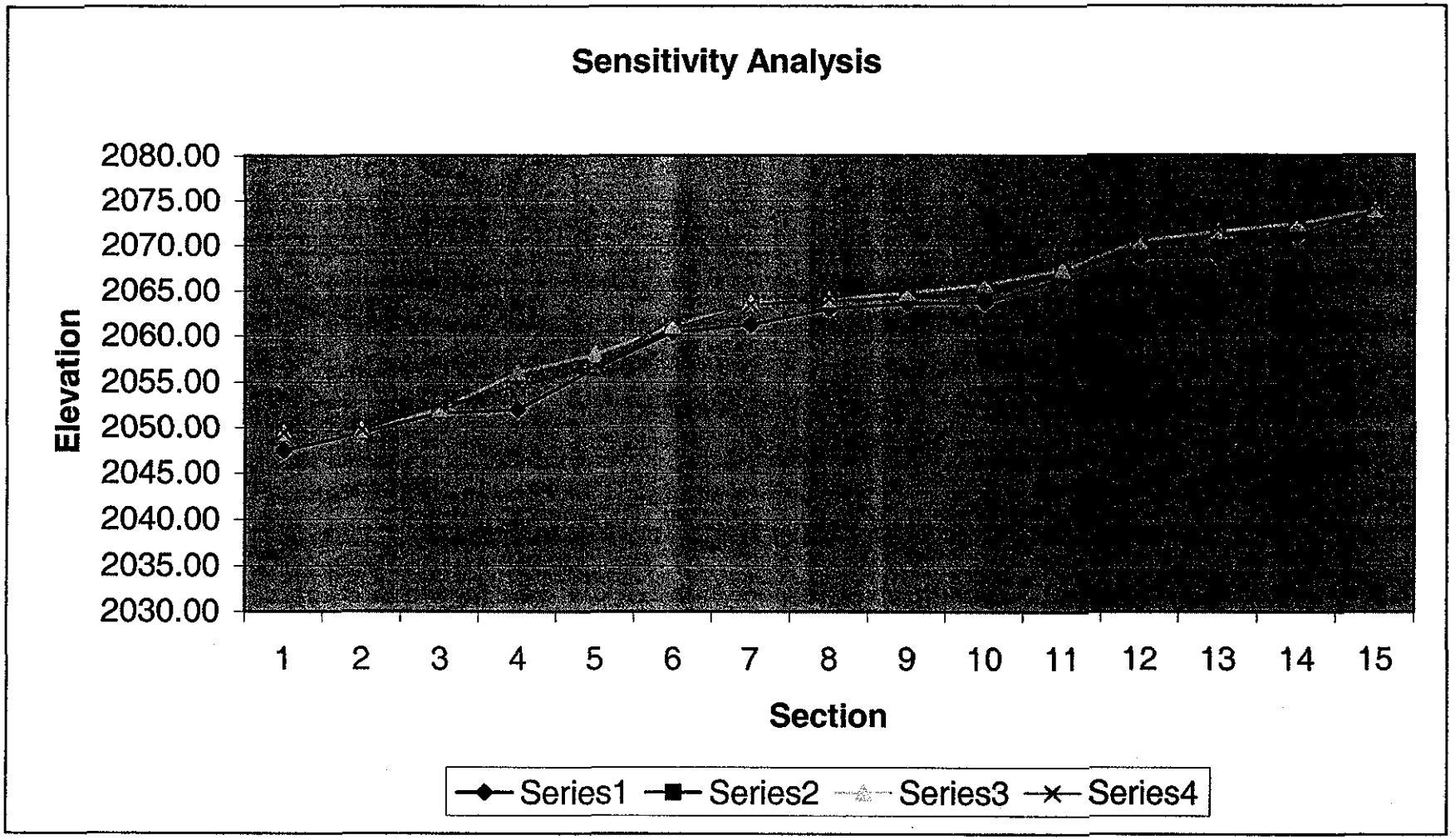

Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs 7/6/2004
RS = 0.08
.065
.035
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9200
9400
9600
9800
10000
10200
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Base Model COE Discharge Q=24,000 cfs
7/6/2004
RS = .05
1.
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

ATTACHMENT L:
SENSITIVITY ANALYSIS

SENSITIVITY ANALYSIS

Section	n=.02	n=.03	n=.04	n=.05
	Water Surface Elevations for "n"			
0.13	2047.45	2049.40	2049.40	2049.40
0.19	2049.40	2049.70	2049.70	2049.70
0.22	2051.58	2052.04	2052.04	2052.49
0.27	2052.00	2054.65	2056.07	2054.12
0.35	2056.50	2056.46	2057.98	2056.51
0.40	2060.38	2060.83	2061.09	2061.82
0.43	2061.23	2063.64	2063.64	2063.43
0.48	2063.02	2063.89	2064.11	2064.21
0.52	2063.64	2064.21	2064.85	2065.39
0.57	2063.72	2064.67	2065.74	2066.55
0.61	2066.37	2066.89	2067.40	2068.44
0.66	2068.62	2069.70	2070.45	2070.96
0.71	2068.78	2071.02	2071.54	2071.86
0.76	2071.11	2071.96	2072.44	2073.01
0.79	2073.80	2073.90	2073.95	2074.26


Sensitivity Analysis
Elevation
2080.00
2075.00
2070.00
2065.00
2060.00
2055.00
2050.00
2045.00
2040.00
2035.00
2030.00
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Section
Series1
Series2
Series3
Series4

HEC-RAS Plan: n=.02 River: Sols Wash Reach: Reach 1 Profile: PF 2

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	[illegible]	PF 2	14413.00	2082.30	20[illegible]	[illegible]	2089.89	0.004414	12.19	2057.58	880.77	0.92
Reach 1	[illegible]	PF 2	14413.00	2078.10	2[illegible]	[illegible]	[illegible] 33	0.004281	12.19	2886.35	1711.00	0.91
Reach 1	[illegible]	PF 2	14413.00	2073.10	[illegible]	[illegible]	[illegible]	[illegible]006360	11.72	2697.71	1392.79	0.90
Reach 1	[illegible]	PF 2	14413.00	2067.42	[illegible]	[illegible]	[illegible]	[illegible]	13.32	1886.69	924.15	1.09
Reach 1	[illegible]	PF 2	14413.00	2065.84	[illegible]	[illegible]	[illegible]	[illegible]	11.56	1634.44	882.15	0.89
Reach 1	[illegible]	PF 2	14413.00	2063.89	[illegible]	[illegible]	[illegible]	[illegible]	12.00	1649.22	651.29	0.90
Reach 1	[illegible]	PF 2	14413.00	2061.79	[illegible]	[illegible]	[illegible]	[illegible]	12.97	1410.90	365.69	0.93
Reach 1	[illegible]	PF 2	14459.00	2059.91	[illegible]	[illegible]	[illegible]	[illegible]	13.77	1092.15	200.58	0.98
Reach 1	[illegible]	PF 2	14459.00	2057.69	[illegible]	[illegible]	[illegible]	[illegible]	13.67	1064.24	185.53	0.99
Reach 1	[illegible]	PF 2	14459.00	2055.50	[illegible]	[illegible]	[illegible]	[illegible]	11.70	1305.48	219.28	0.80
Reach 1	[illegible]	PF 2	15045.00	2053.51	[illegible]	[illegible]	[illegible]	[illegible]	9.01	1669.82	184.16	0.53
Reach 1	[illegible]	PF 2	15045.00	2051.2[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8.00	1880.98	201.36	0.41
Reach 1	[illegible]		Bridge									
Reach 1	[illegible]	PF 2	15045.00	2049.33	2060.38	[illegible]	[illegible]	[illegible]3	9.08	1657.35	243.01	0.50
Reach 1	[illegible]	PF 2	15045.00	2047.68	2056.50	2056.[illegible]	[illegible]	[illegible]48	16.11	939.81	117.88	1.00
Reach 1	[illegible]	PF 2	15045.00	2044.00	2053.26	2053.26	205[illegible]	[illegible]20	16.58	907.65	105.41	1.00
Reach 1	[illegible]	PF 2	15045.00	2043.00	2052.04	2052.04	2056.06	[illegible]835	16.09	934.98	115.47	1.00
Reach 1	[illegible]	PF 2	15045.00	2040.69	2049.70	2049.70	2053.59	0.003507	15.82	950.82	121.19	1.00
Reach 1	[illegible]	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	[illegible]		Bridge									
Reach 1	[illegible]	PF 2	15045.00	2039.00	2047.25	2047.25	2050.36	0.004473	15.08	1349.67	239.45	0.98
Reach 1	[illegible]	PF 2	15045.00	2036.99	2044.19		2044.79	0.002923	7.67	3305.61	818.56	0.55
Reach 1	[illegible]	PF 2	15045.00	2038.00	2043.52	2042.38	2044.34	0.002757	9.09	3336.53	1079.12	0.72

SENSITIVITY

n=.02

n=.03

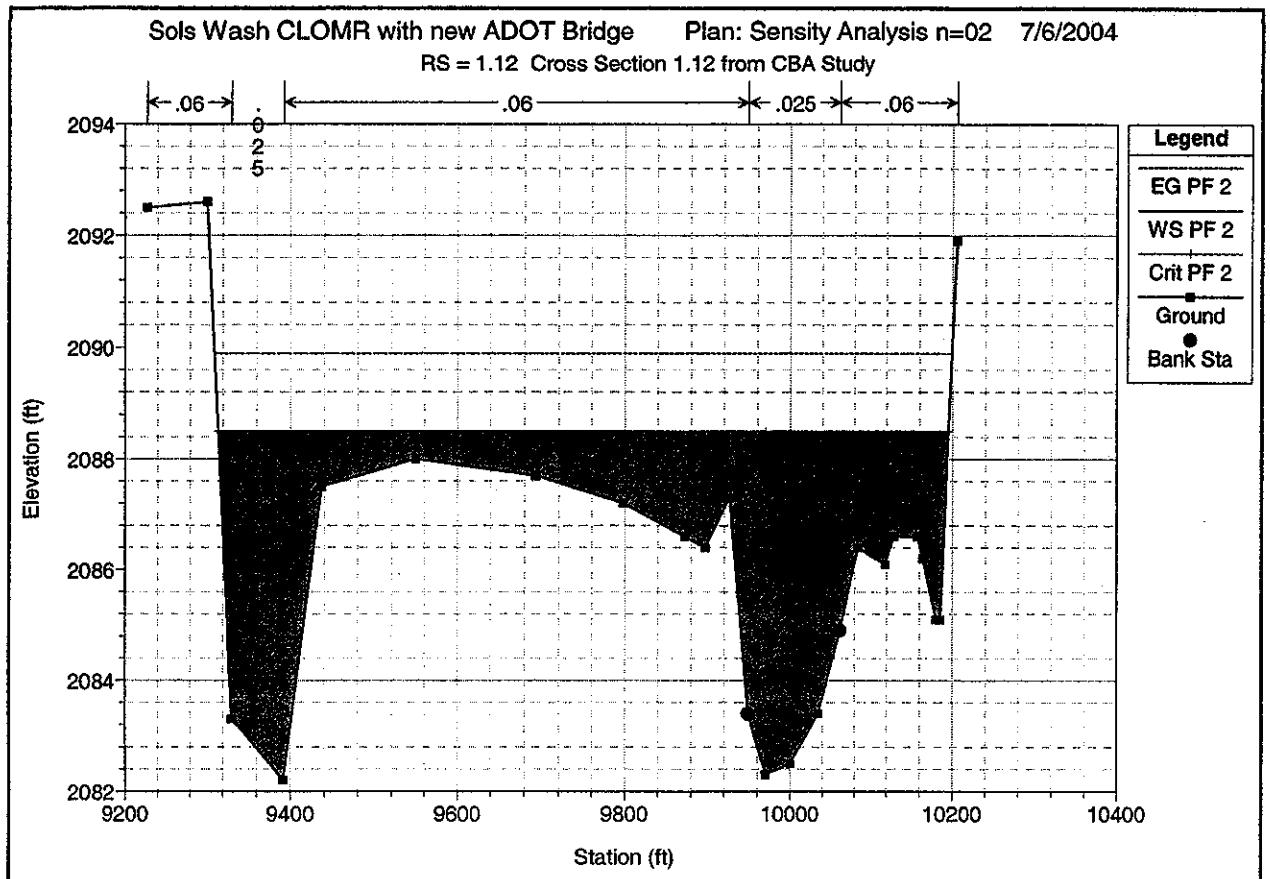
n=.04

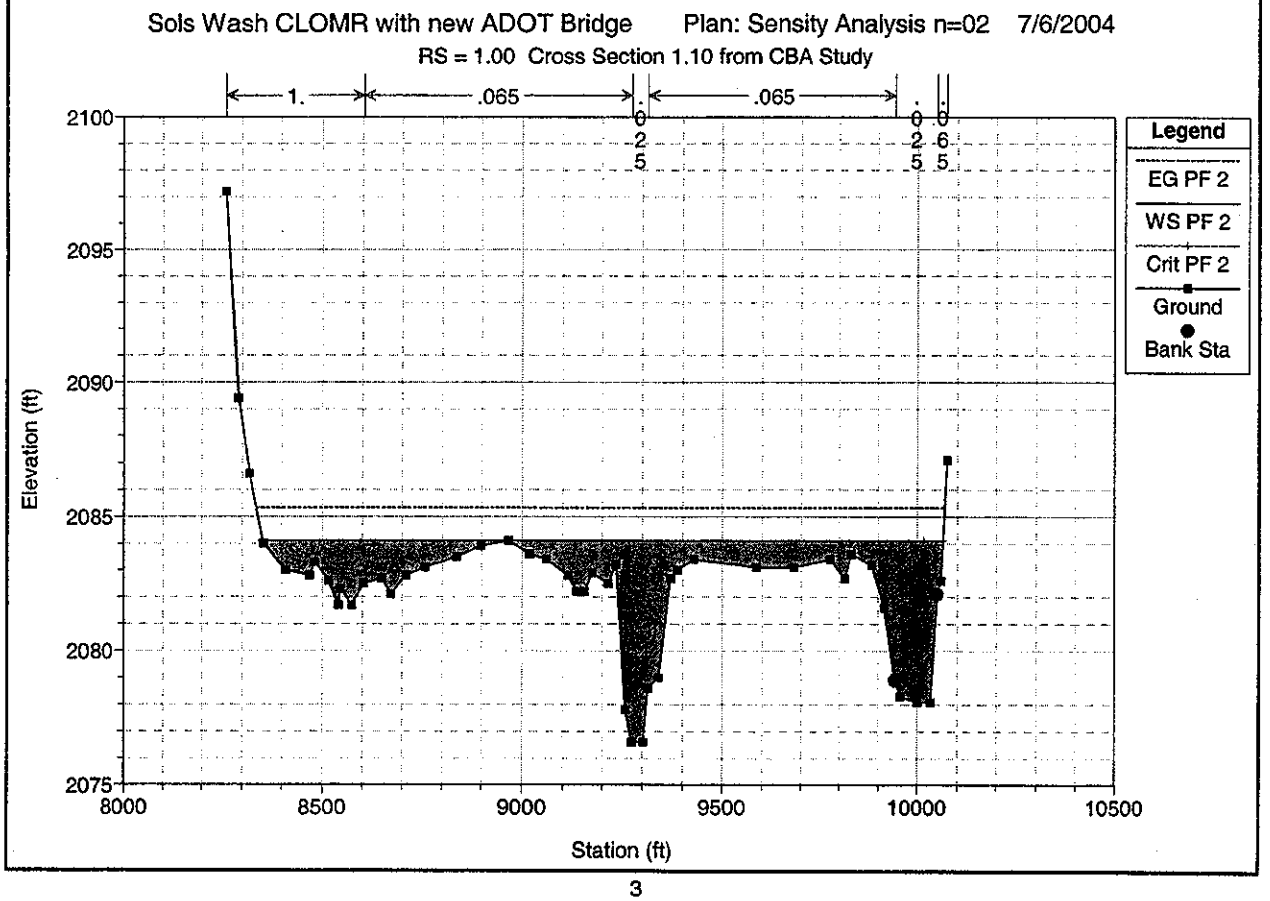
n=.05

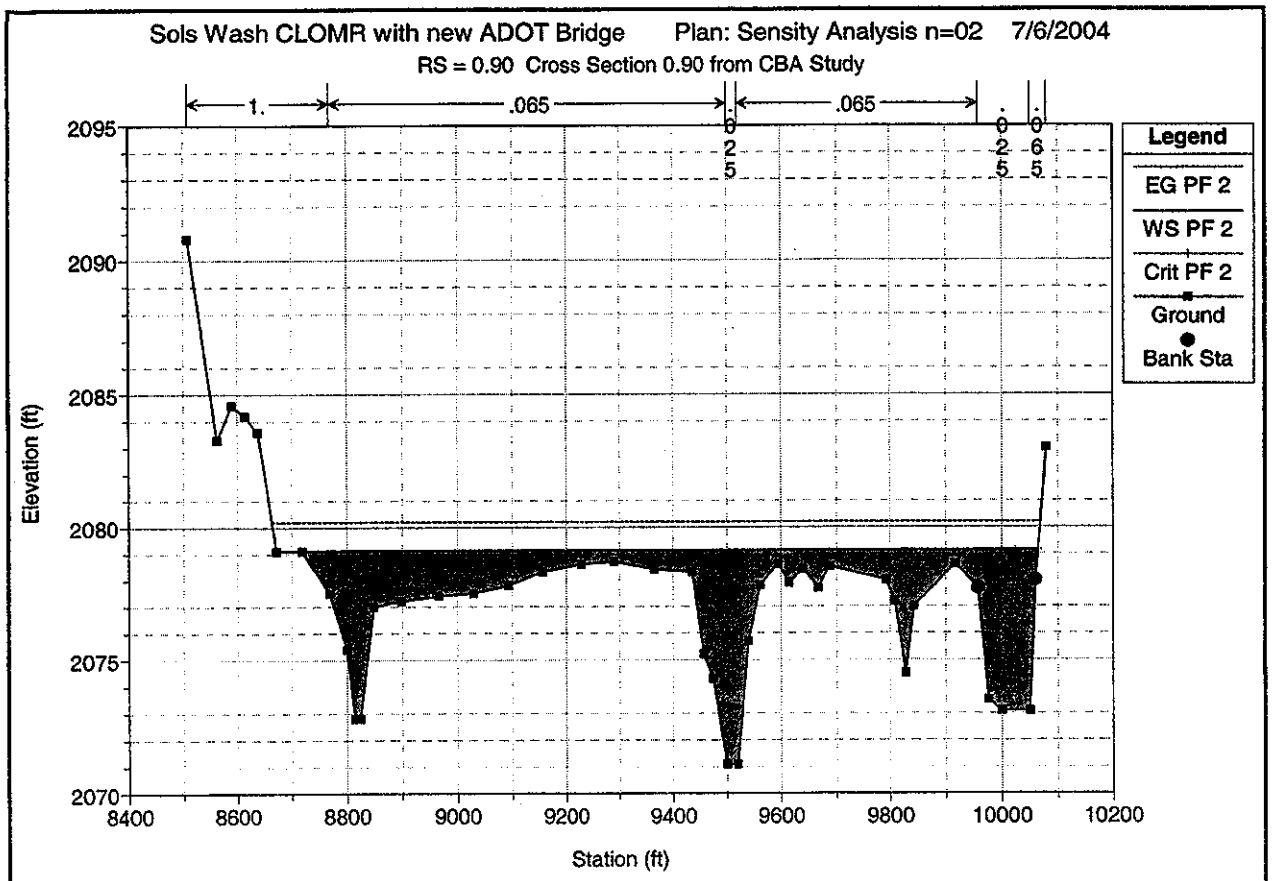
SENSITIVITY ANALYSIS n=.02

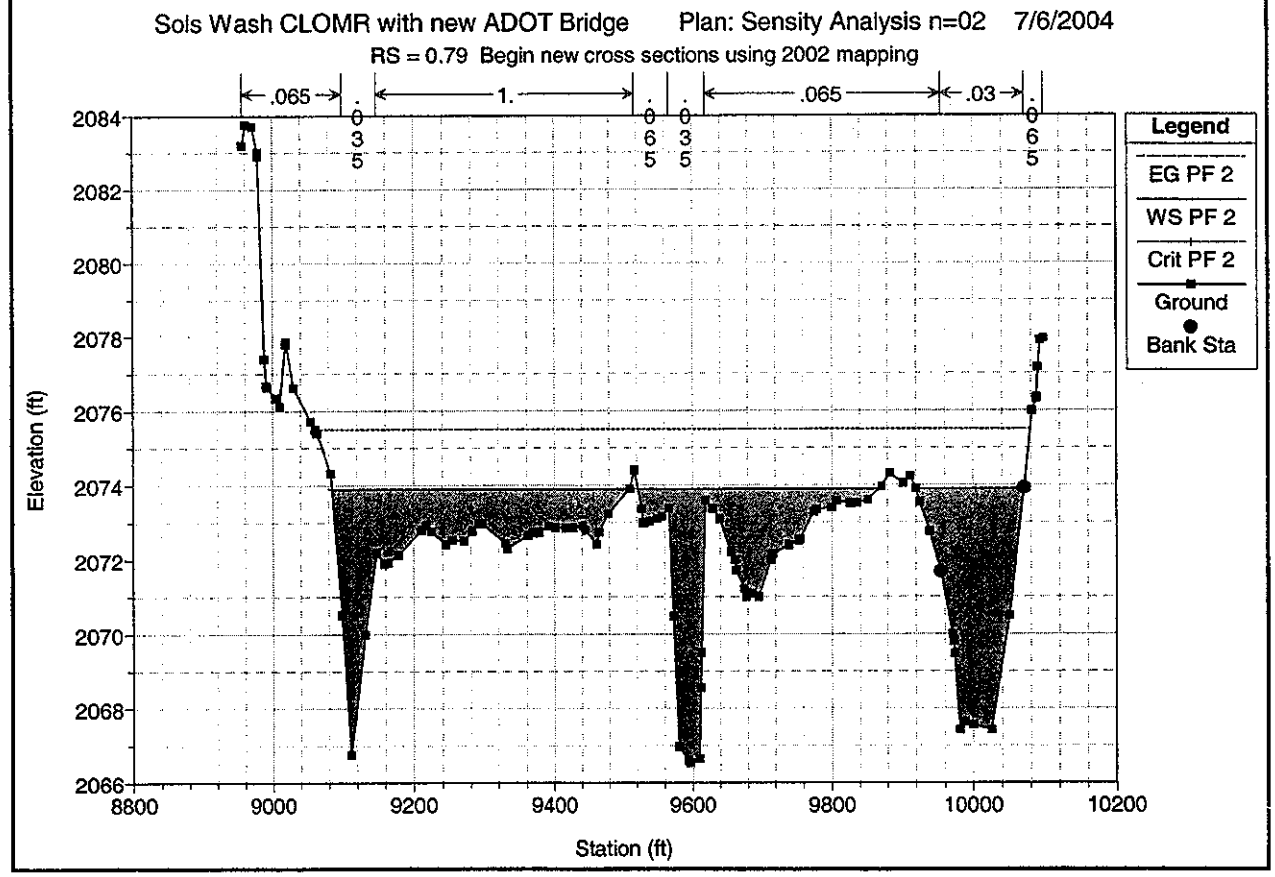
HEC-RAS Plan: n=.02 River: Sols Wash Reach: Reach 1 Profile: PF 2

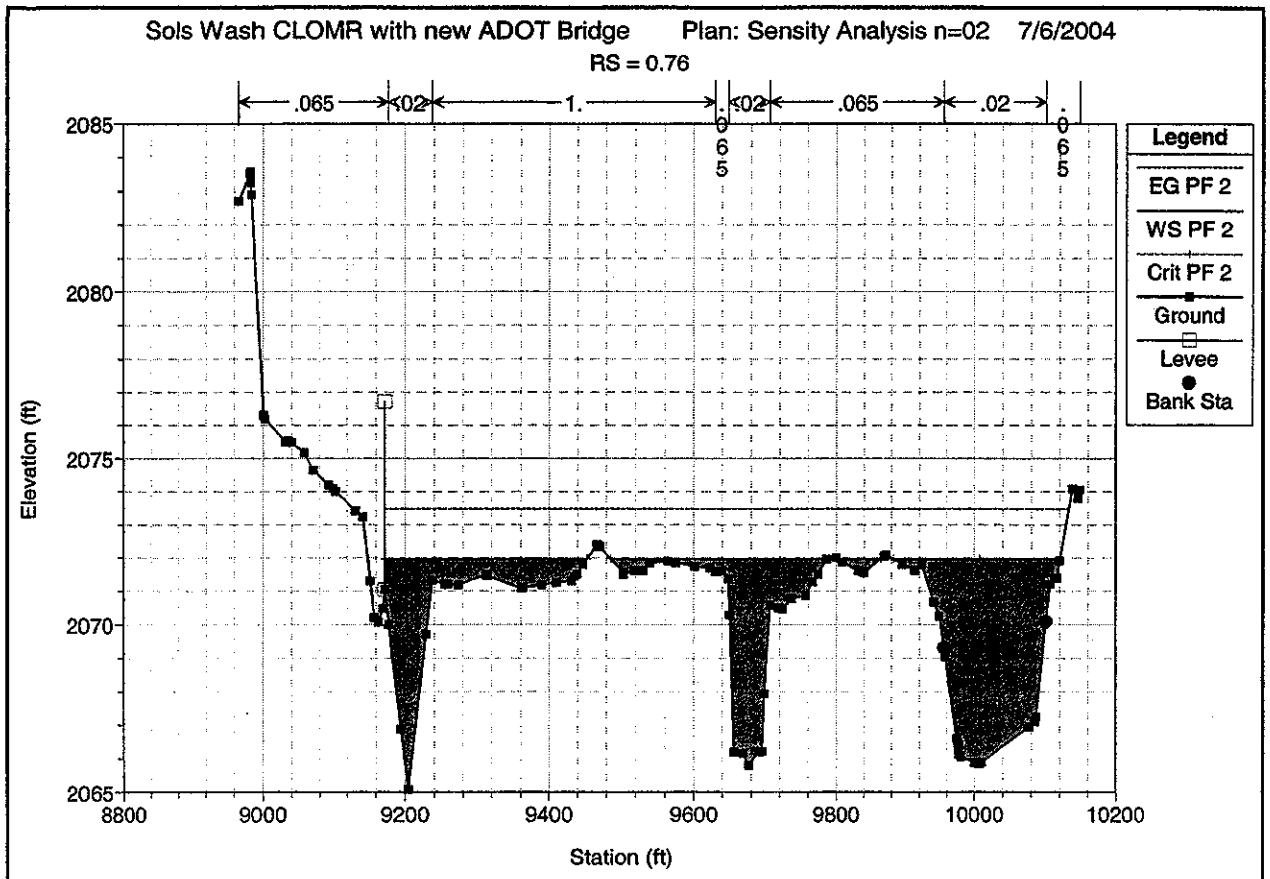
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.50	2088.50	2089.89	0.004414	12.19	2057.58	880.77	0.92
Reach 1	0.90	PF 2	14413.00	2078.10	2082.82	2084.10	2085.63	0.011161	16.55	1230.41	634.96	1.41
Reach 1	0.80	PF 2	14413.00	2073.10	2079.04	2079.13	2080.20	0.007034	12.18	2569.40	1343.27	0.94
Reach 1	0.79	PF 2	14413.00	2067.42	2073.80	2073.90	2075.52	0.010167	13.72	1790.65	909.70	1.13
Reach 1	0.78	PF 2	14413.00	2065.84	2071.11	2071.96	2073.84	0.005174	14.17	1104.22	360.40	1.20
Reach 1	0.77	PF 2	14413.00	2063.69	2068.78	2069.95	2072.22	0.006614	16.32	1025.88	347.63	1.36
Reach 1	0.95	PF 2	14413.00	2061.79	2068.62	2068.67	2070.83	0.002900	13.11	1392.25	365.59	0.94
Reach 1	0.81	PF 2	14459.00	2059.91	2066.37	2066.87	2069.86	0.004092	15.01	992.01	199.58	1.11
Reach 1	0.67	PF 2	14459.00	2057.69	2063.02	2064.56	2068.29	0.008506	18.42	784.78	176.45	1.54
Reach 1	0.23	PF 2	14459.00	2055.50	2061.23	2062.77	2066.41	0.008583	18.27	798.44	200.67	1.54
Reach 1	0.49	PF 2	15045.00	2053.51	2063.72	2060.38	2064.98	0.000802	9.01	1669.82	184.16	0.53
Reach 1	0.43	PF 2	15045.00	2051.27	2063.64	2058.29	2064.63	0.000426	8.00	1880.98	201.36	0.41
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2060.38	2056.59	2061.66	0.000673	9.08	1657.35	243.01	0.50
Reach 1	0.05	PF 2	15045.00	2047.68	2056.50	2056.50	2060.53	0.002748	16.11	939.81	117.88	1.00
Reach 1	0.27	PF 2	15045.00	2044.00	2051.58	2053.26	2058.14	0.005739	20.55	732.04	102.90	1.36
Reach 1	0.22	PF 2	15045.00	2043.00	2052.00	2052.04	2056.06	0.002879	16.17	930.39	115.41	1.00
Reach 1	0.19	PF 2	15045.00	2040.69	2047.45	2049.70	2054.90	0.009146	21.89	687.28	113.41	1.57
Reach 1	0.13	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.03	PF 2	15045.00	2039.00	2046.27	2047.25	2050.55	0.007350	17.58	1133.13	214.56	1.22
Reach 1	0.06	PF 2	15045.00	2036.99	2044.19	2042.48	2044.79	0.002917	7.66	3307.91	818.58	0.55
Reach 1	.05	PF 2	15045.00	2038.00	2043.52	2042.39	2044.34	0.002757	9.09	3336.53	1079.12	0.72

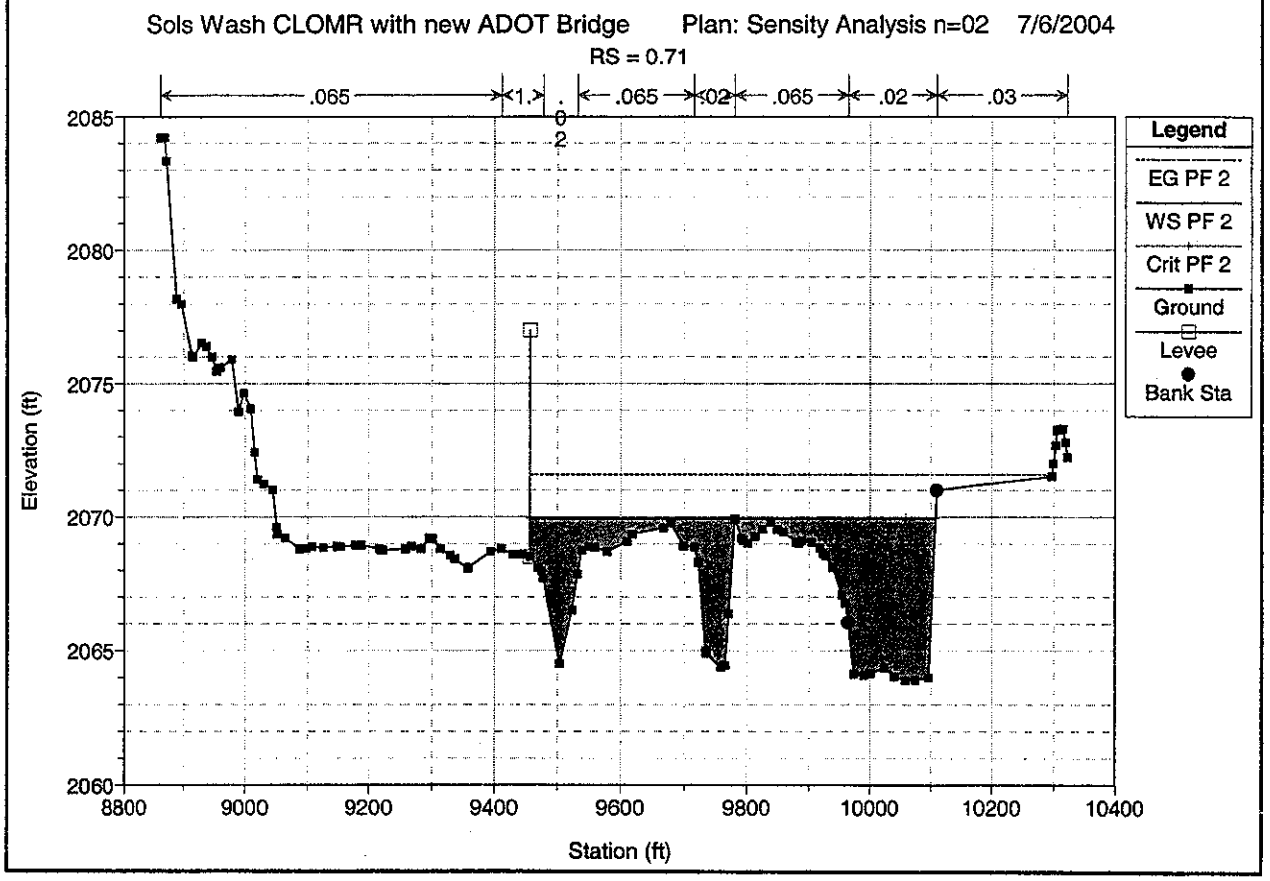

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 1.12 Cross Section 1.12 from CBA Study
.06
.025
.06
.06
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2094
2092
2090
2088
2086
2084
2082
9200
9400
9600
9800
10000
10200
10400
Station (ft)

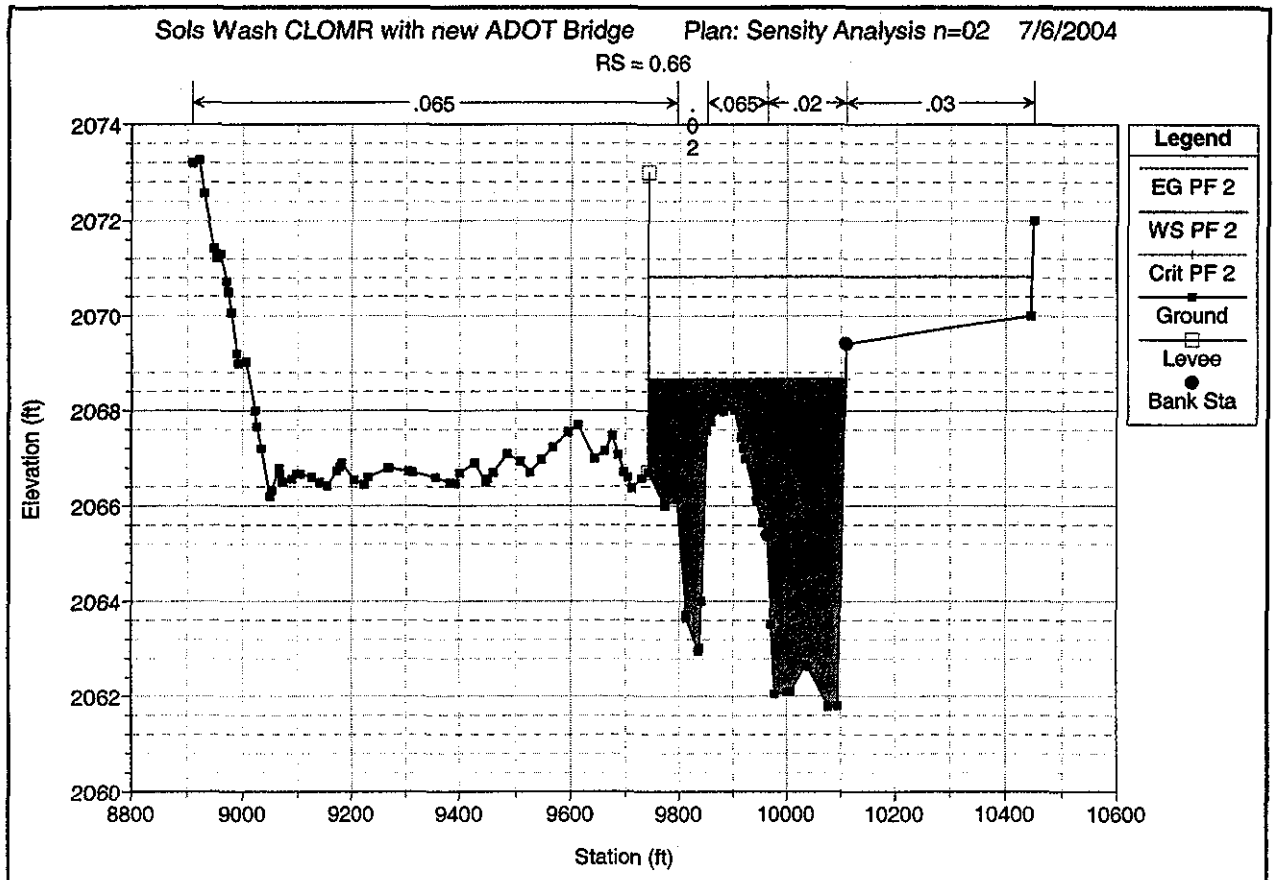

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 1.00 Cross Section 1.10 from CBA Study
1.
.065
.065
.025
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2100
2095
2090
2085
2080
2075
8000
8500
9000
9500
10000
10500
Station (ft)

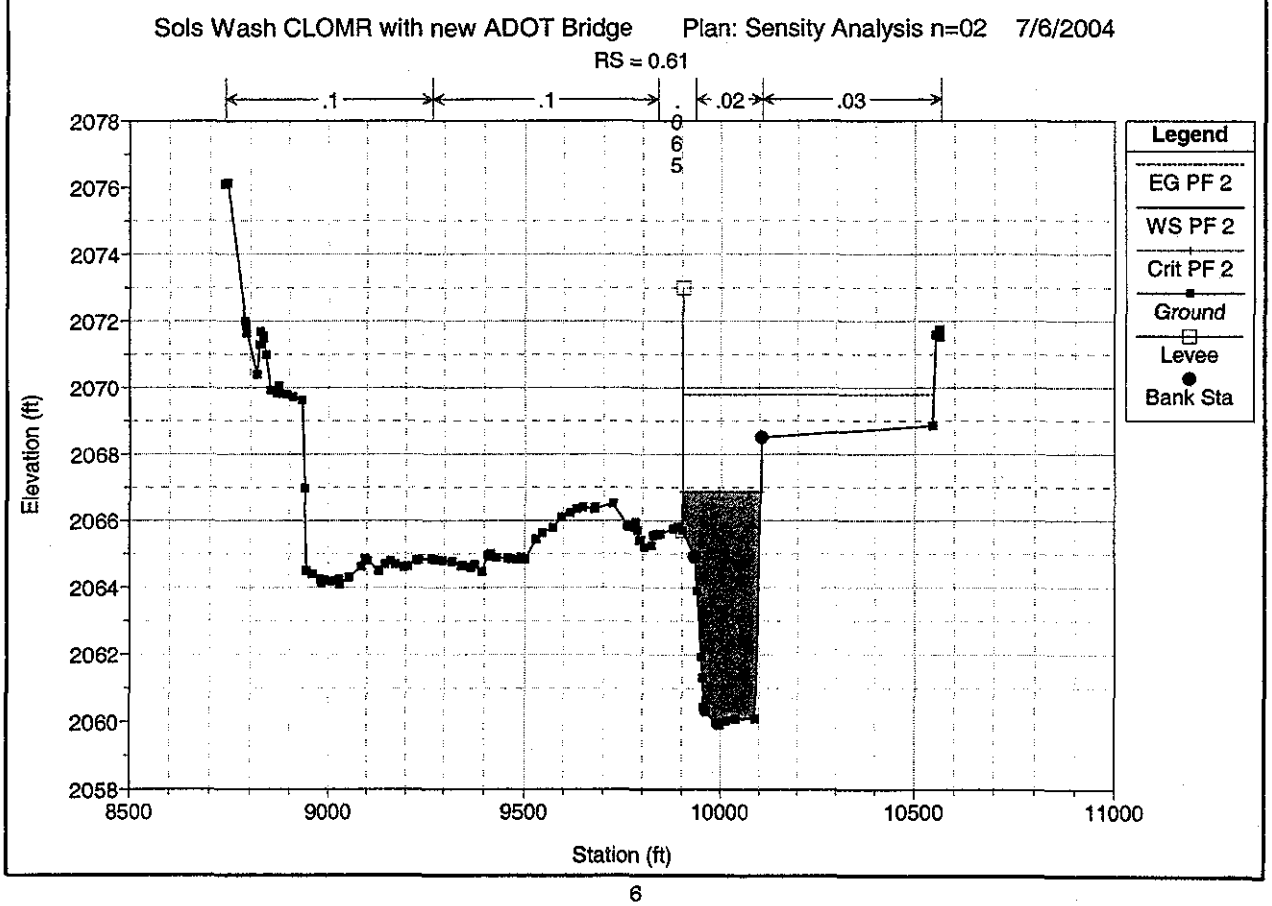

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.90 Cross Section 0.90 from CBA Study
1.
.065
.065
.025
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2095
2090
2085
2080
2075
2070
8400
8600
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

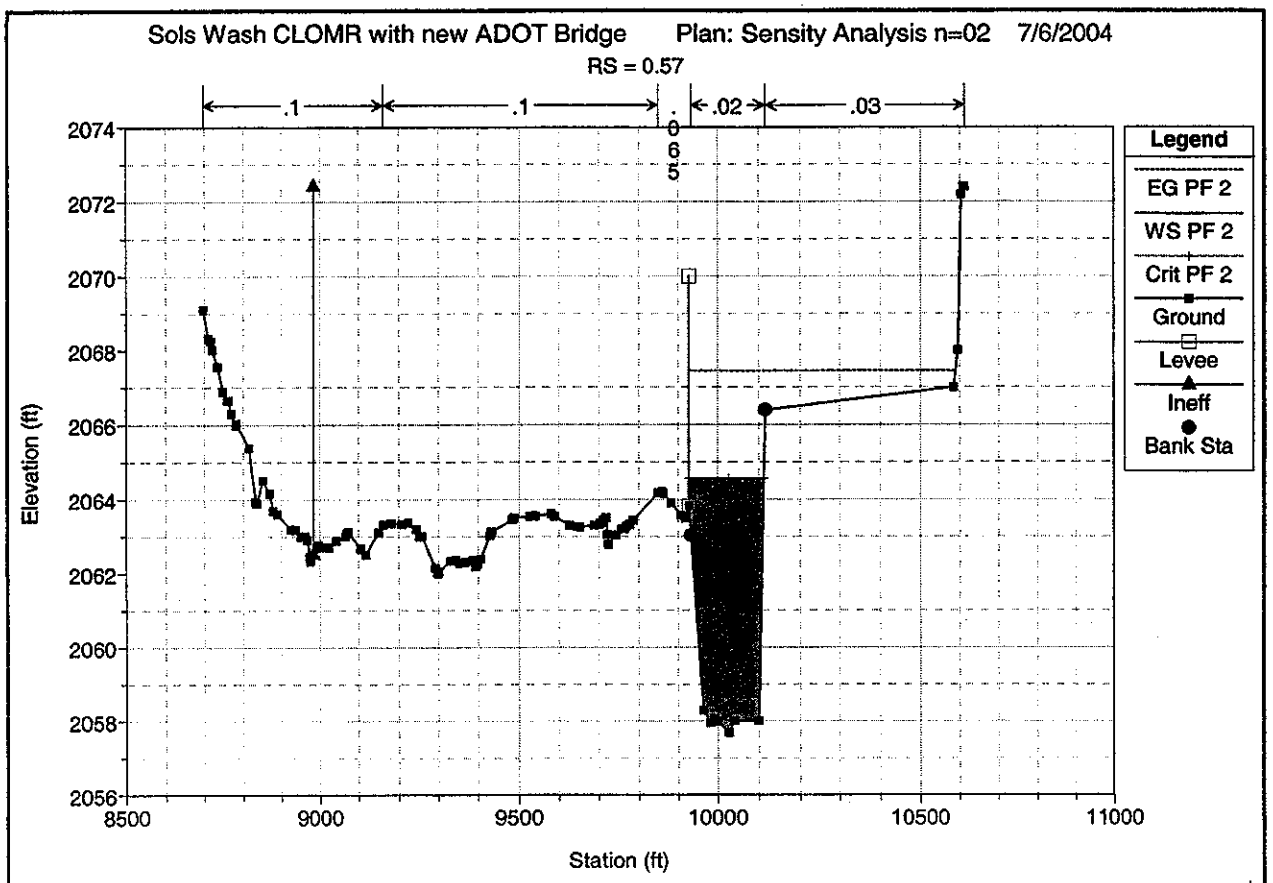

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.79 Begin new cross sections using 2002 mapping
.065
1.
.065
.03
.035
.065
.035
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2084
2082
2080
2078
2076
2074
2072
2070
2068
2066
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

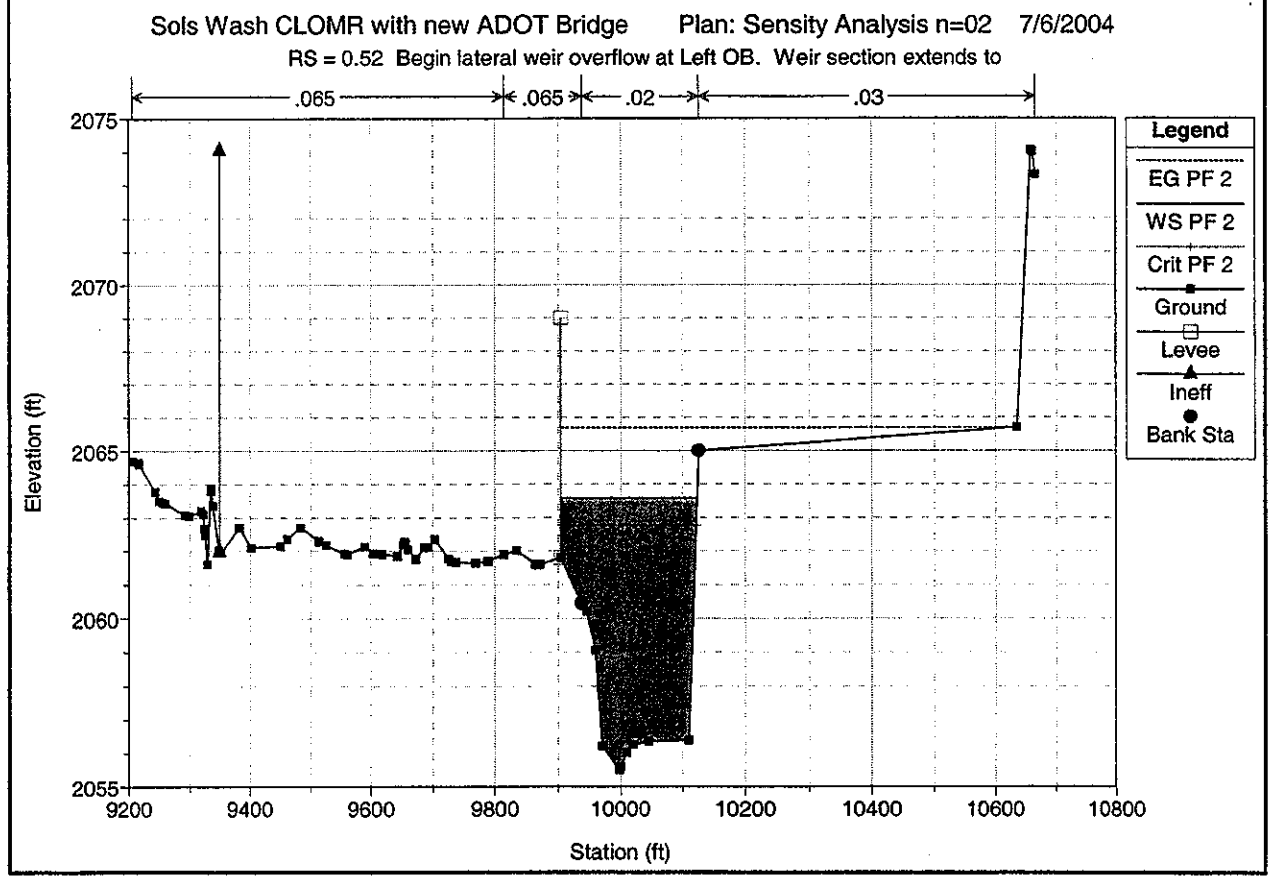

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.76
.065
.02
1.
.02
.065
.02
.065
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

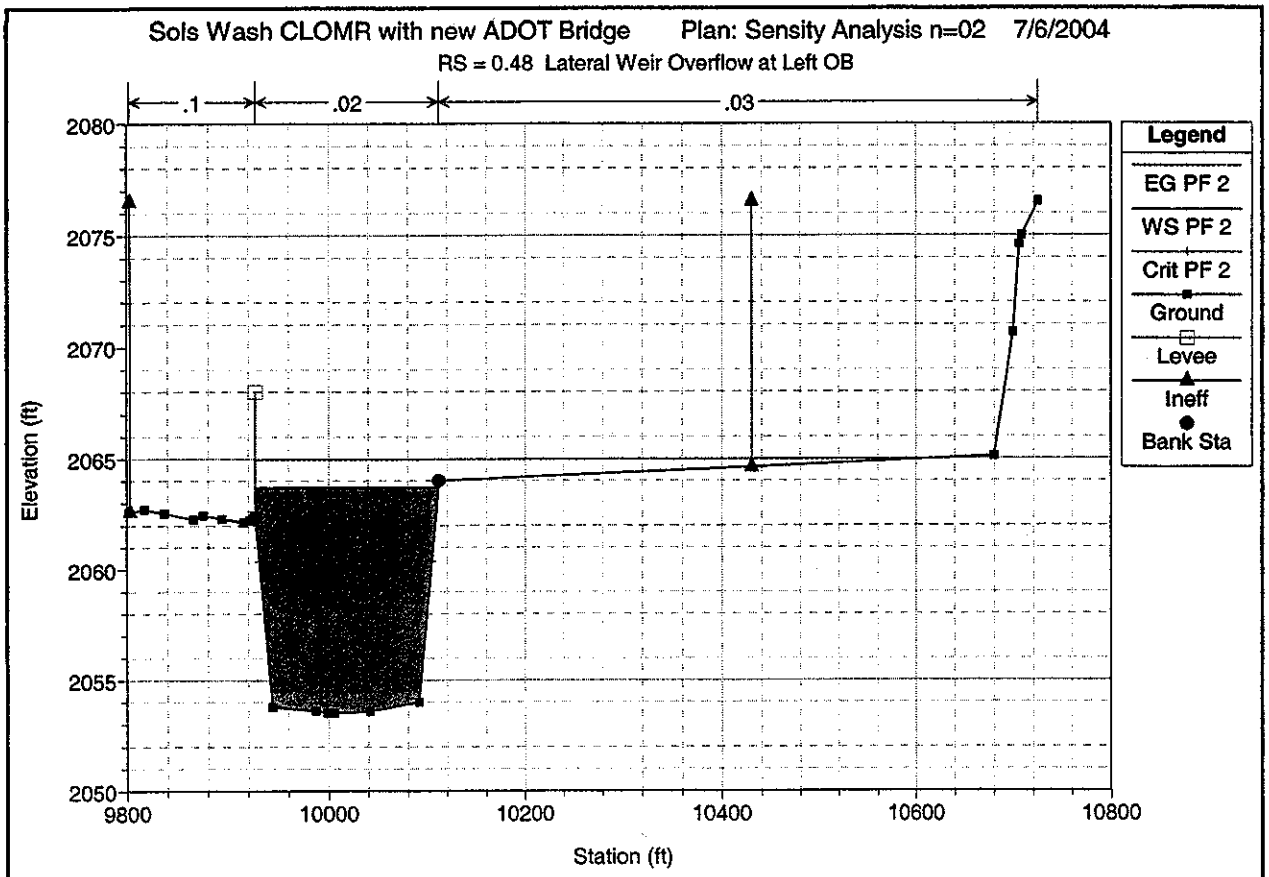

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.71
.065
1.
.02
.065
.02
.065
.02
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

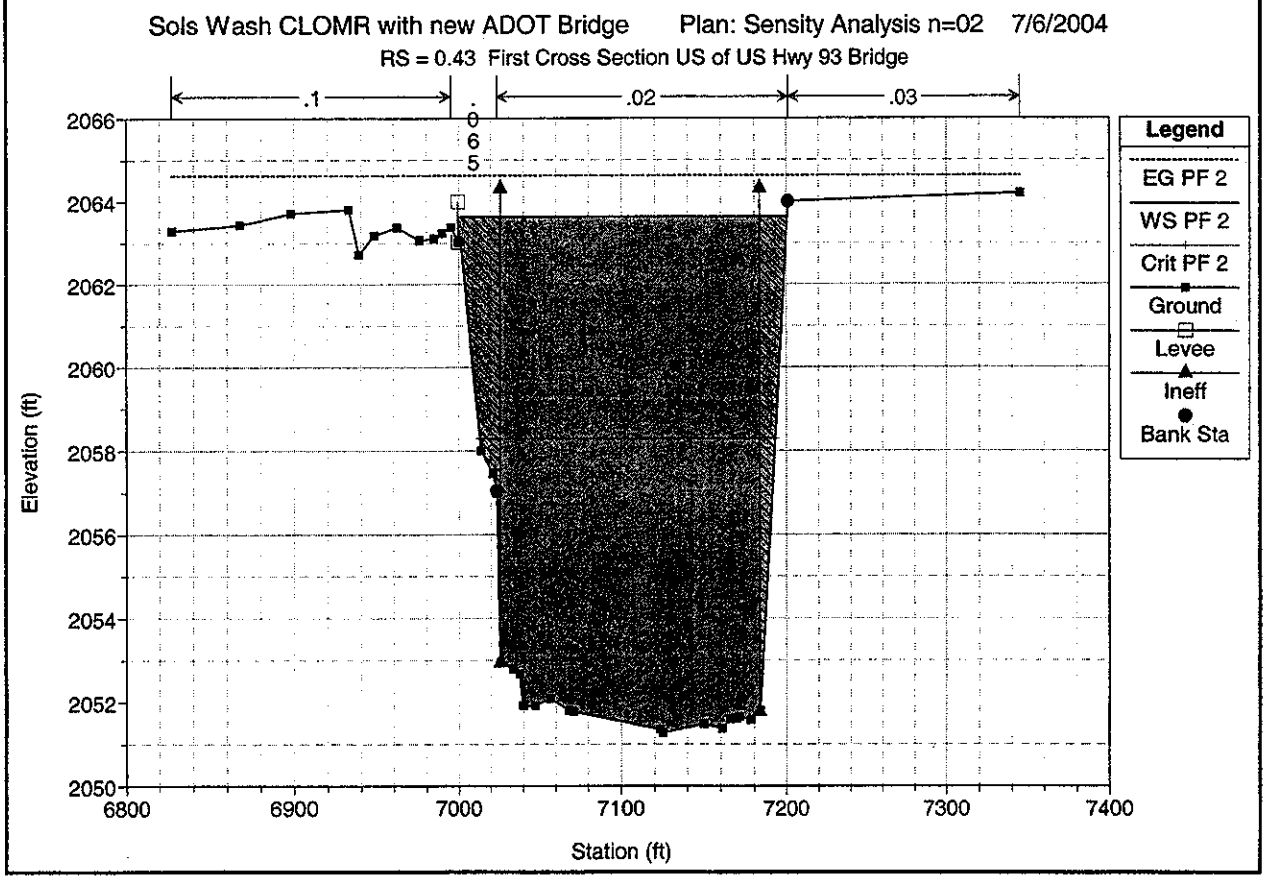

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.66
.065
.065
.02
.03
.02
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

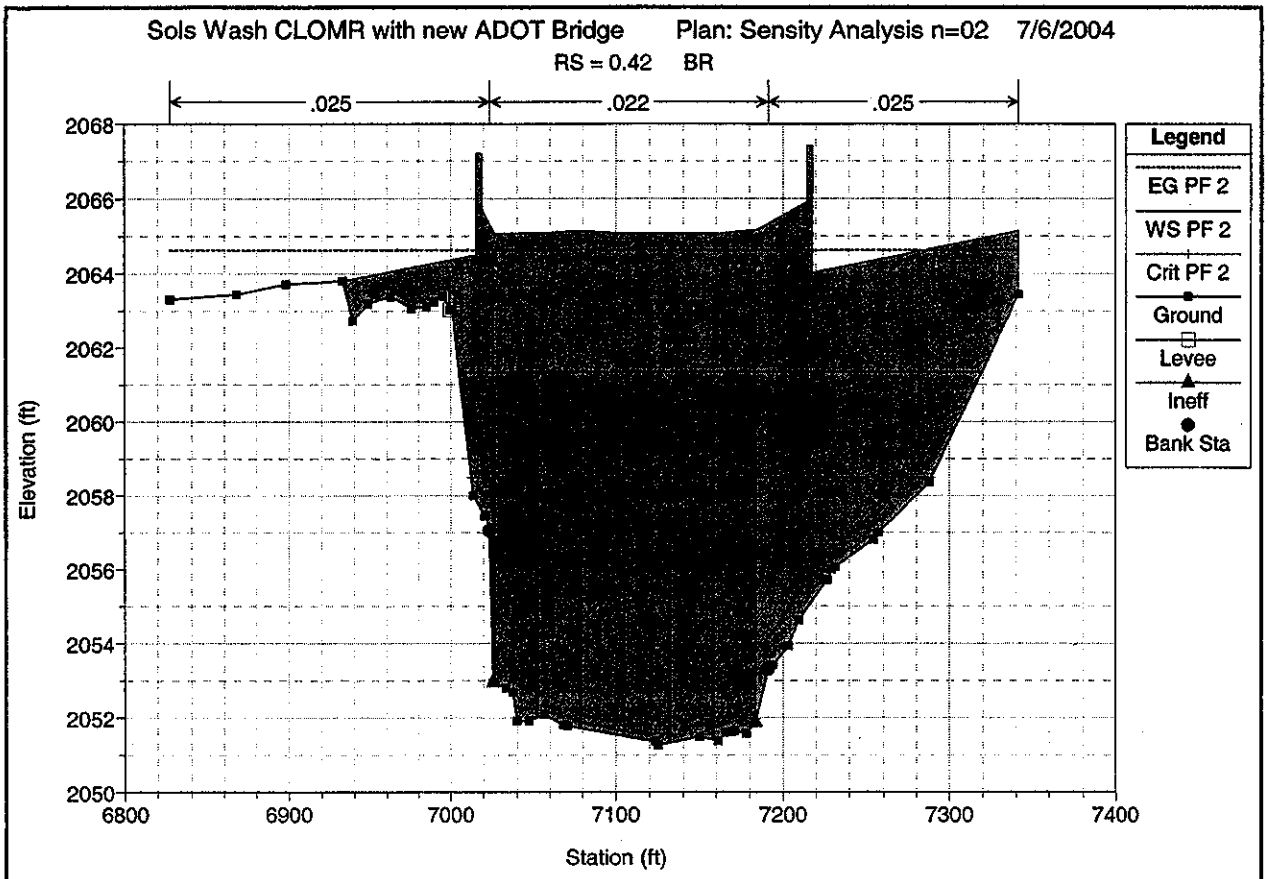

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.61
.1
.1
.02
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

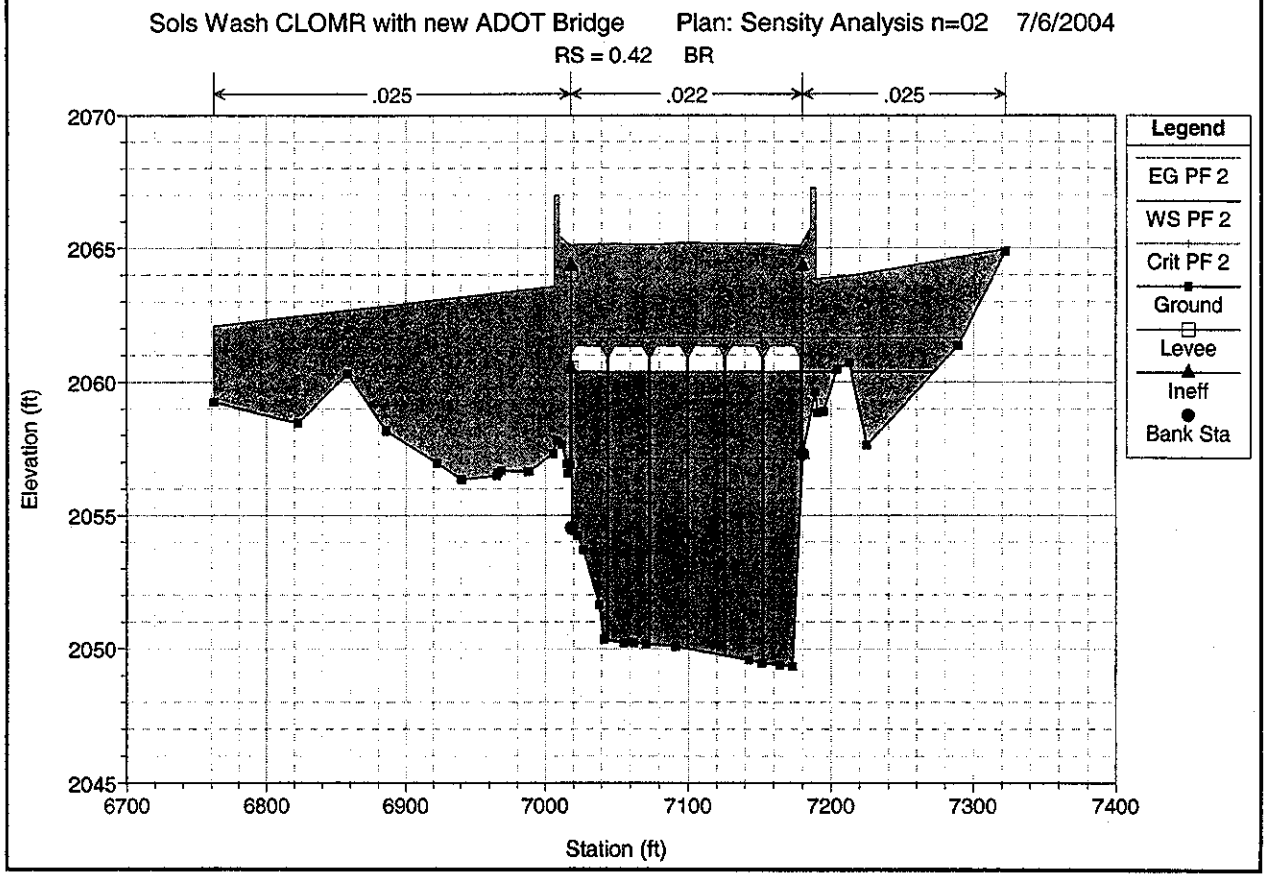

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.57
.1
.1
.065
.02
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
2058
2056
8500
9000
9500
10000
10500
11000

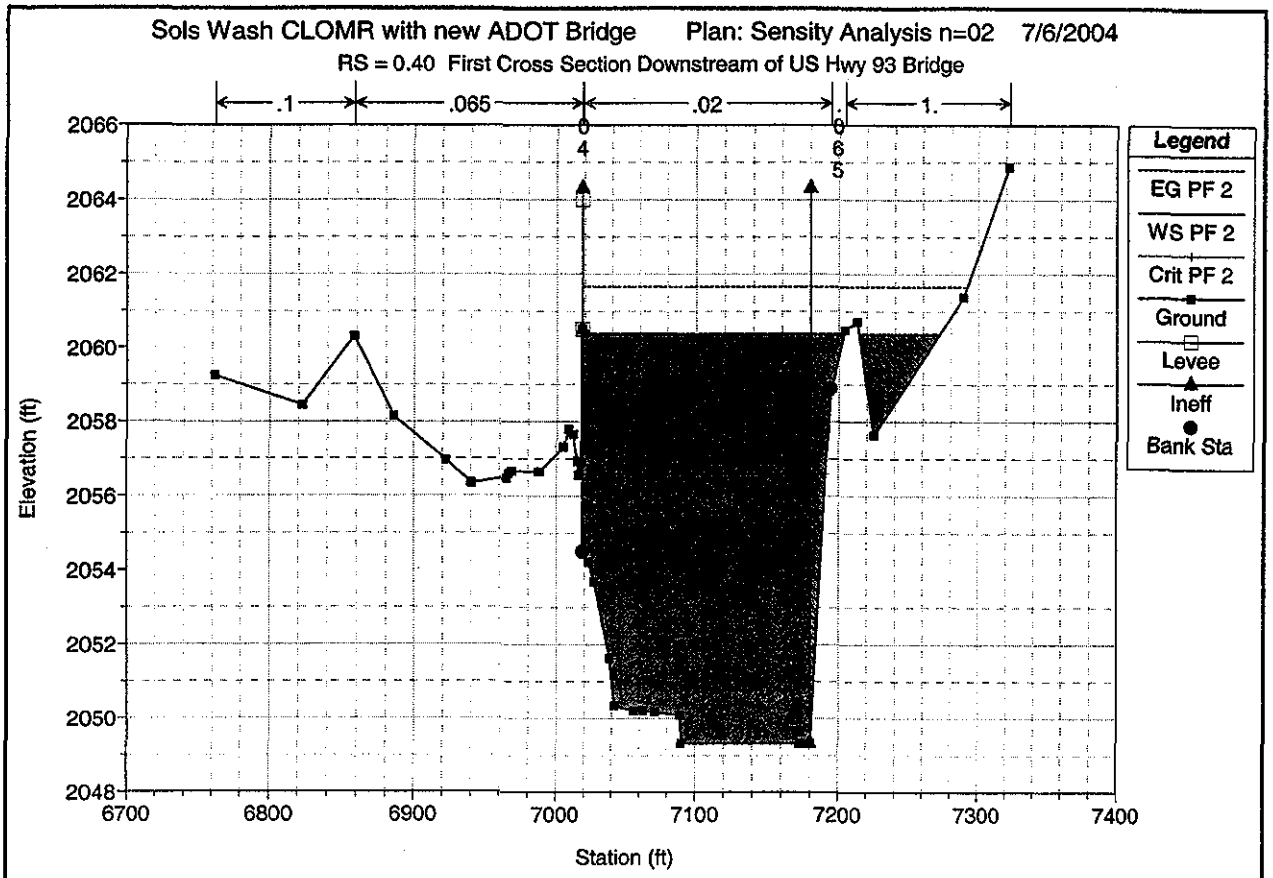

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.52 Begin lateral weir overflow at Left OB. Weir section extends to
.065
.065
.02
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2075
2070
2065
2060
2055
9200
9400
9600
9800
10000
10200
10400
10600
10800

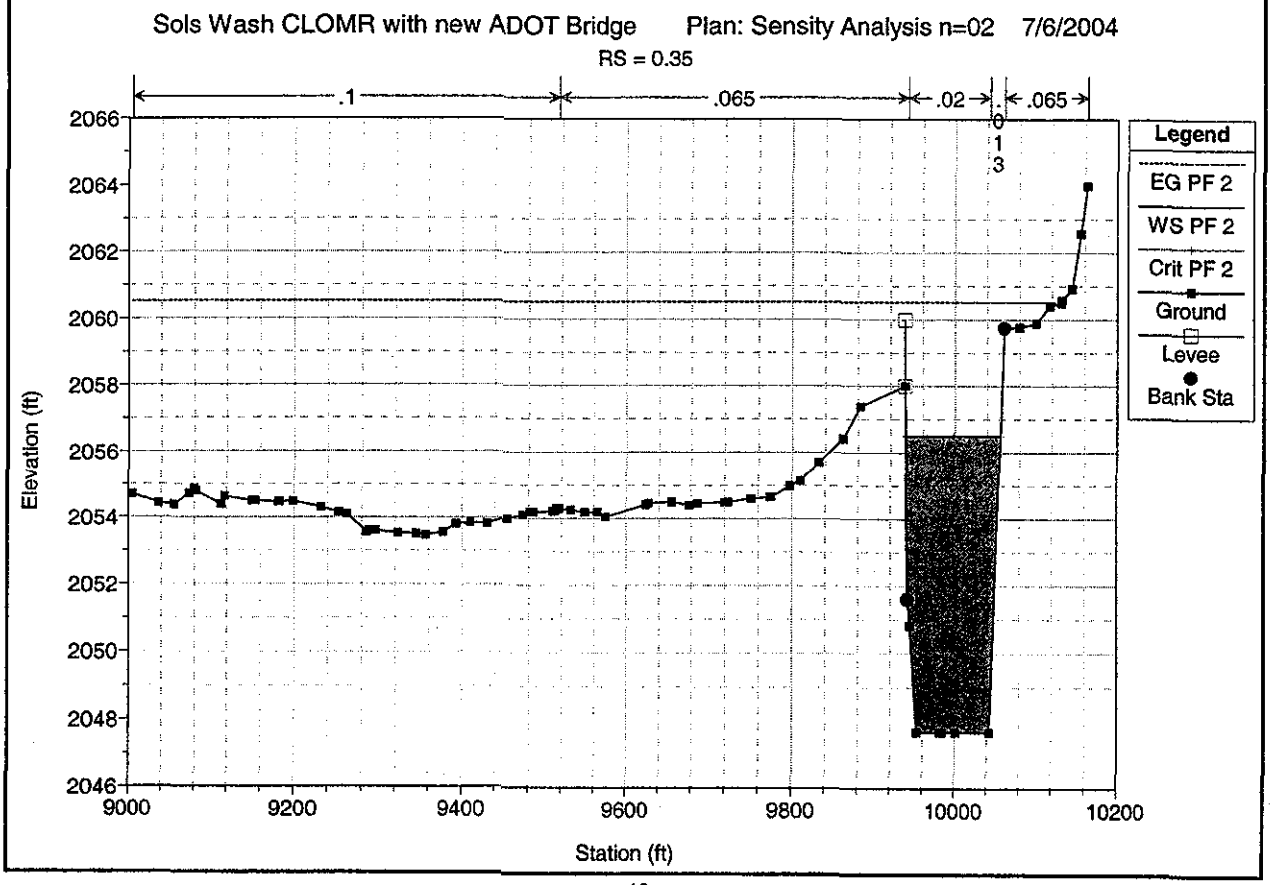

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.48 Lateral Weir Overflow at Left OB
.1
.02
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2080
2075
2070
2065
2060
2055
2050
9800
10000
10200
10400
10600
10800
Station (ft)

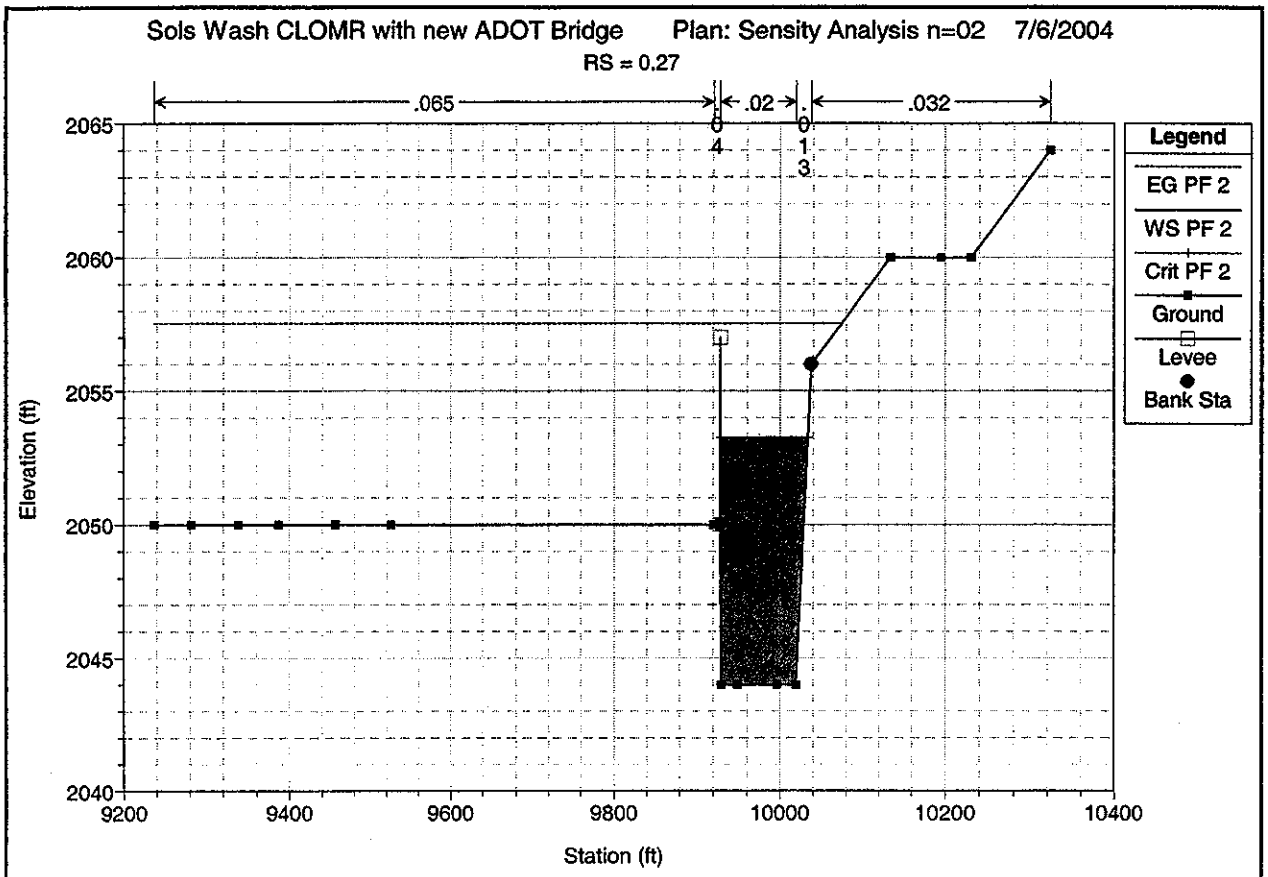

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.43 First Cross Section US of US Hwy 93 Bridge
.1
.065
.02
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

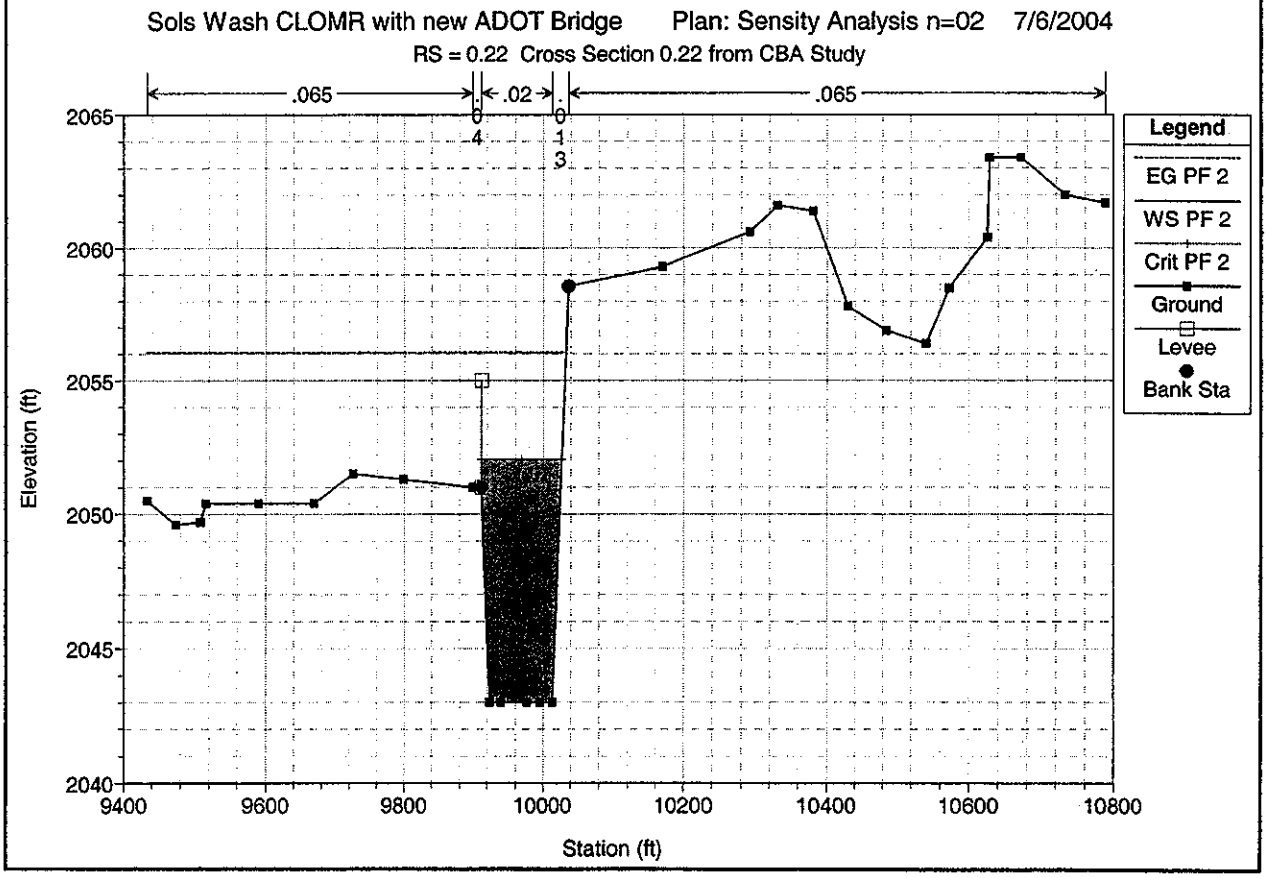

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2068
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400

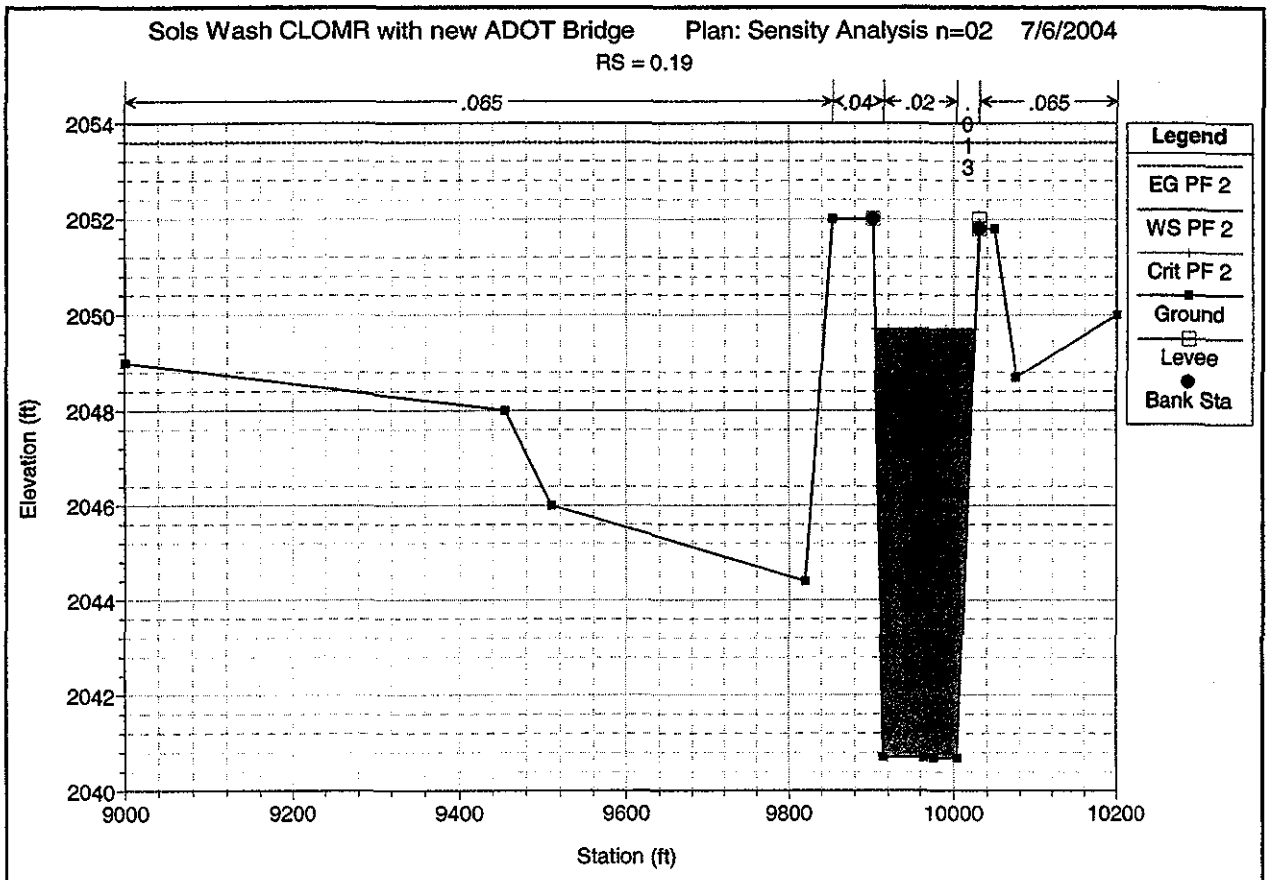

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2070
2065
2060
2055
2050
2045
6700
6800
6900
7000
7100
7200
7300
7400

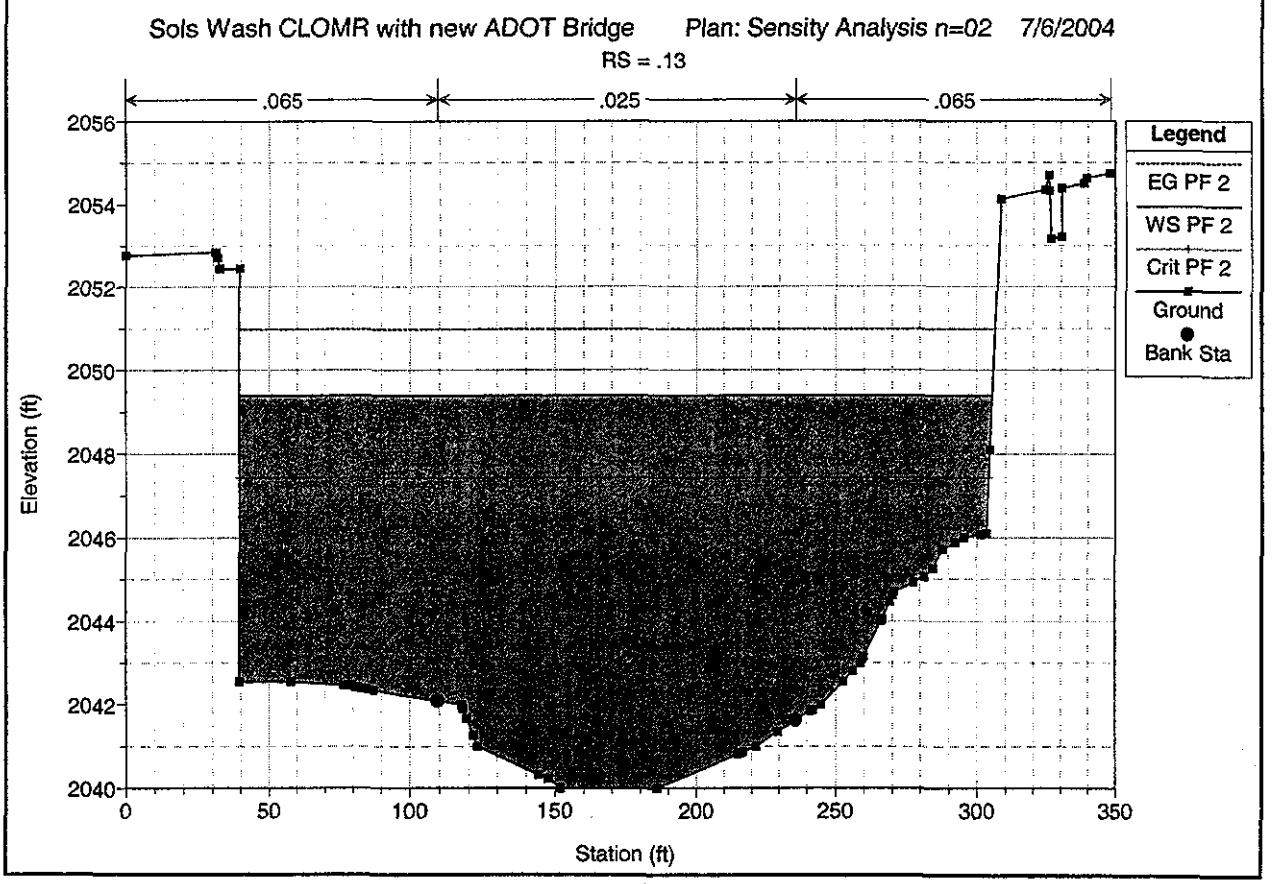

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.40 First Cross Section Downstream of US Hwy 93 Bridge
.1
.065
.02
1.
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

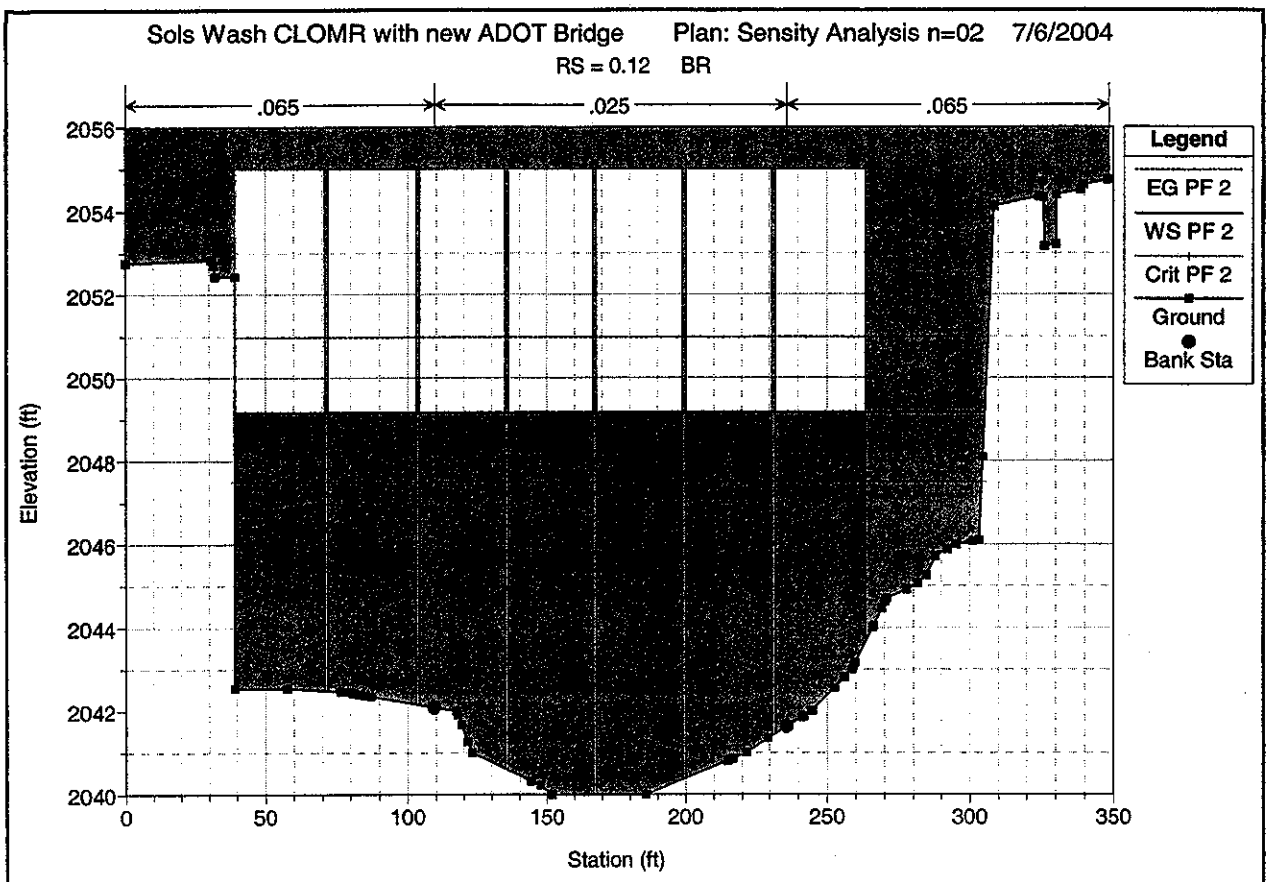

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.35
.1
.065
.02
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

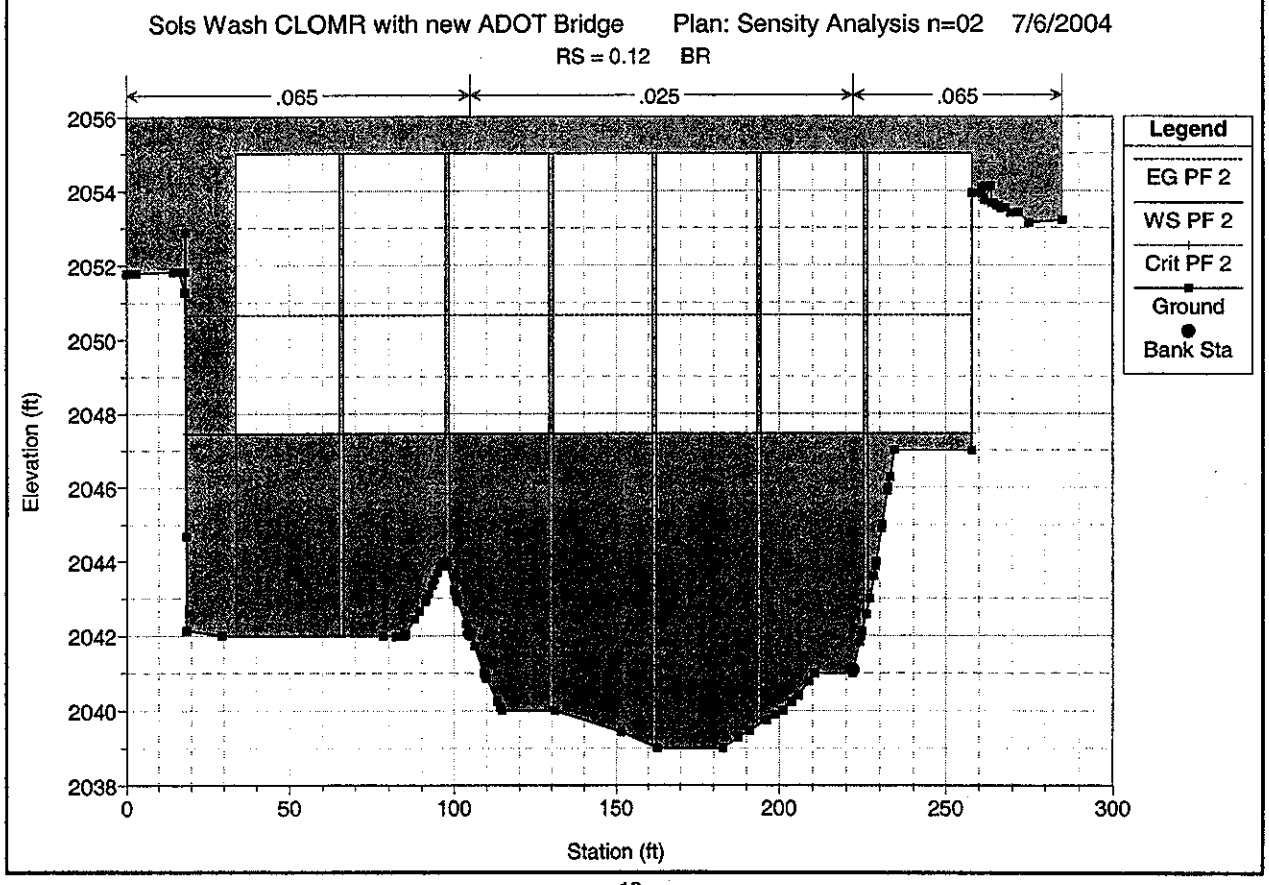

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.27
.065
.02
.032
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

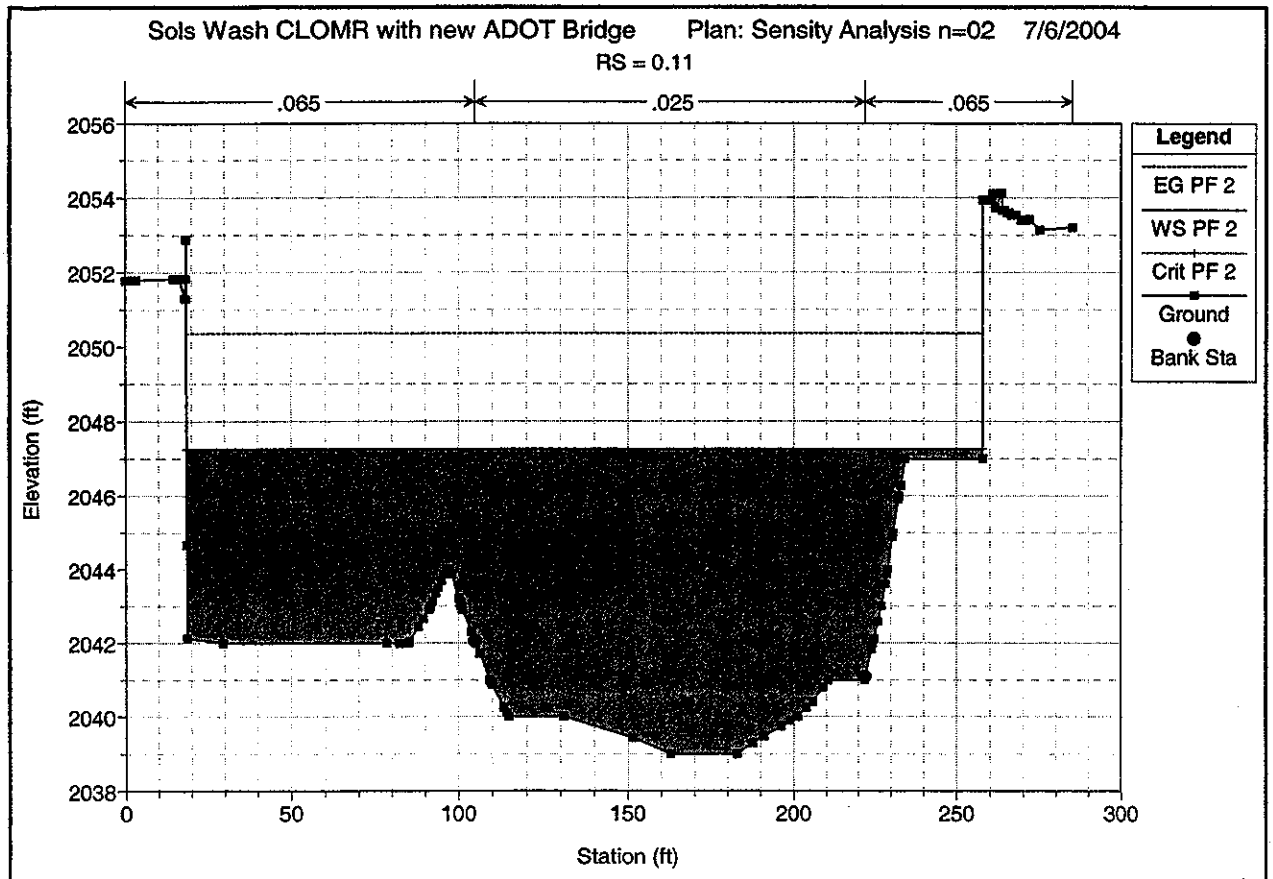

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.22 Cross Section 0.22 from CBA Study
.065
.02
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

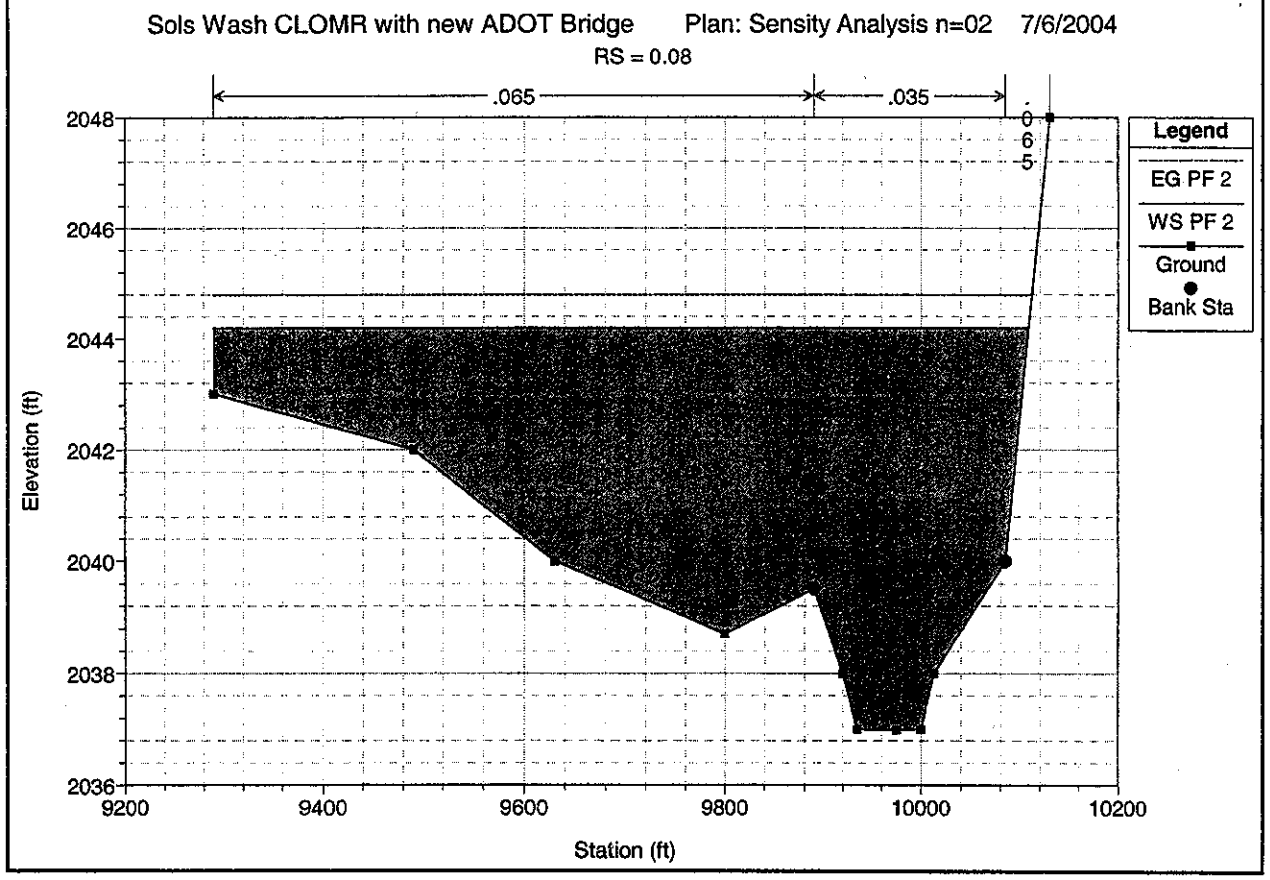

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.19
.065
.04
.02
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

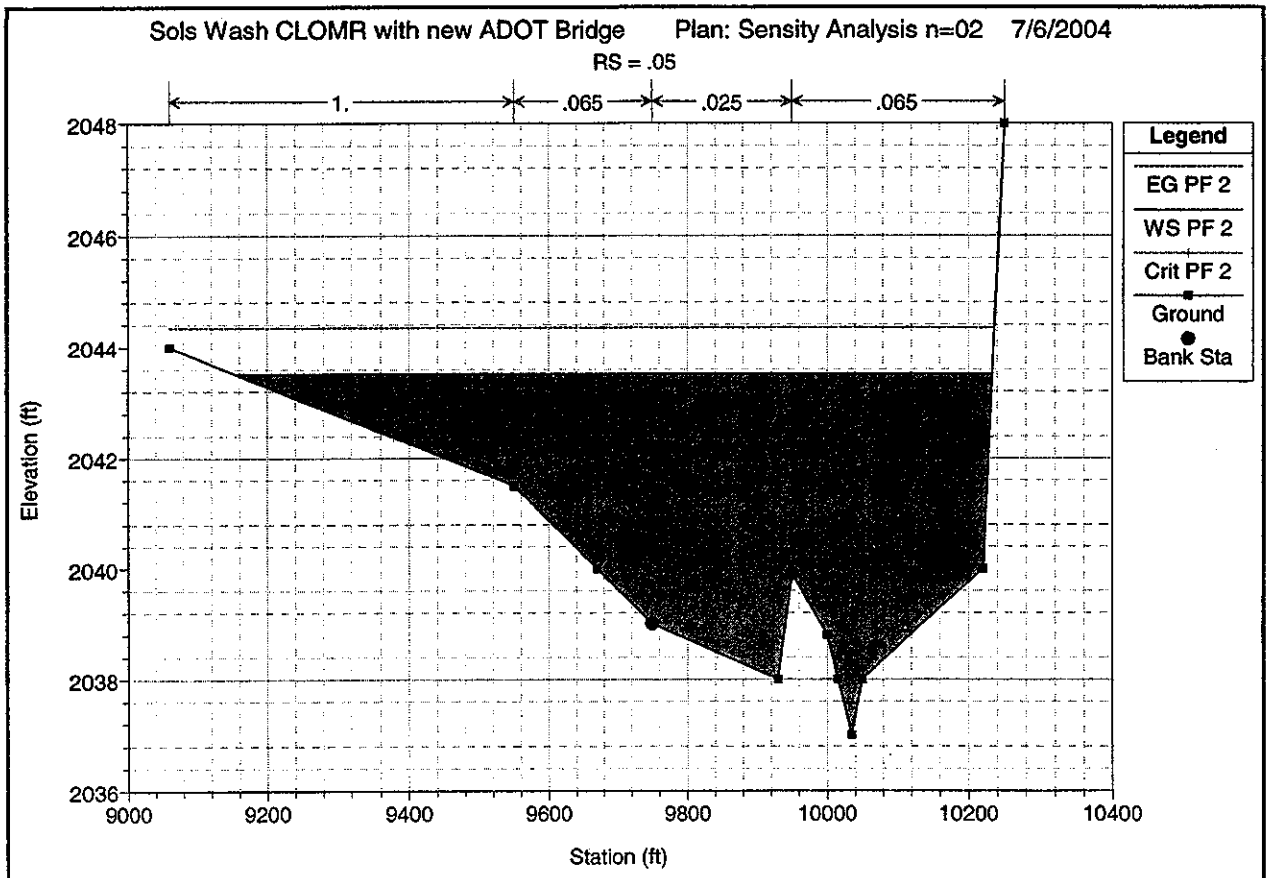

Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = .13
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.11
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = 0.08
.065
.035
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Sensity Analysis n=02 7/6/2004
RS = .05
1.
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

HEC-RAS Plan: B=90 n=03 River: Sols Wash Reach: Reach 1 Profile: PF 2

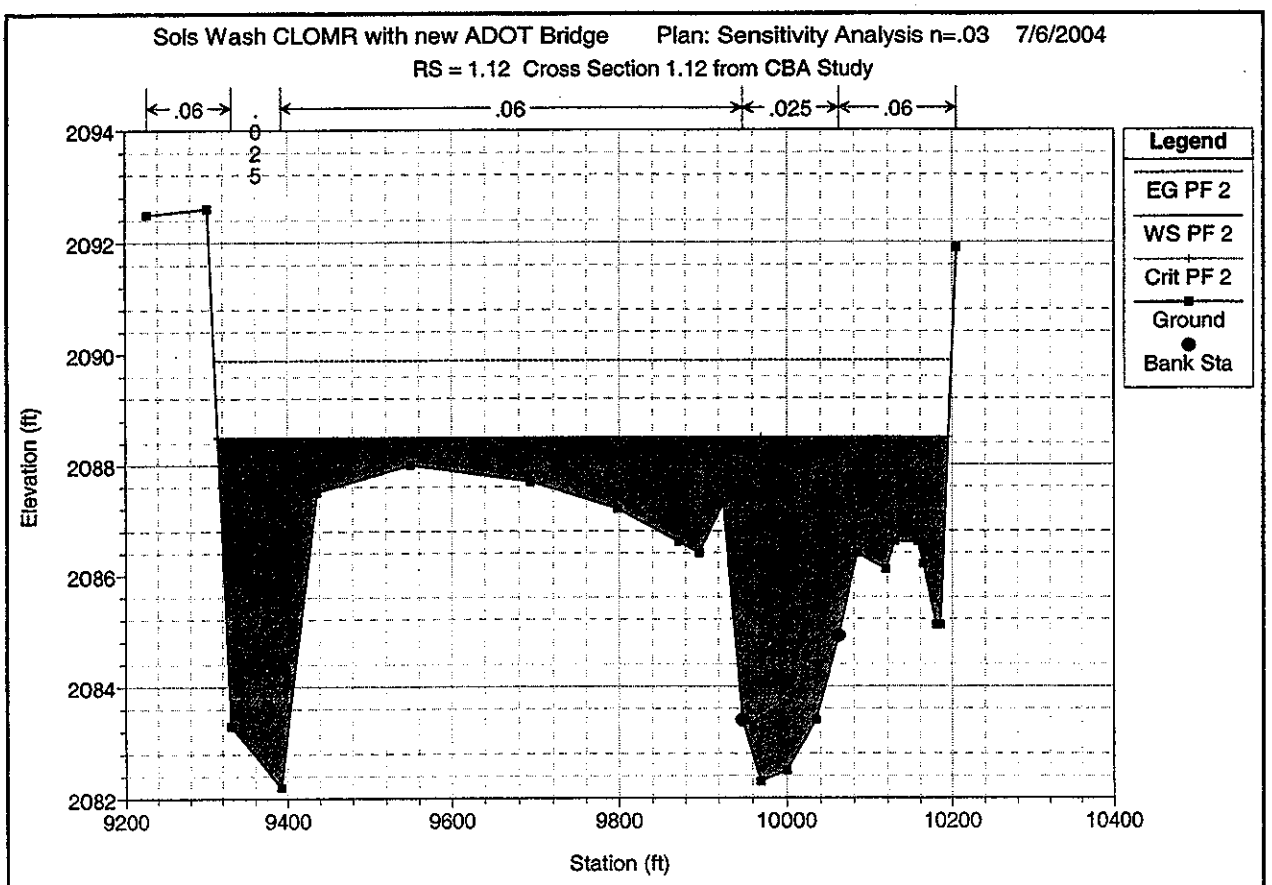
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.50	2088.50	2089.89	0.004414	12.19	2057.58	880.77	0.92
Reach 1	1.00	PF 2	14413.00	2078.10	2084.10	2084.10	2085.33	0.004281	12.19	2886.35	1711.00	0.91
Reach 1	0.90	PF 2	14413.00	2073.10	2079.13	2079.13	2080.20	0.006360	11.72	2697.71	1392.79	0.90
Reach 1	0.79	PF 2	14413.00	2067.42	2073.90	2073.90	2075.50	0.009363	13.32	1886.69	924.15	1.09
Reach 1	0.76	PF 2	14413.00	2065.84	2071.96	2071.96	2073.62	0.006730	12.15	1633.80	881.70	0.94
Reach 1	0.71	PF 2	14413.00	2063.89	2071.02	2070.12	2071.96	0.002965	9.37	2351.77	664.94	0.64
Reach 1	0.66	PF 2	14413.00	2061.79	2069.70	2068.75	2071.10	0.003460	10.59	1815.94	534.05	0.70
Reach 1	0.61	PF 2	14459.00	2059.91	2066.89	2066.89	2069.77	0.006845	13.67	1097.00	200.63	0.97
Reach 1	0.57	PF 2	14459.00	2057.69	2064.67	2064.53	2067.46	0.006821	13.40	1085.09	185.76	0.96
Reach 1	0.52	PF 2	14459.00	2055.50	2064.21	2062.80	2065.92	0.003367	10.59	1442.53	220.48	0.70
Reach 1	0.48	PF 2	15045.00	2053.51	2063.89	2060.38	2065.10	0.001699	8.84	1701.64	184.51	0.51
Reach 1	0.43	PF 2	15045.00	2051.27	2063.64	2058.29	2064.63	0.000958	8.00	1881.52	201.37	0.41
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2060.83	2056.60	2062.01	0.001309	8.70	1731.28	261.56	0.47
Reach 1	0.35	PF 2	15045.00	2047.68	2056.46	2056.46	2060.53	0.005993	16.19	935.27	117.80	1.00
Reach 1	0.27	PF 2	15045.00	2044.00	2054.65	2053.26	2057.81	0.003879	14.25	1055.70	107.48	0.80
Reach 1	0.22	PF 2	15045.00	2043.00	2052.04	2052.04	2056.06	0.006091	16.09	934.98	115.47	1.00
Reach 1	0.19	PF 2	15045.00	2040.69	2049.70	2049.70	2053.59	0.006240	15.82	950.82	121.19	1.00
Reach 1	13	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2047.25	2047.25	2050.36	0.004473	15.08	1349.67	239.45	0.98
Reach 1	0.08	PF 2	15045.00	2036.99	2044.19		2044.79	0.002923	7.67	3305.61	818.56	0.55
Reach 1	.05	PF 2	15045.00	2038.00	2043.52	2042.38	2044.34	0.002757	9.09	3336.53	1079.12	0.72

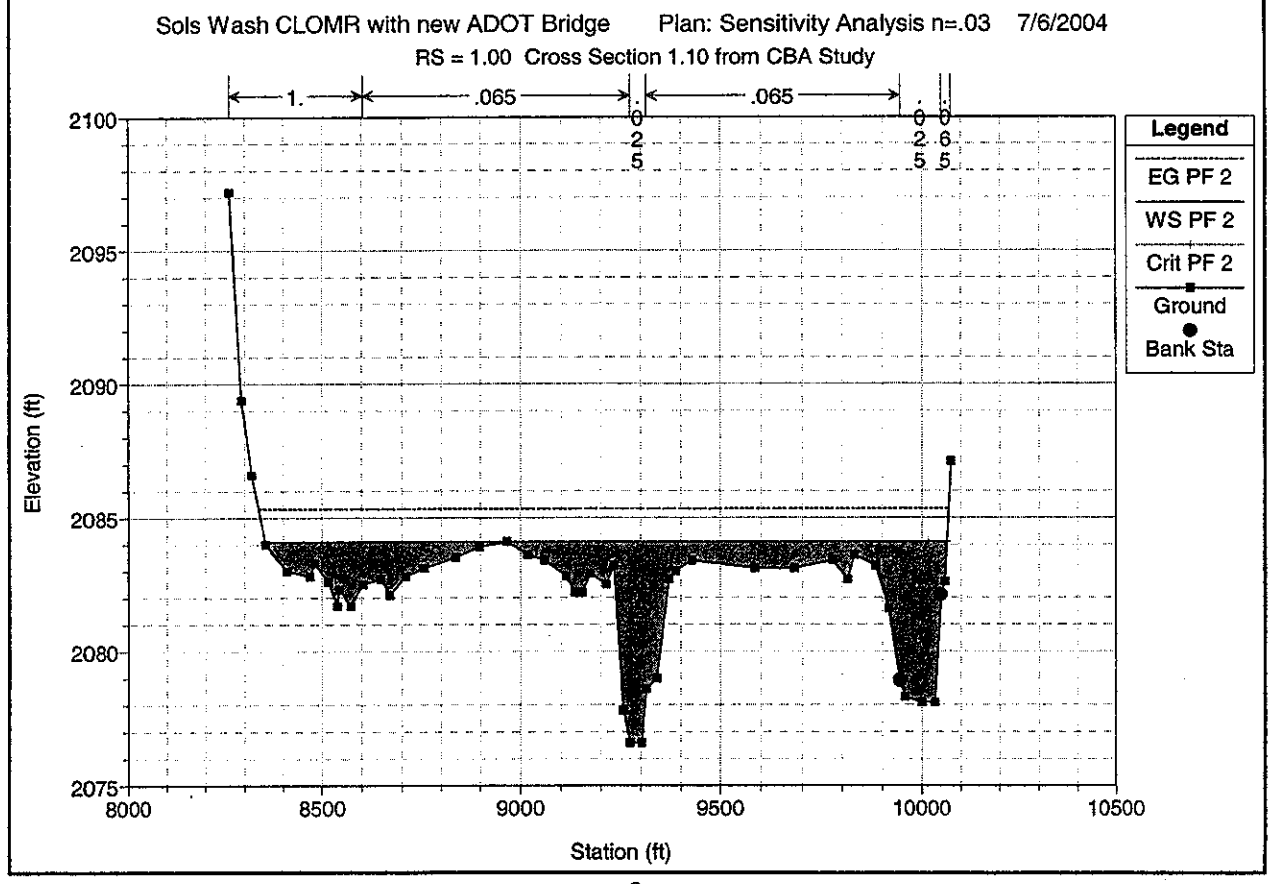
SENSITIVITY ANALYSIS

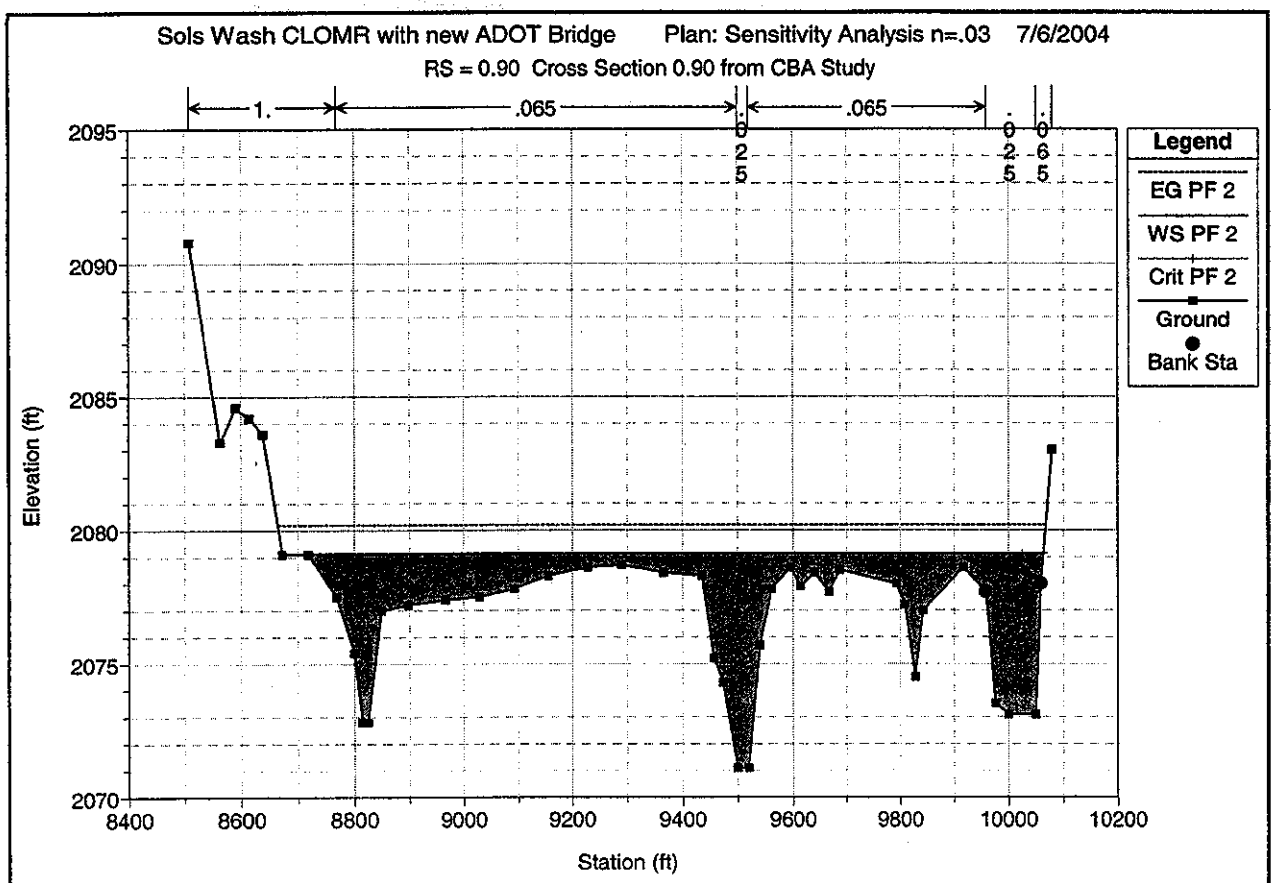
n = .03

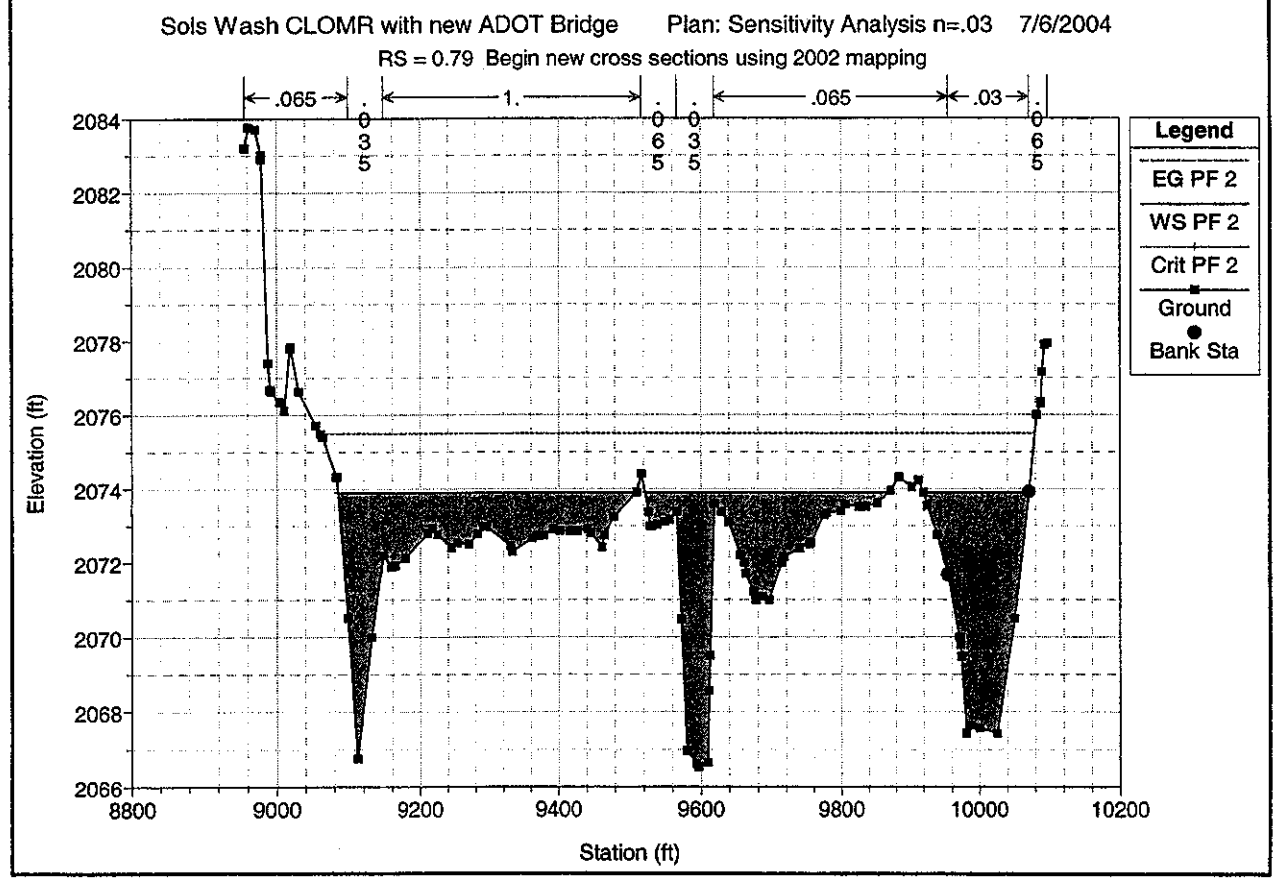
HEC-RAS Plan: B=90 n=03 River: Sols Wash Reach: Reach 1 Profile: PF 2

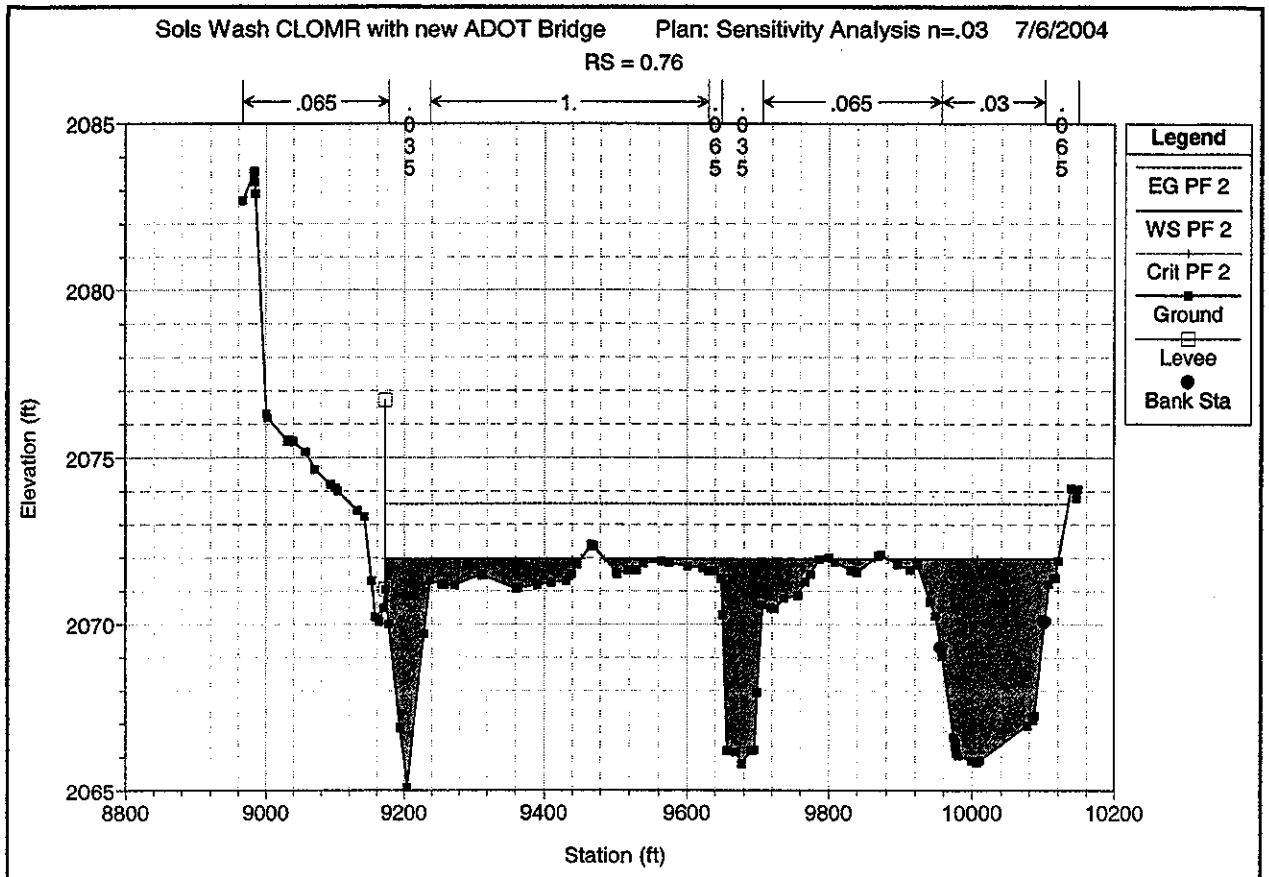
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.50	2088.50	2089.89	0.004414	12.19	2057.58	880.77	0.92
Reach 1	1.00	PF 2	14413.00	2078.10	2082.82	2084.10	2085.63	0.011161	16.55	1230.41	634.96	1.41
Reach 1	0.90	PF 2	14413.00	2073.10	2079.04	2079.13	2080.20	0.007034	12.18	2569.40	1343.27	0.94
Reach 1	0.79	PF 2	14413.00	2067.42	2073.80	2073.90	2075.52	0.010167	13.72	1790.65	909.70	1.13
Reach 1	0.76	PF 2	14413.00	2065.84	2071.90	2071.96	2073.63	0.007057	12.34	1577.68	859.98	0.96
Reach 1	0.71	PF 2	14413.00	2063.89	2071.02	2070.12	2071.96	0.002965	9.37	2351.77	664.94	0.64
Reach 1	0.66	PF 2	14413.00	2061.79	2069.70	2068.75	2071.10	0.003460	10.59	1815.94	534.05	0.70
Reach 1	0.61	PF 2	14459.00	2059.91	2066.89	2066.89	2069.77	0.006845	13.67	1097.00	200.63	0.97
Reach 1	0.57	PF 2	14459.00	2057.69	2063.82	2064.53	2067.60	0.011173	15.61	928.21	184.03	1.21
Reach 1	0.52	PF 2	14459.00	2055.50	2064.21	2062.80	2065.92	0.003367	10.59	1442.53	220.48	0.70
Reach 1	0.48	PF 2	15045.00	2053.51	2063.89	2060.38	2065.10	0.001699	8.84	1701.64	184.51	0.51
Reach 1	0.43	PF 2	15045.00	2051.27	2063.64	2058.29	2064.63	0.000958	8.00	1881.52	201.37	0.41
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2060.83	2056.60	2062.01	0.001309	8.70	1731.28	261.56	0.47
Reach 1	0.35	PF 2	15045.00	2047.68	2056.46	2056.46	2060.53	0.005993	16.19	935.27	117.80	1.00
Reach 1	0.27	PF 2	15045.00	2044.00	2054.65	2053.26	2057.81	0.003879	14.25	1055.70	107.48	0.80
Reach 1	0.22	PF 2	15045.00	2043.00	2052.04	2052.04	2056.06	0.006091	16.09	934.98	115.47	1.00
Reach 1	0.19	PF 2	15045.00	2040.69	2047.94	2049.70	2054.31	0.013343	20.24	743.18	115.10	1.40
Reach 1	0.12	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2046.27	2047.25	2050.55	0.007350	17.58	1133.13	214.56	1.22
Reach 1	0.06	PF 2	15045.00	2036.99	2044.19	2042.48	2044.79	0.002917	7.66	3307.91	818.58	0.55
Reach 1	0.0	PF 2	15045.00	2038.00	2043.52	2042.39	2044.34	0.002757	9.09	3336.53	1079.12	0.72

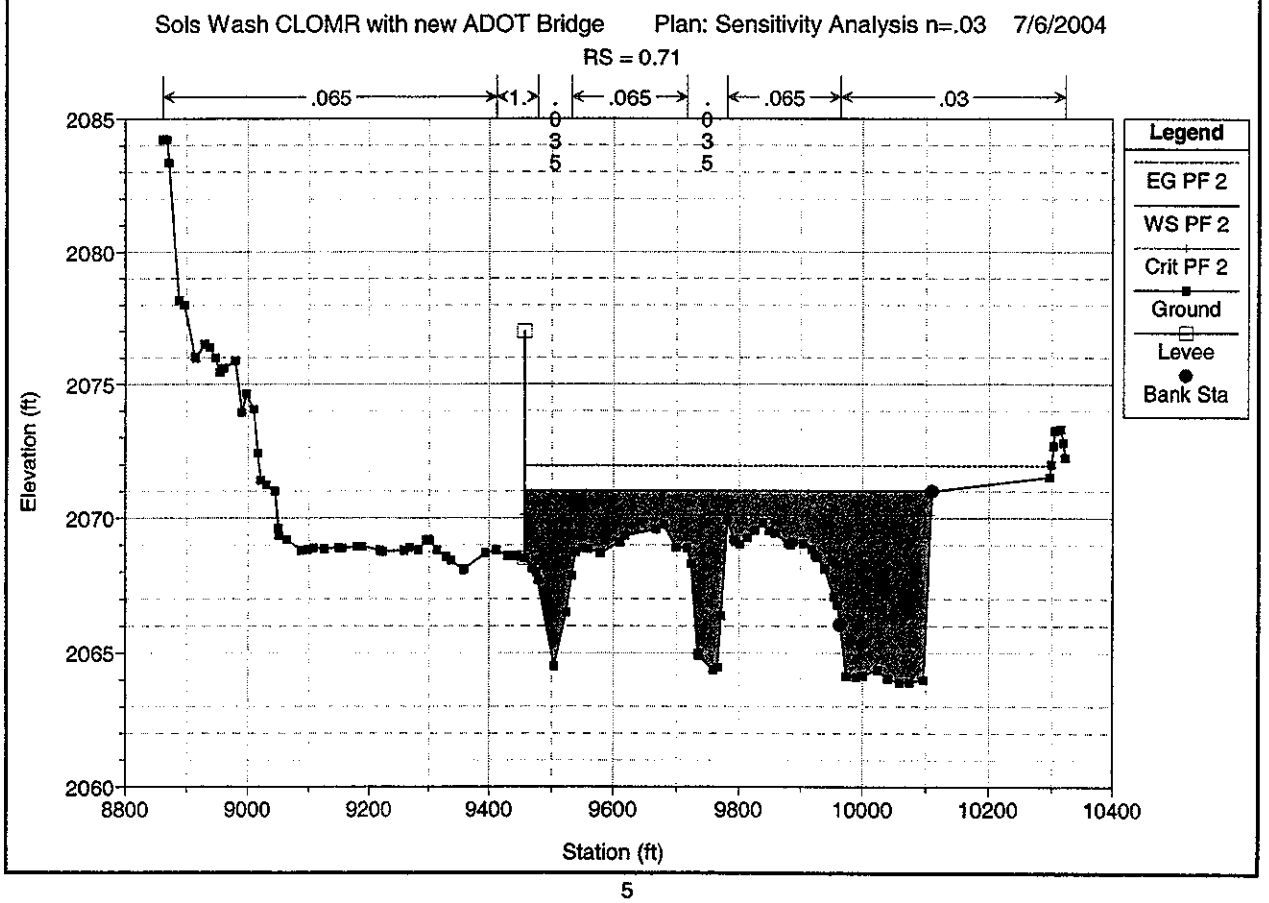

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 1.12 Cross Section 1.12 from CBA Study
.06
.025
.06
.06
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2094
2092
2090
2088
2086
2084
2082
9200
9400
9600
9800
10000
10200
10400
Station (ft)

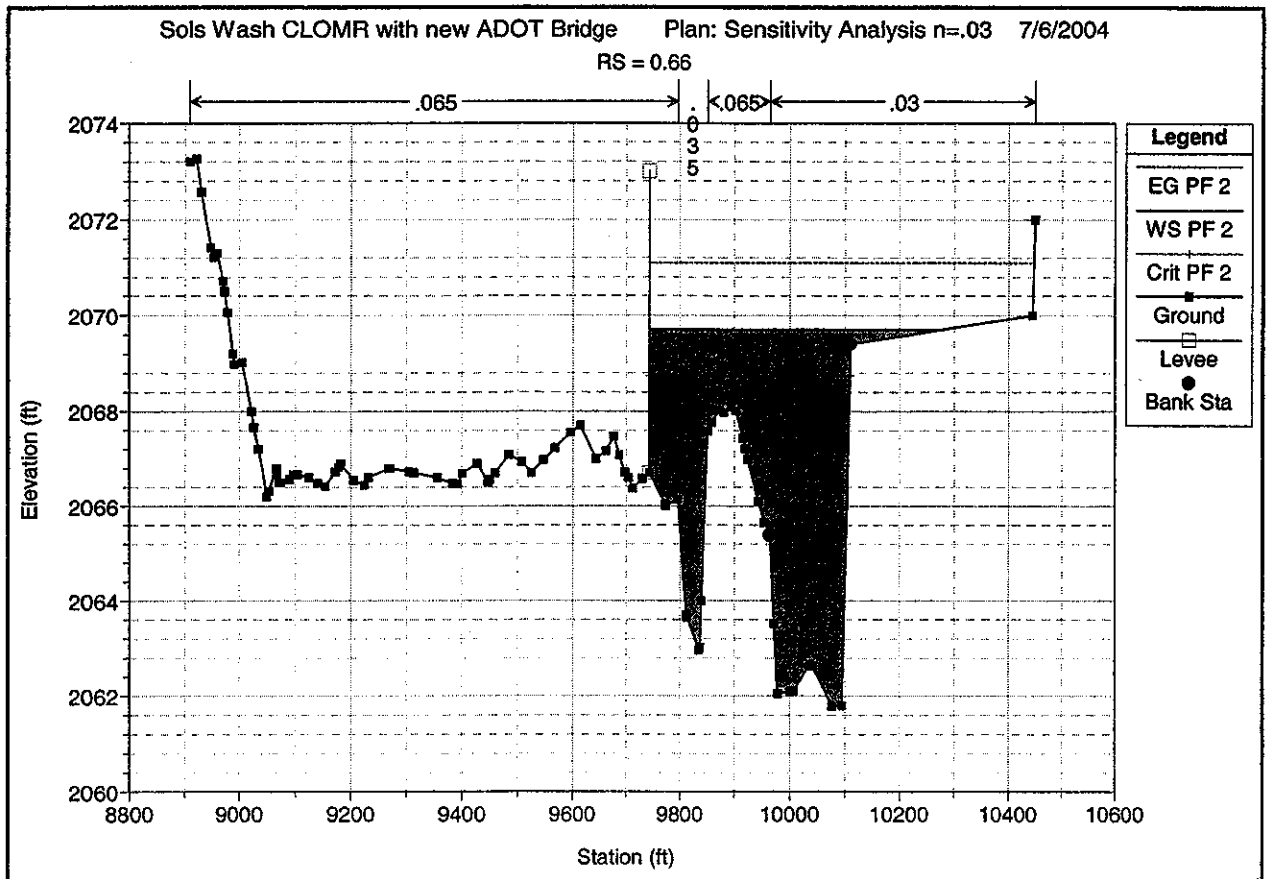

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 1.00 Cross Section 1.10 from CBA Study
1.
.065
.065
.025
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2100
2095
2090
2085
2080
2075
8000
8500
9000
9500
10000
10500
Station (ft)

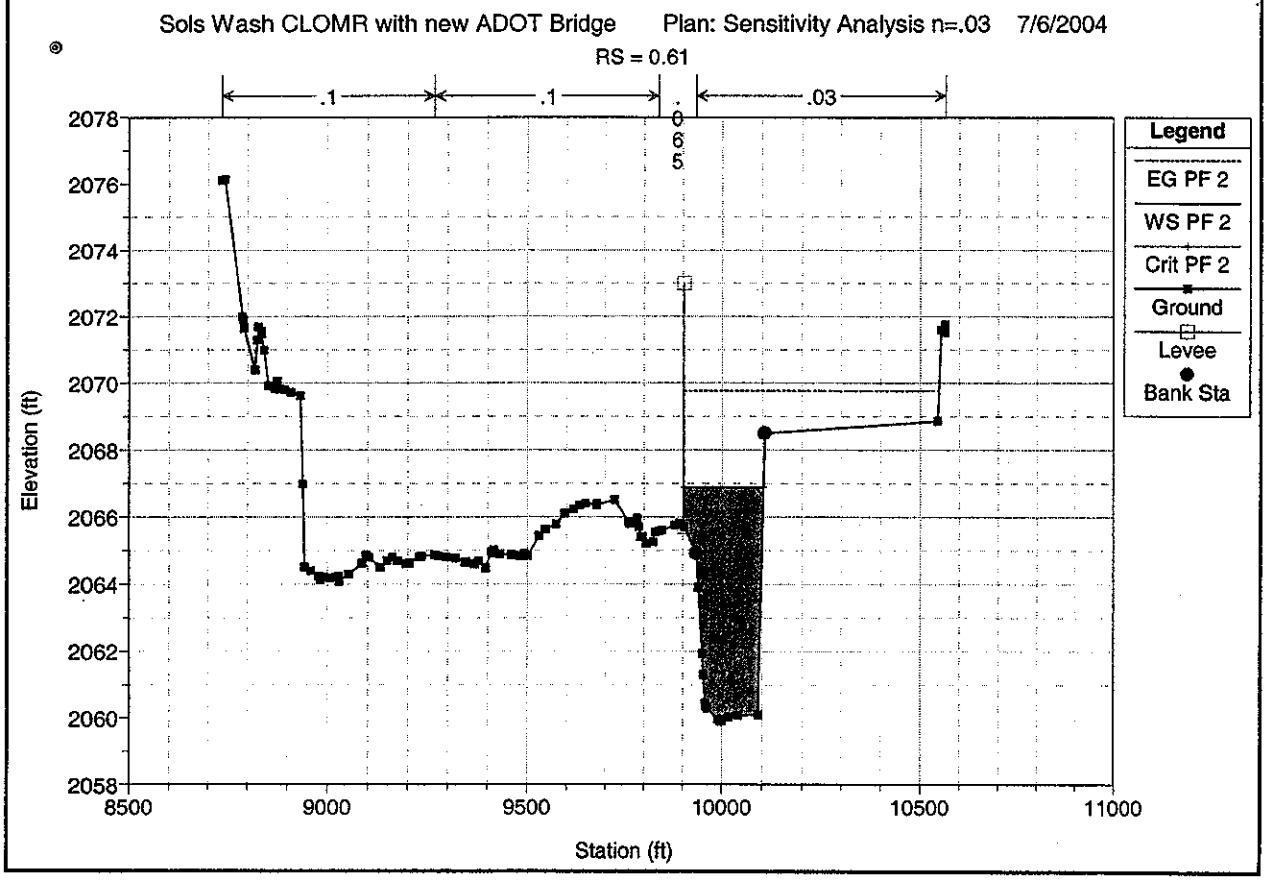

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.90 Cross Section 0.90 from CBA Study
1.
.065
.065
.025
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

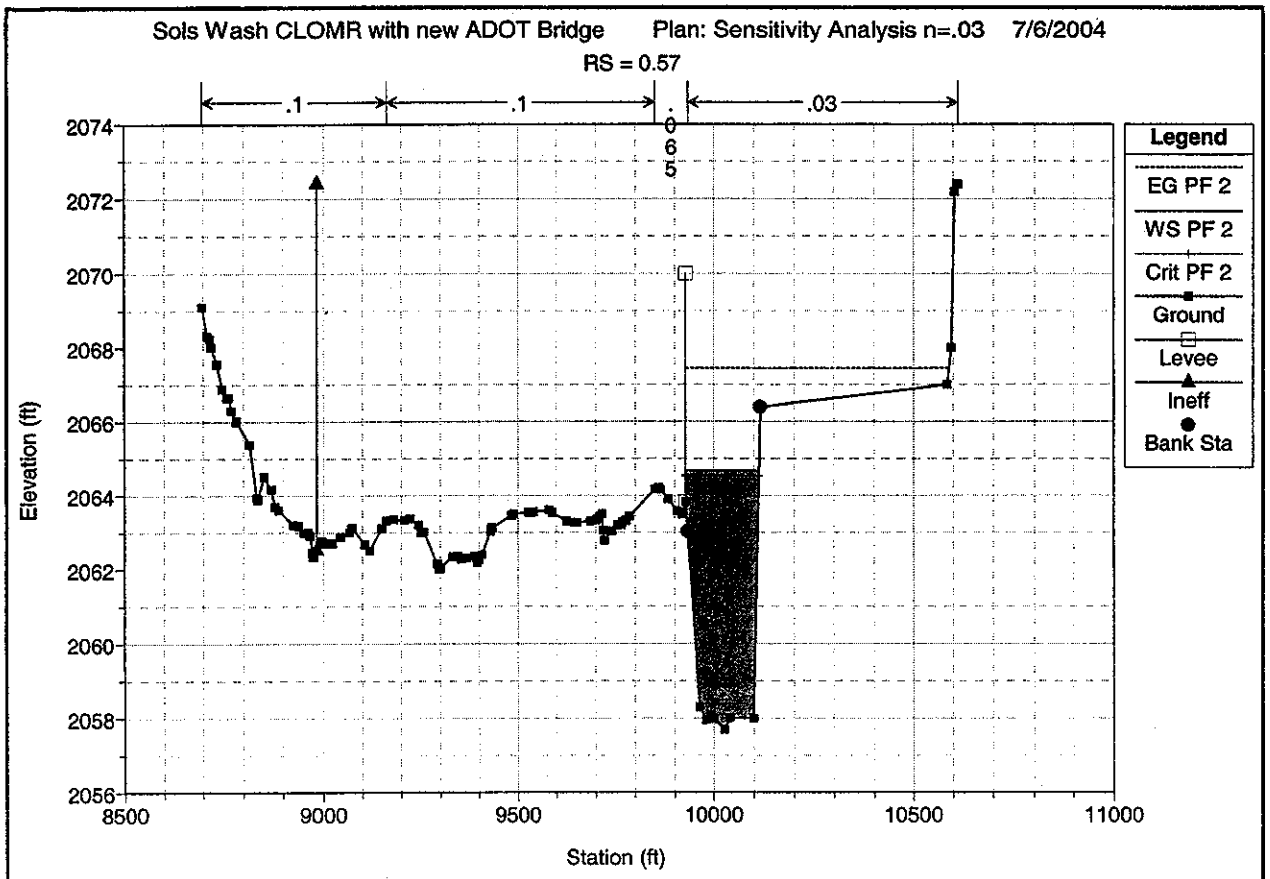

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.79 Begin new cross sections using 2002 mapping
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

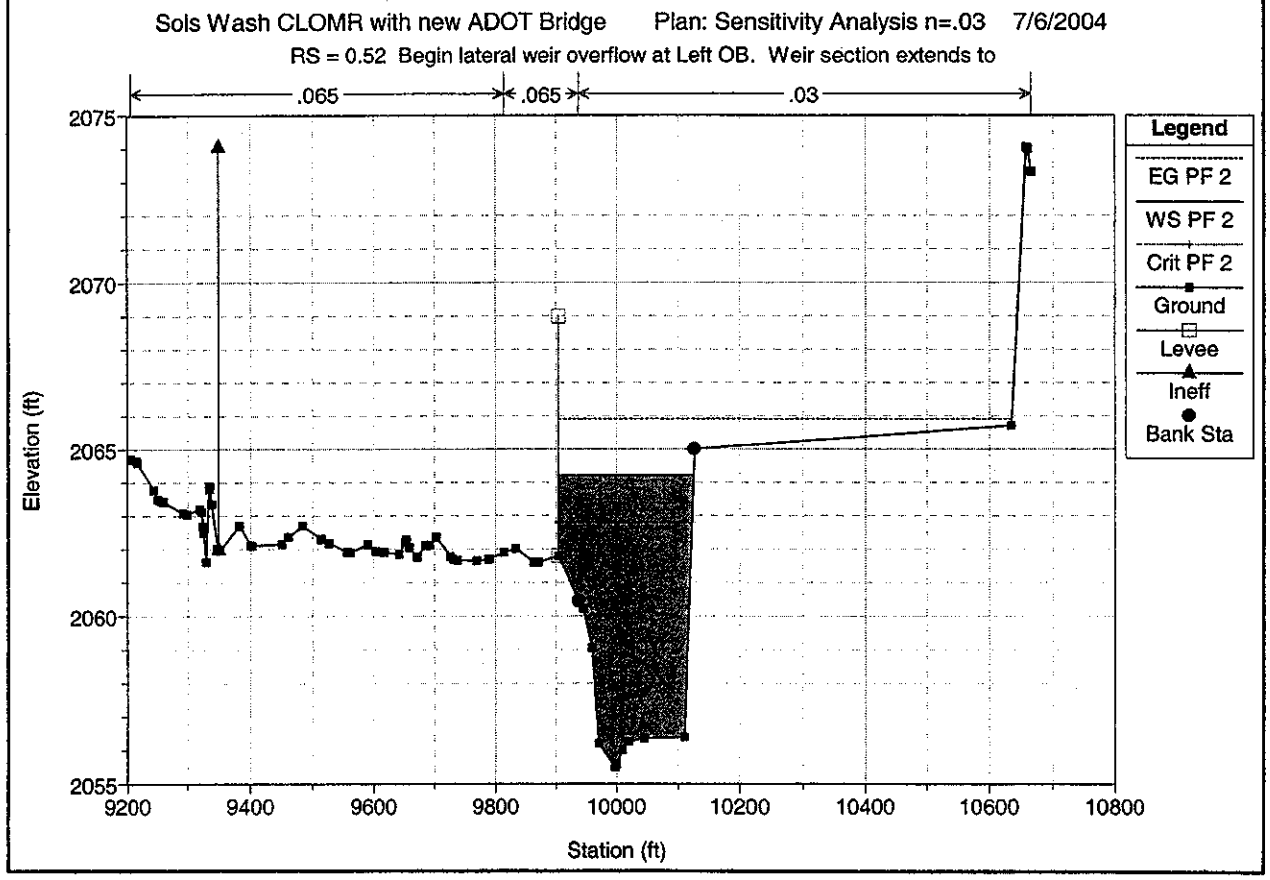

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.76
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

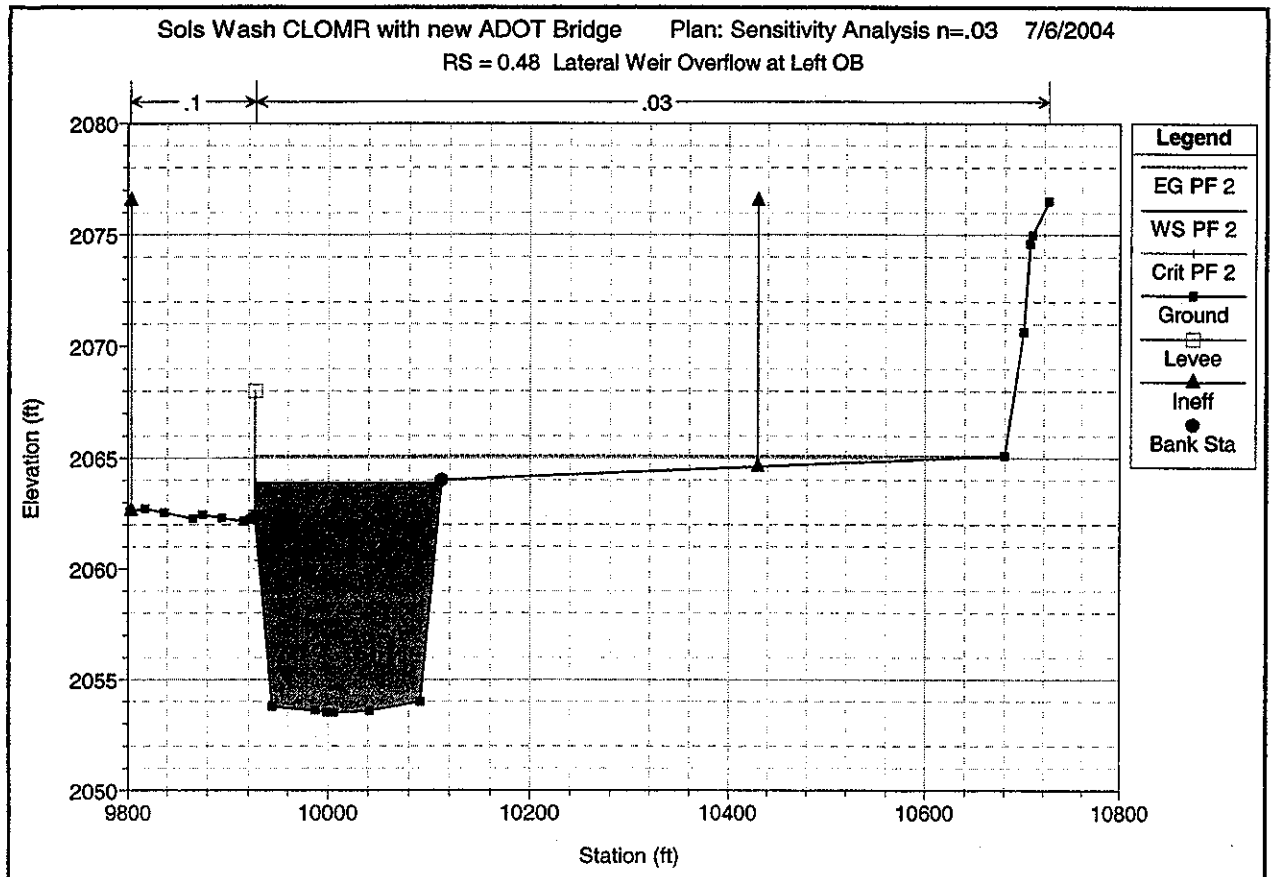

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.71
.065
1.
.035
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

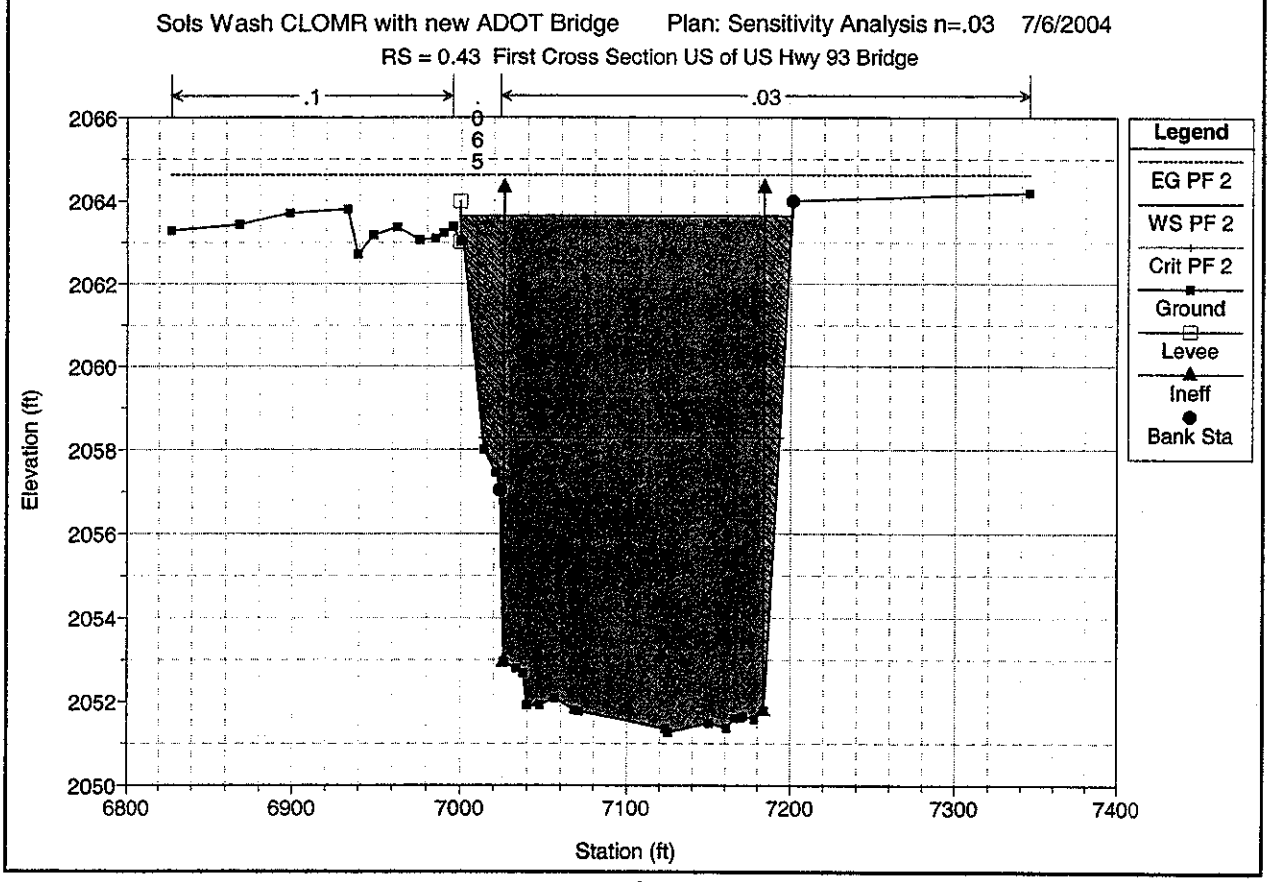

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.66
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

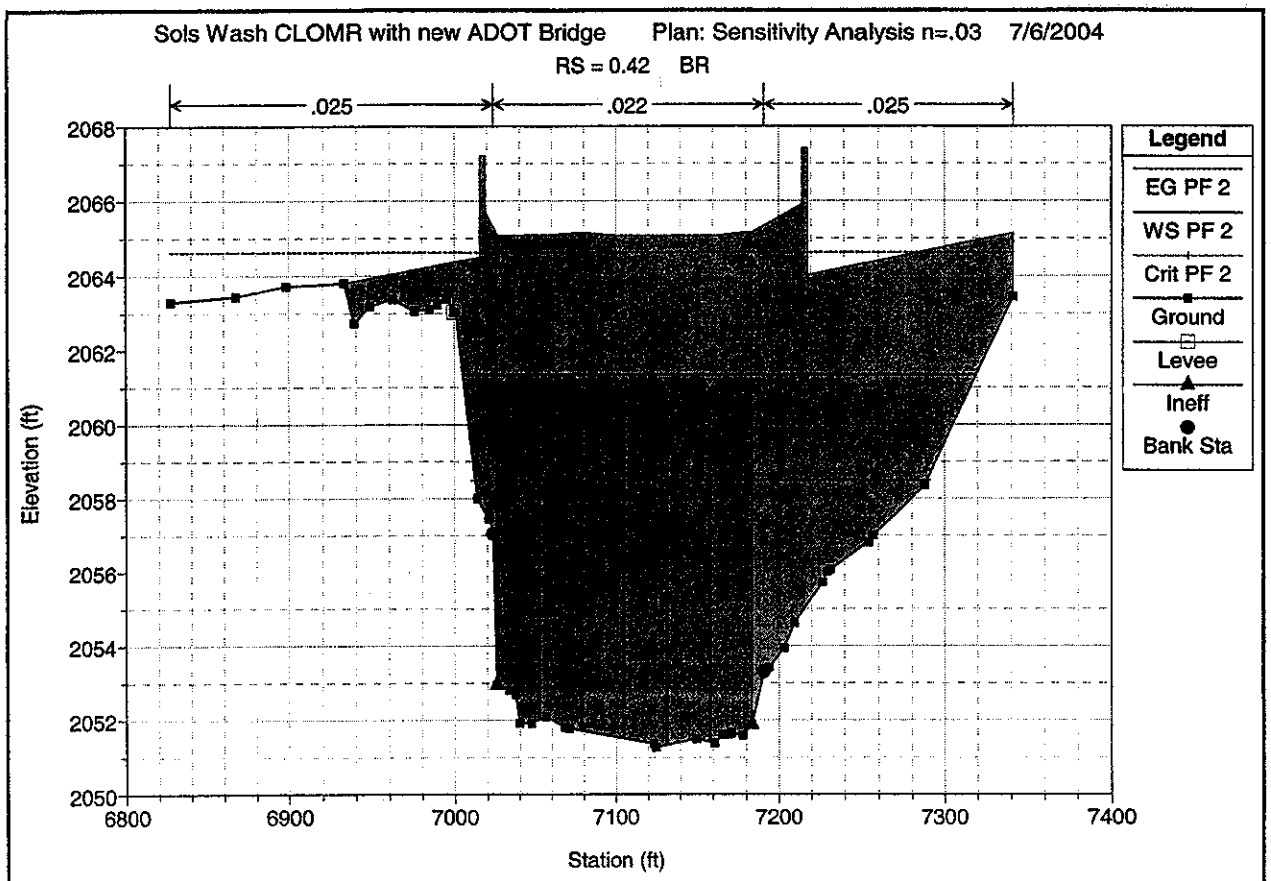

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.61
.1
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

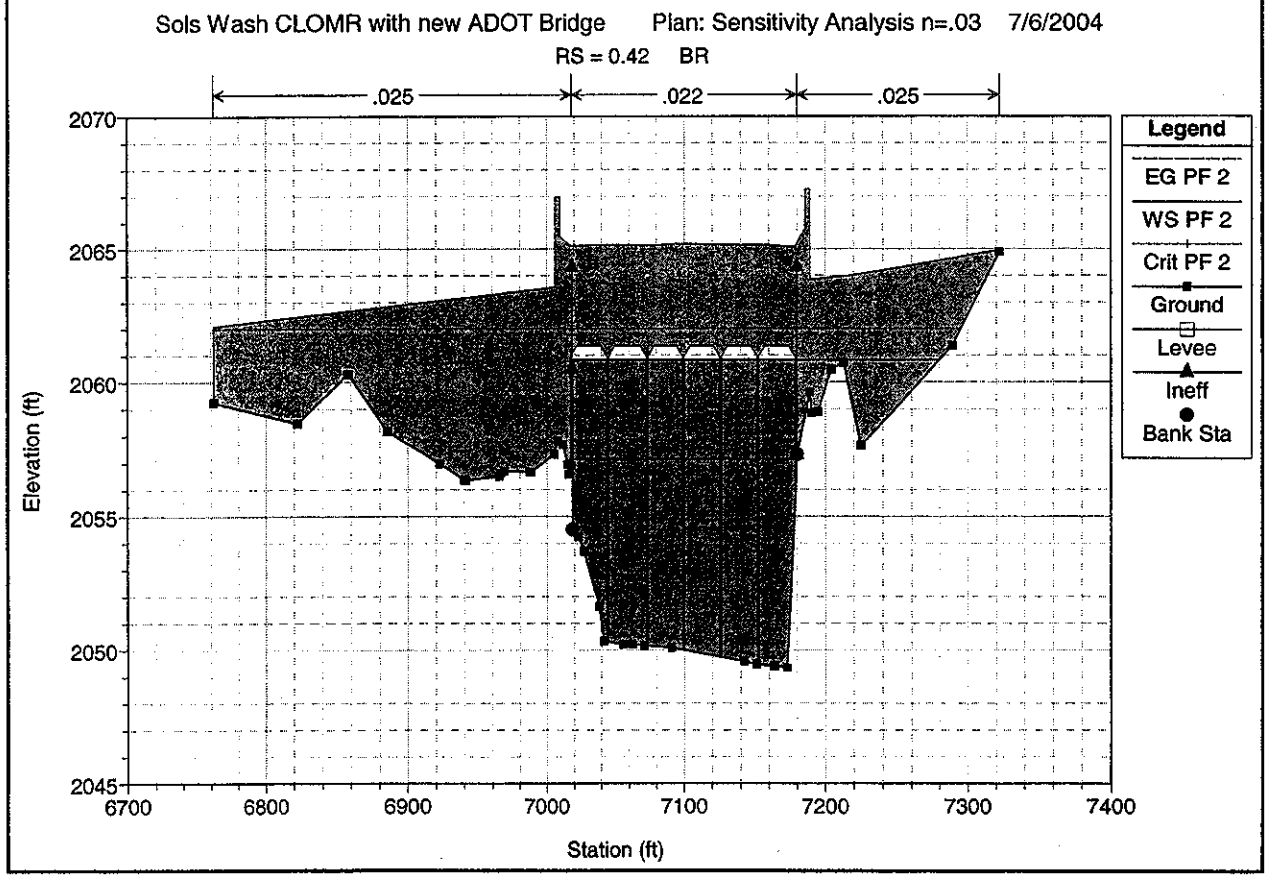

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.57
.1
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
2058
2056
8500
9000
9500
10000
10500
11000

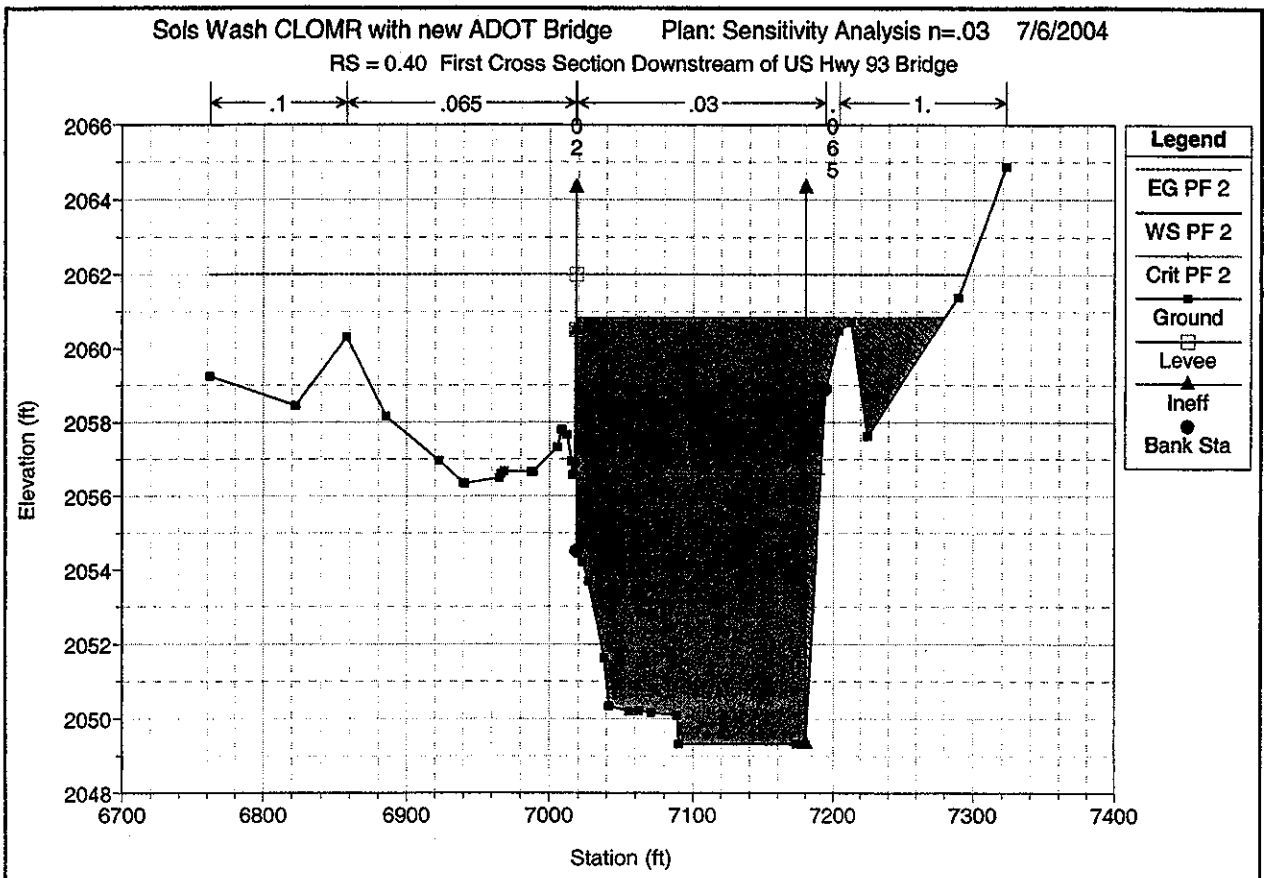

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.52 Begin lateral weir overflow at Left OB. Weir section extends to
.065
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2075
2070
2065
2060
2055
9200
9400
9600
9800
10000
10200
10400
10600
10800

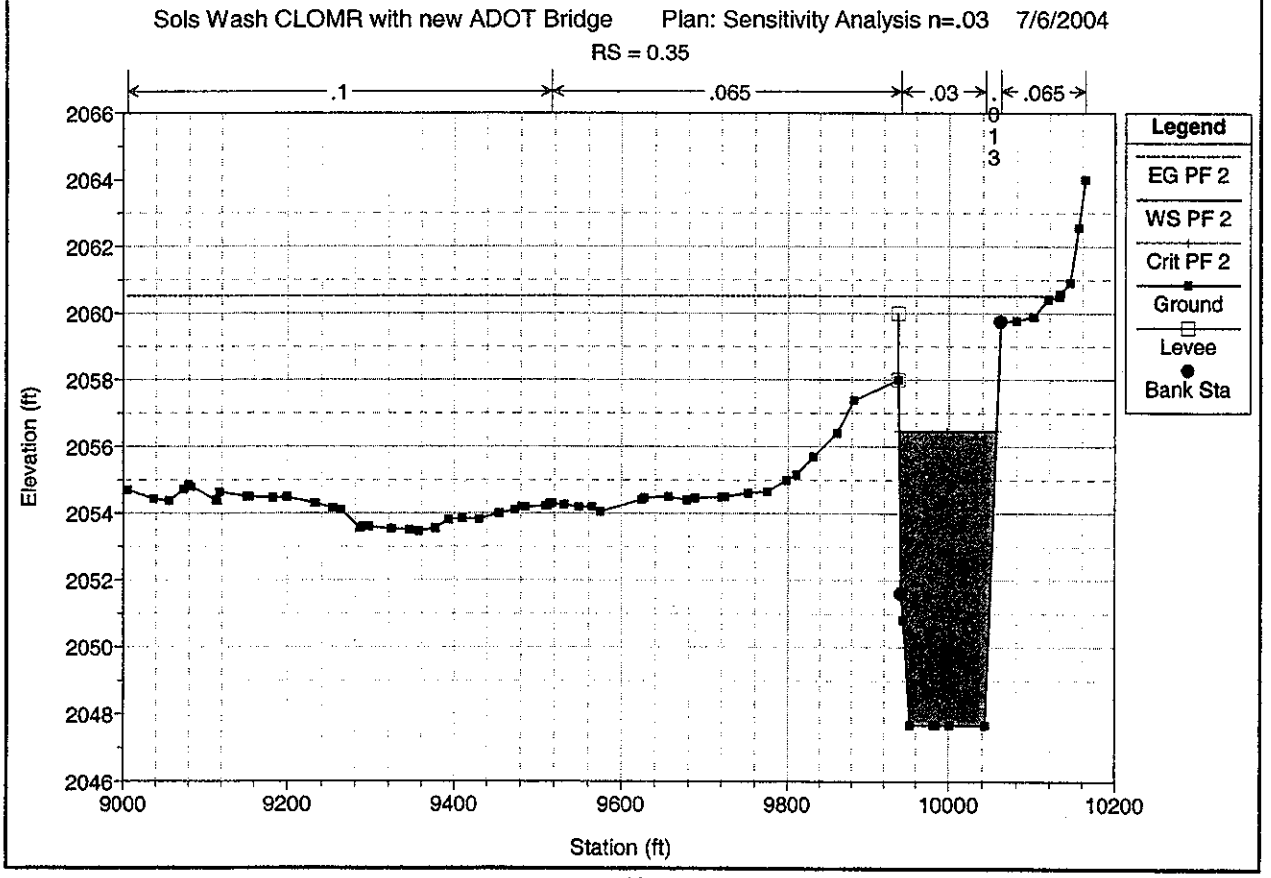

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.48 Lateral Weir Overflow at Left OB
.1
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2080
2075
2070
2065
2060
2055
2050
9800
10000
10200
10400
10600
10800
Station (ft)

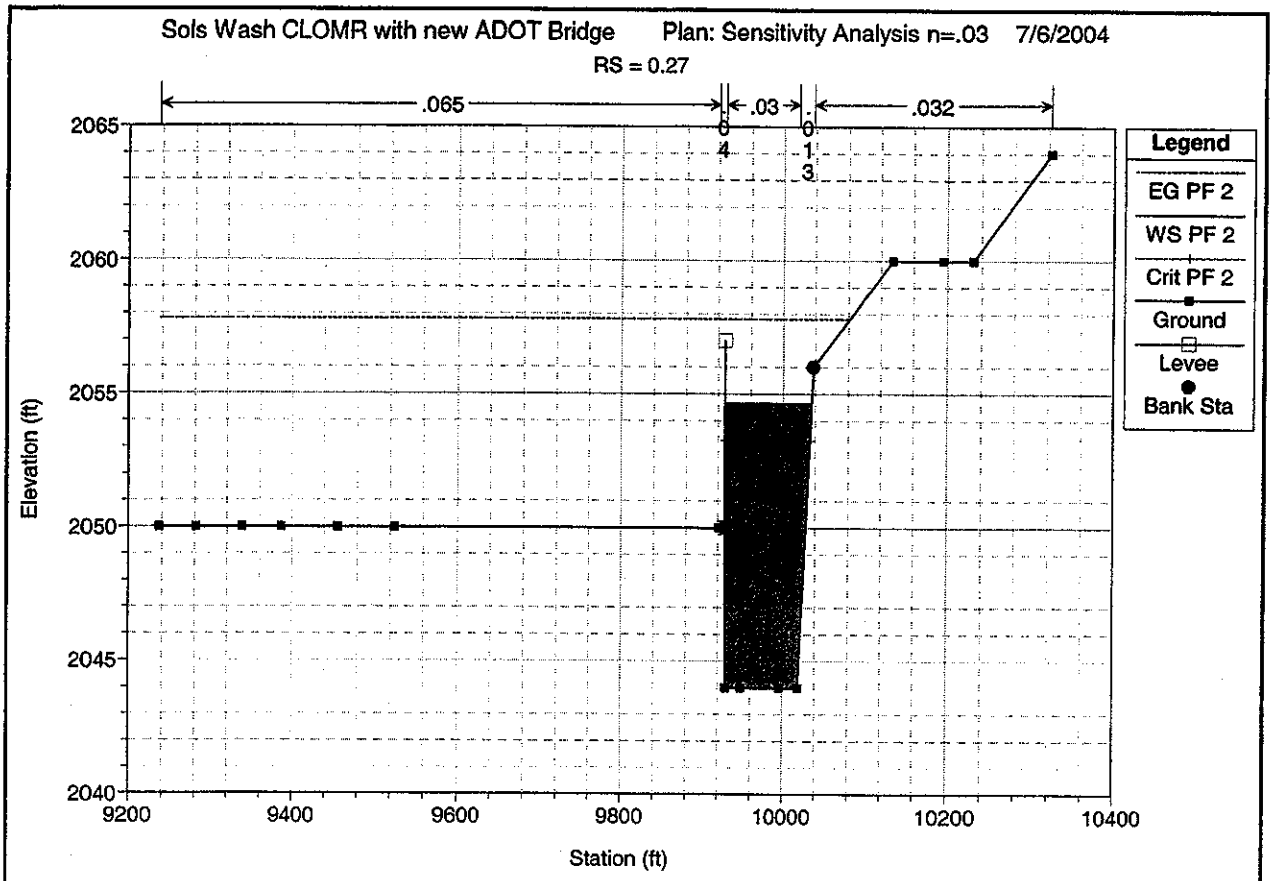

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.43 First Cross Section US of US Hwy 93 Bridge
.1
.03
0
6
5
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

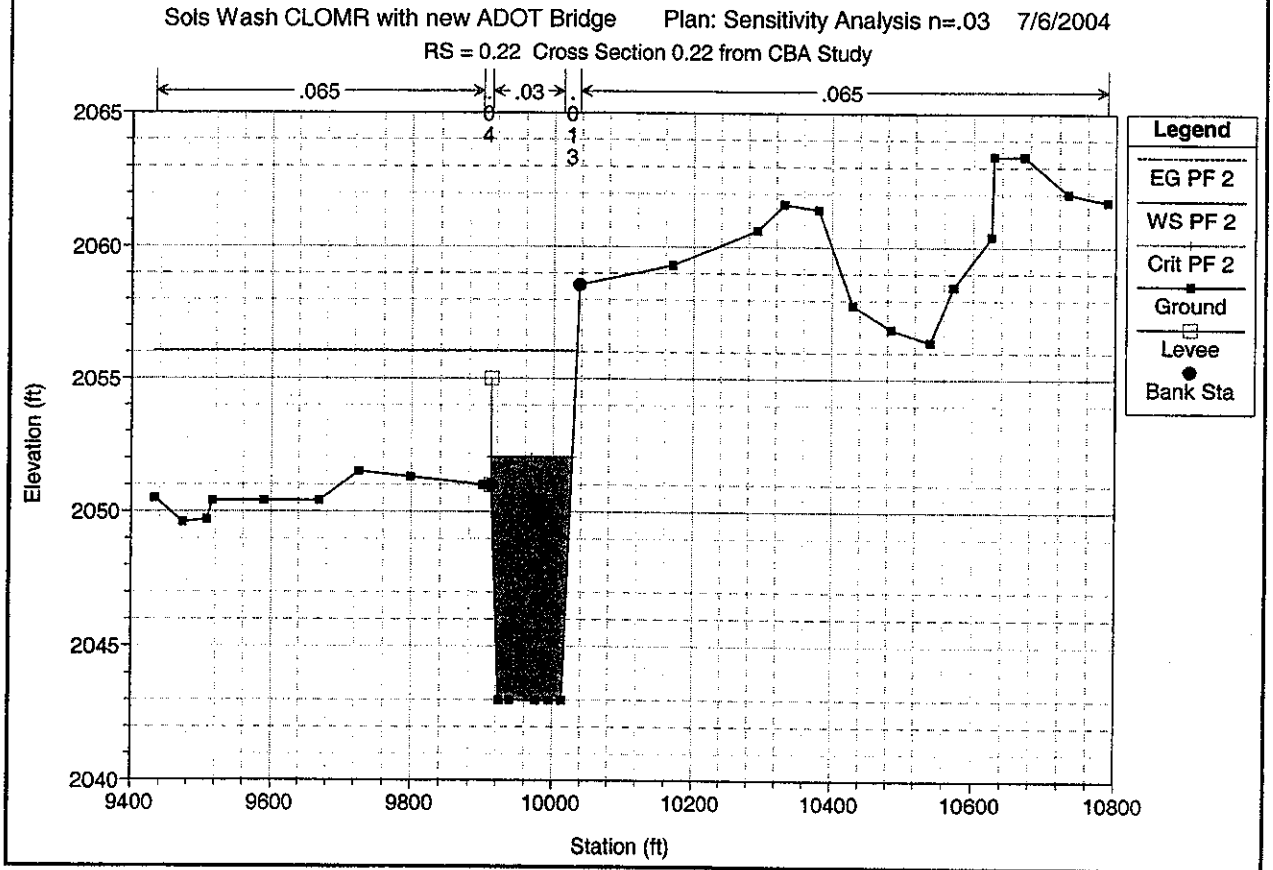

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

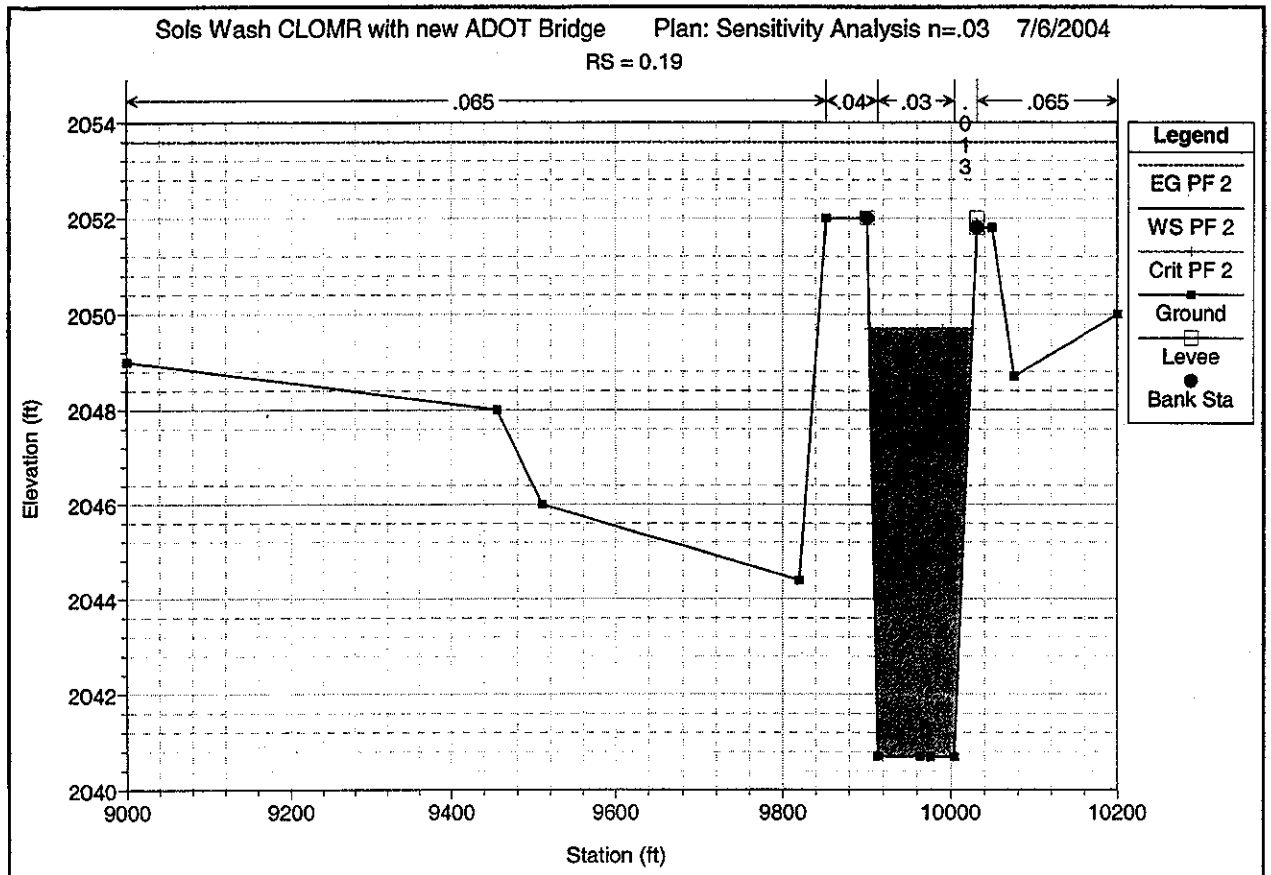

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

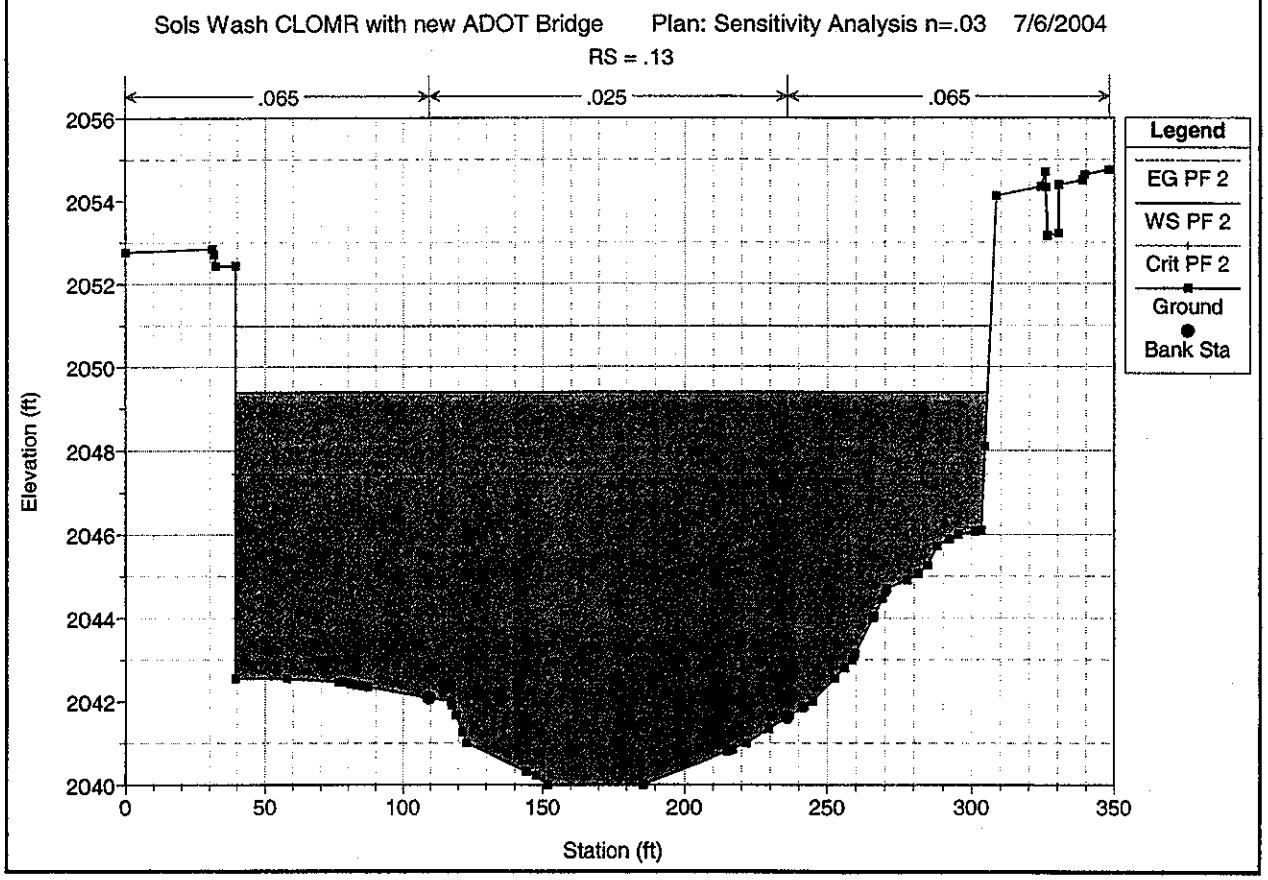

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.40 First Cross Section Downstream of US Hwy 93 Bridge
.1
.065
.03
1.
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

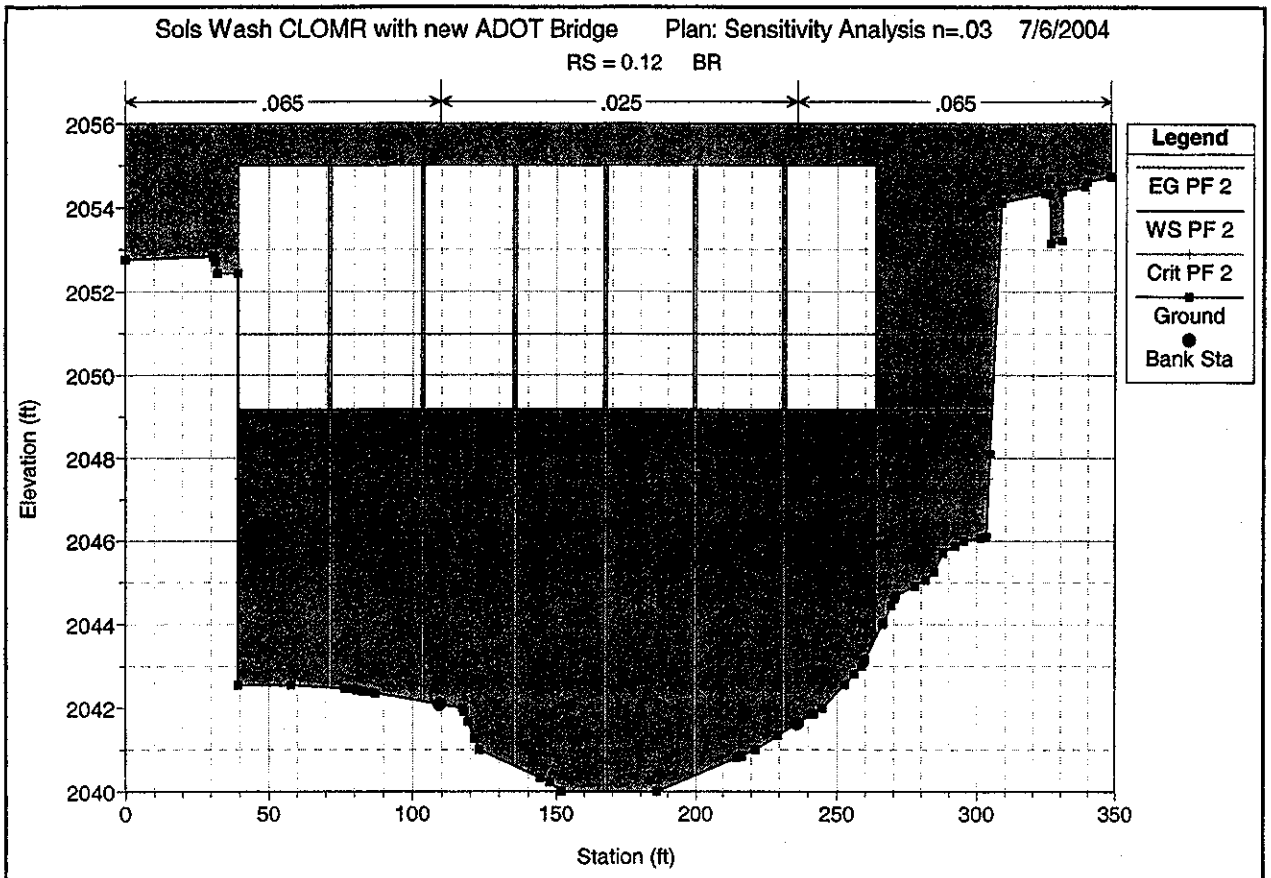

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.35
.1
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

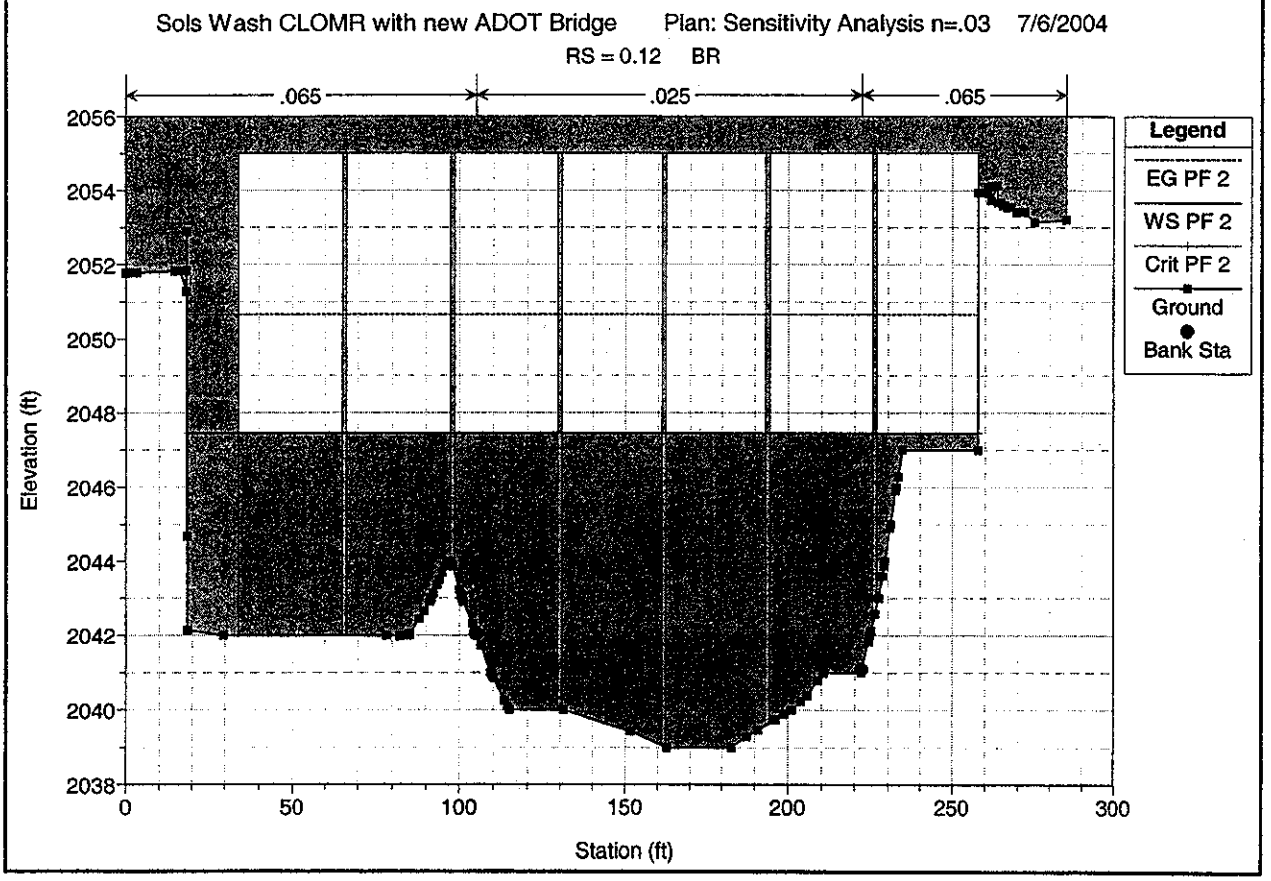

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.27
.065
.03
.032
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

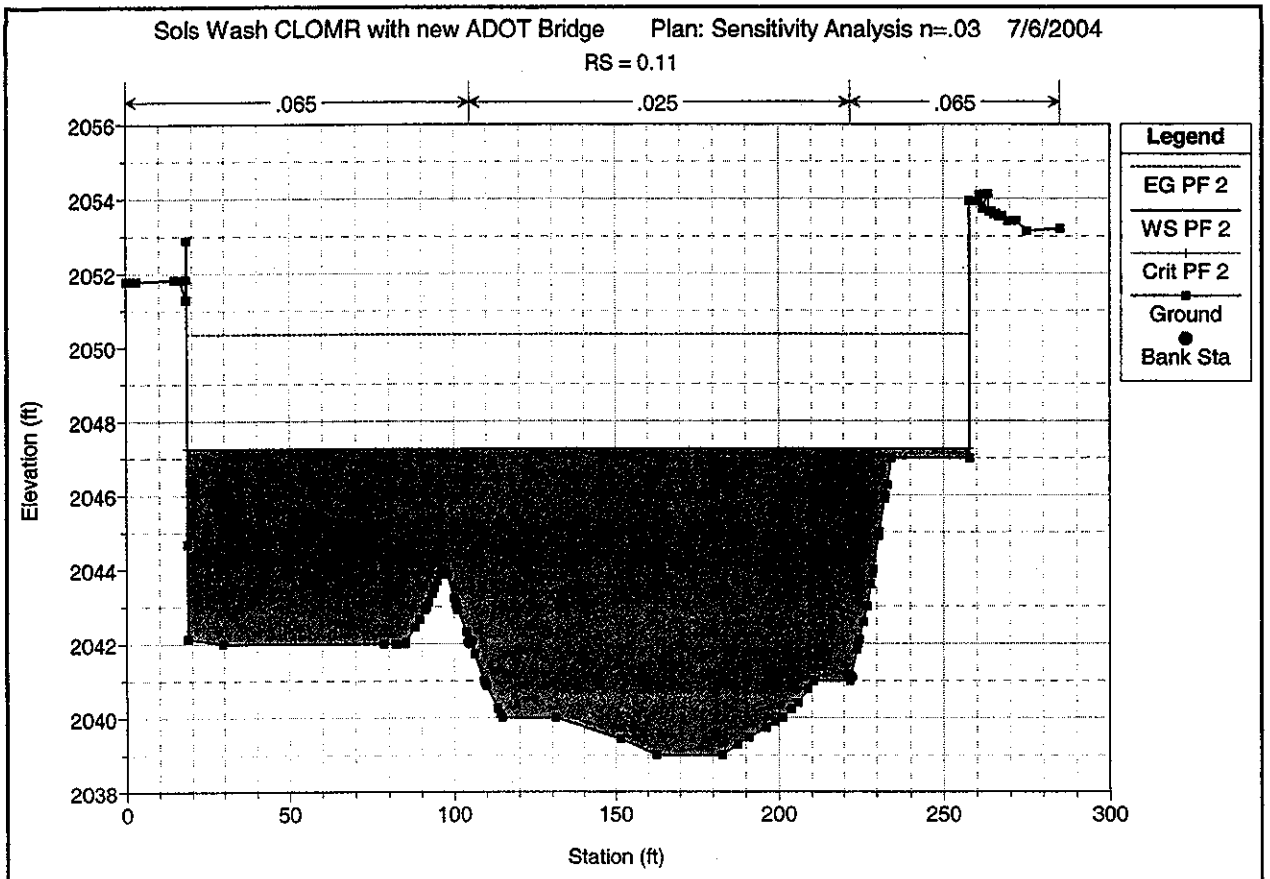

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.22 Cross Section 0.22 from CBA Study
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

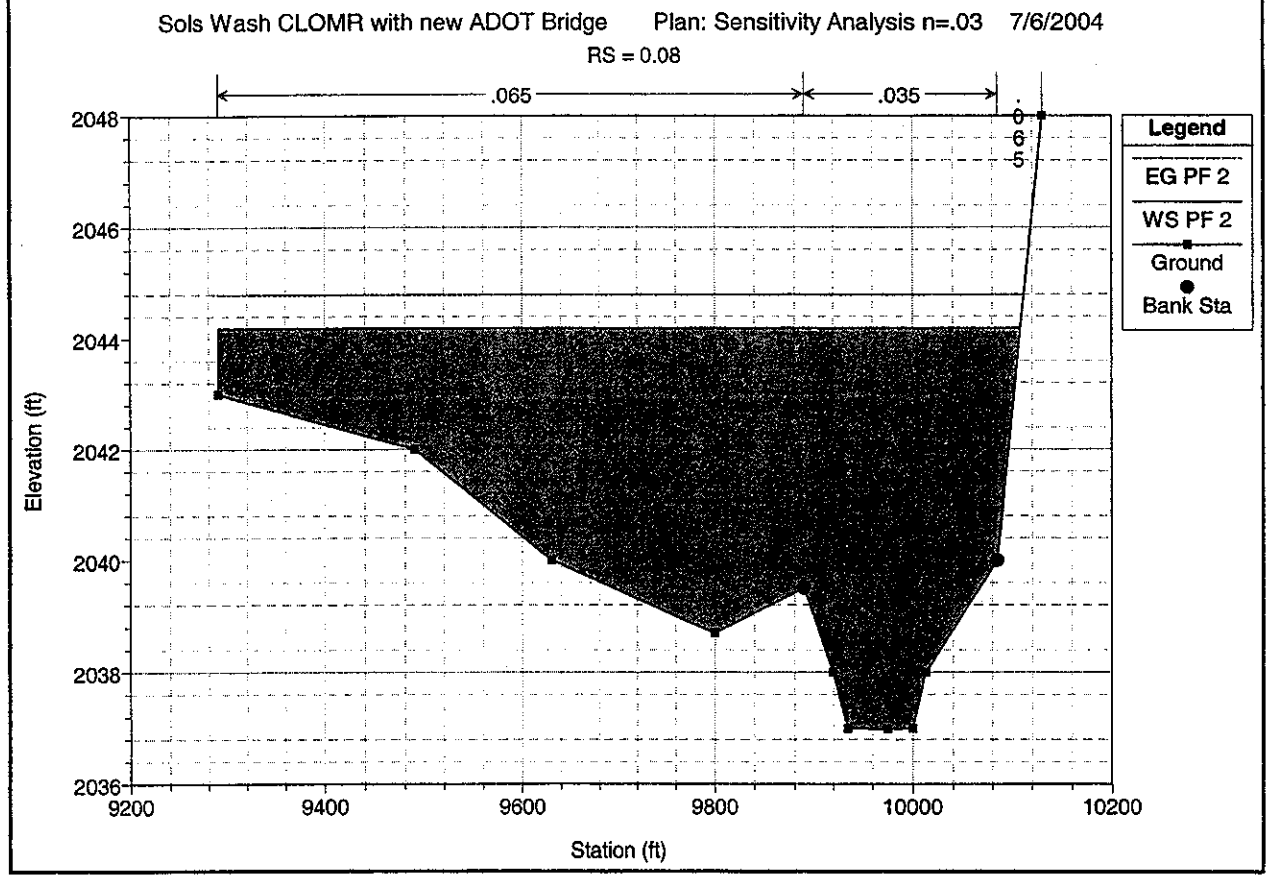

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.19
.065
.04
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

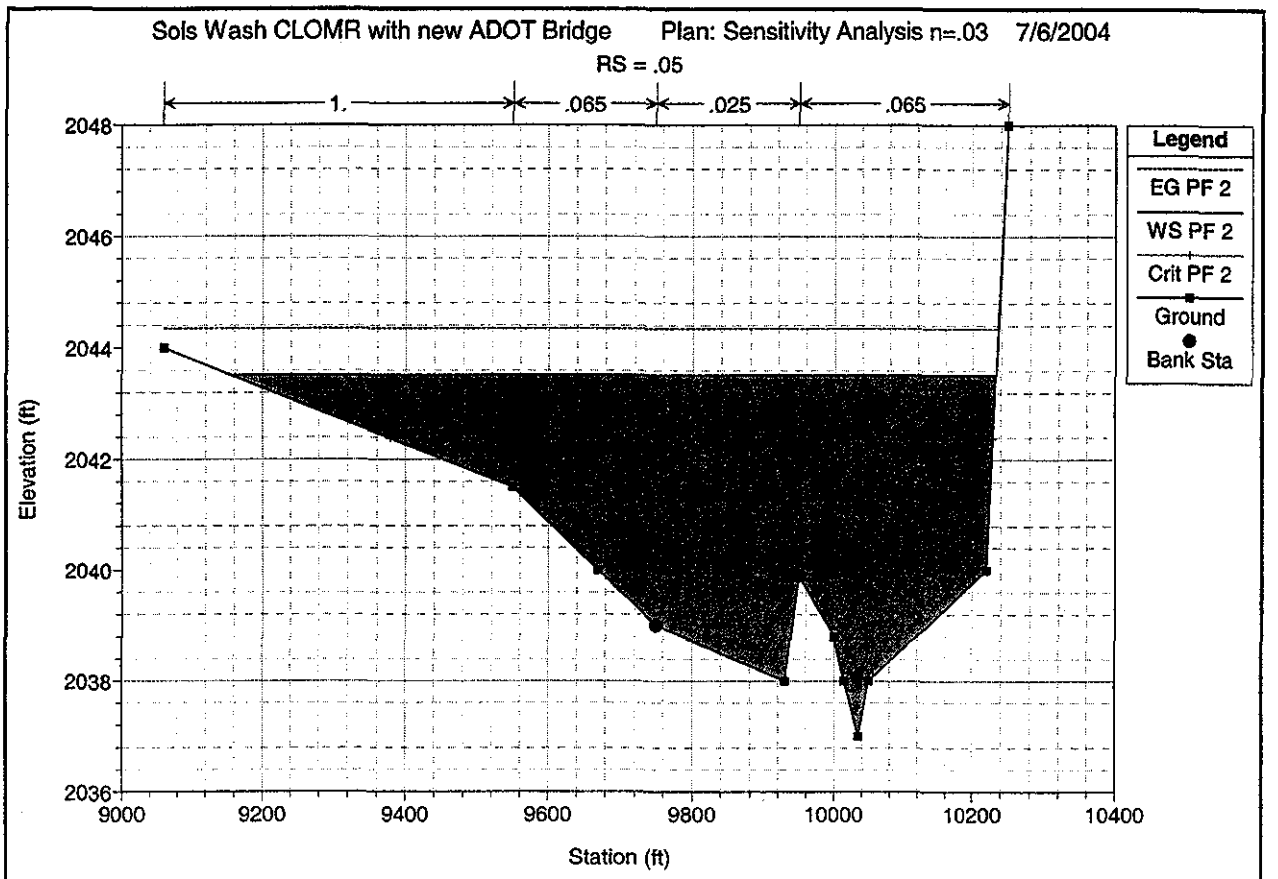

Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = .13
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.11
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = 0.08
.065
.035
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Sensitivity Analysis n=.03 7/6/2004
RS = .05
1.
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

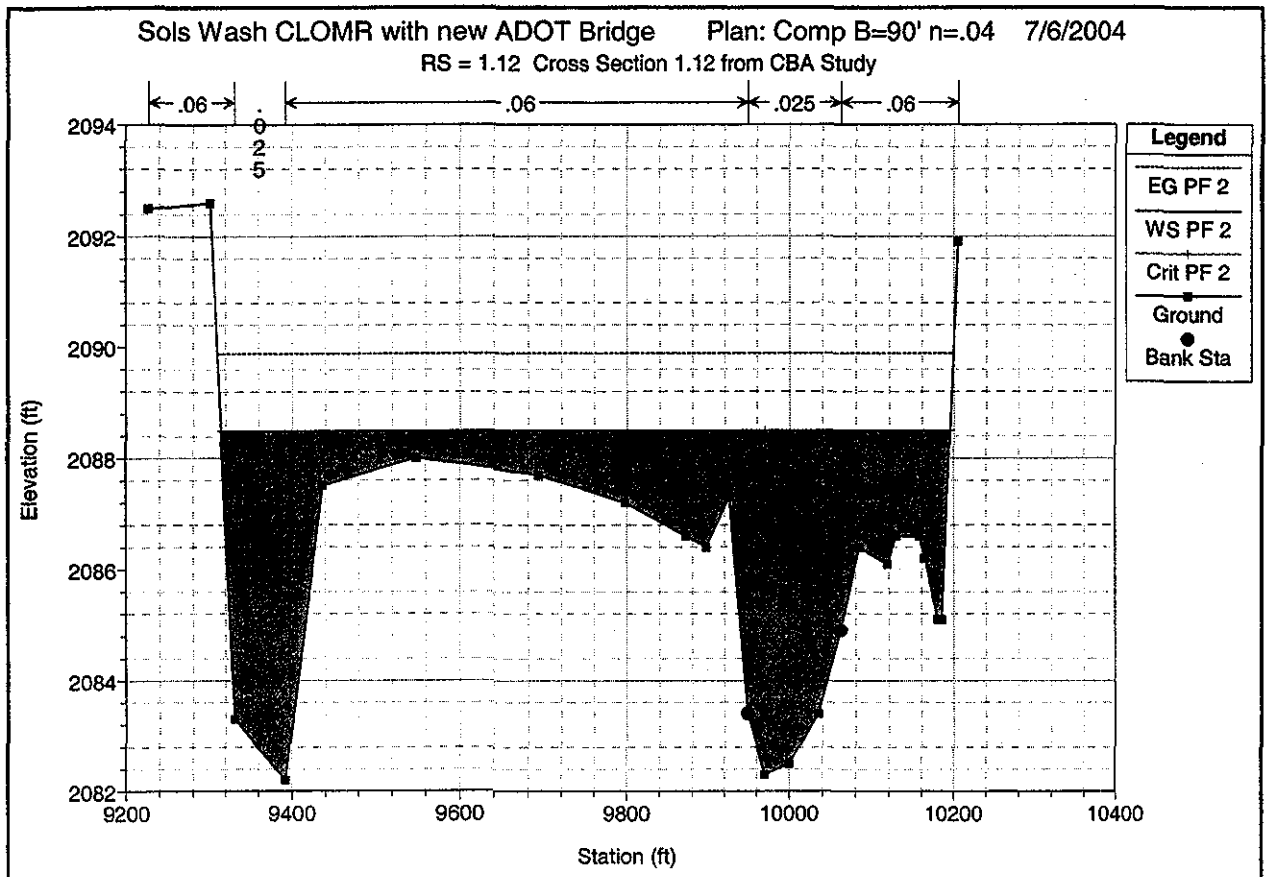
HEC-RAS Plan: n=.04 River: Sols Wash Reach: Reach 1 Profile: PF 2

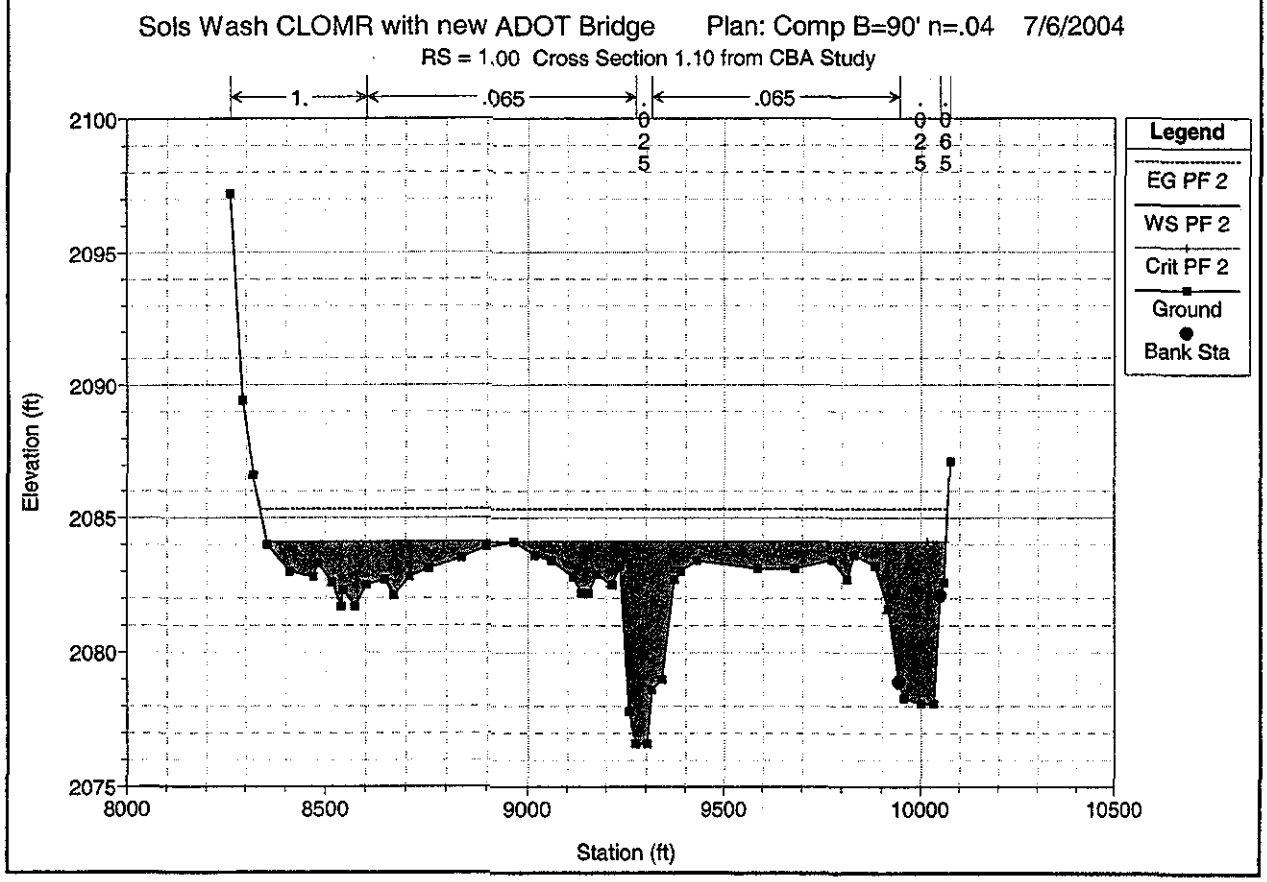
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.50	2088.50	2089.89	0.004414	12.19	2057.58	880.77	0.92
Reach 1	1.00	PF 2	14413.00	2078.10	2084.10	2084.10	2085.33	0.004281	12.19	2886.35	1711.00	0.91
Reach 1	0.95	PF 2	14413.00	2073.10	2079.13	2079.13	2080.20	0.006360	11.72	2697.71	1392.79	0.90
Reach 1	0.91	PF 2	14413.00	2067.42	2073.95	2073.95	2075.50	0.009039	13.16	1927.64	929.09	1.07
Reach 1	0.88	PF 2	14413.00	2065.84	2072.44	2072.05	2073.52	0.007432	10.15	2075.44	952.12	0.75
Reach 1	0.71	PF 2	14413.00	2063.89	2071.54	2070.06	2072.14	0.003171	7.64	2739.48	840.65	0.51
Reach 1	0.66	PF 2	14413.00	2061.79	2070.45	2068.68	2071.28	0.003391	8.41	2317.23	703.22	0.53
Reach 1	0.61	PF 2	14459.00	2059.91	2067.40	2066.91	2069.81	0.009302	12.55	1198.64	201.64	0.86
Reach 1	0.57	PF 2	14459.00	2057.69	2065.74	2064.56	2067.73	0.007088	11.34	1285.28	187.90	0.76
Reach 1	0.52	PF 2	14459.00	2055.50	2064.85	2062.79	2066.25	0.004437	9.61	1584.66	221.72	0.61
Reach 1	0.48	PF 2	15045.00	2053.51	2064.11	2060.38	2065.27	0.002796	8.64	1745.25	240.36	0.50
Reach 1	0.43	PF 2	15045.00	2051.27	2063.64	2058.29	2064.63	0.001704	8.00	1881.09	201.36	0.41
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2061.09	2056.60	2062.21	0.002151	8.49	1772.94	265.99	0.45
Reach 1	0.35	PF 2	15045.00	2047.68	2057.98	2056.53	2060.84	0.005876	13.59	1116.43	120.91	0.78
Reach 1	0.27	PF 2	15045.00	2044.00	2056.07	2053.26	2058.47	0.004384	12.44	1209.23	111.13	0.66
Reach 1	0.22	PF 2	15045.00	2043.00	2052.04	2052.04	2056.06	0.010616	16.09	934.98	115.47	1.00
Reach 1	0.19	PF 2	15045.00	2040.69	2049.70	2049.70	2053.59	0.009917	15.82	950.82	121.19	1.00
Reach 1	0.13	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.10	PF 2	15045.00	2039.00	2047.25	2047.25	2050.36	0.004473	15.08	1349.67	239.45	0.98
Reach 1	0.06	PF 2	15045.00	2036.99	2044.19		2044.79	0.002923	7.67	3305.61	818.56	0.55
Reach 1	0.05	PF 2	15045.00	2038.00	2043.52	2042.38	2044.34	0.002757	9.09	3336.53	1079.12	0.72

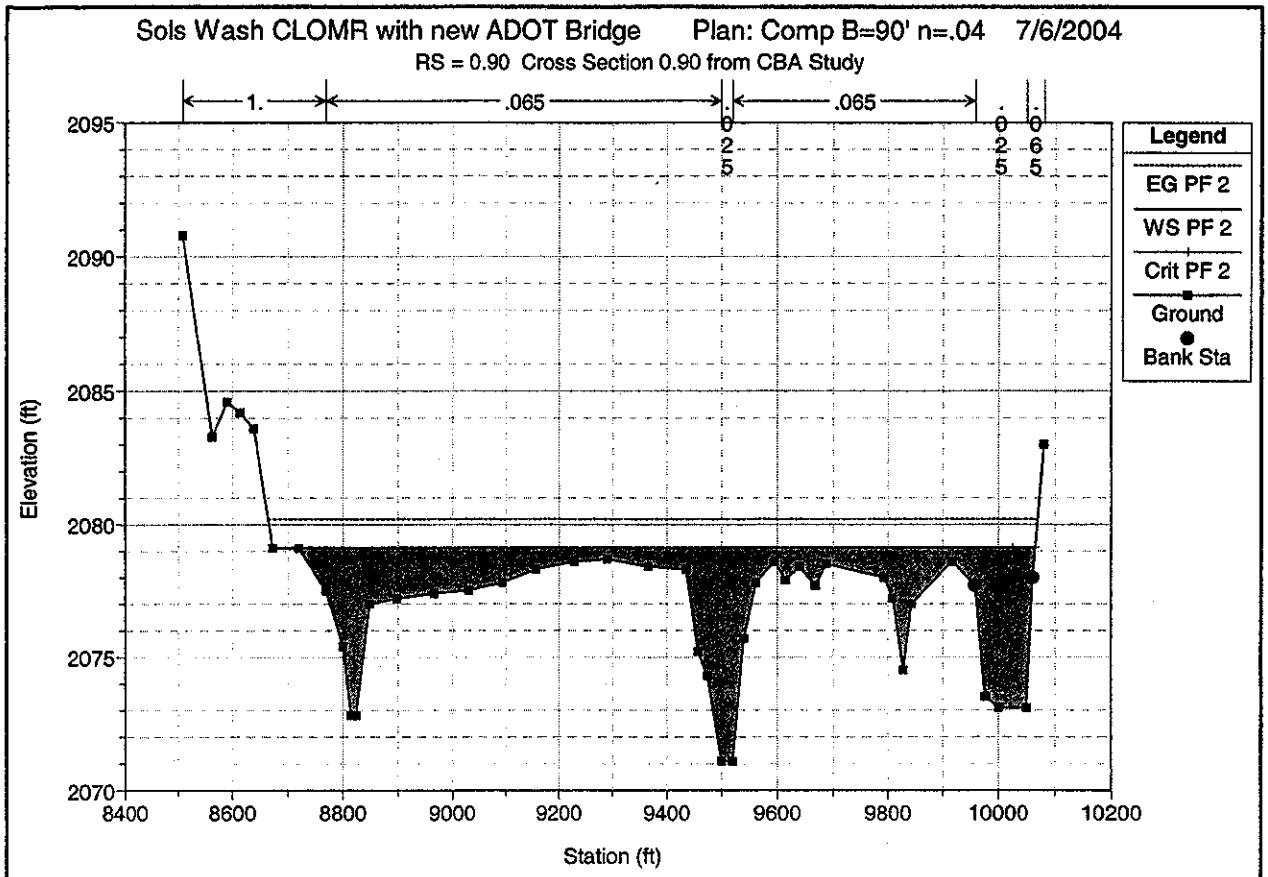
SENSITIVITY ANALYSIS n=.04

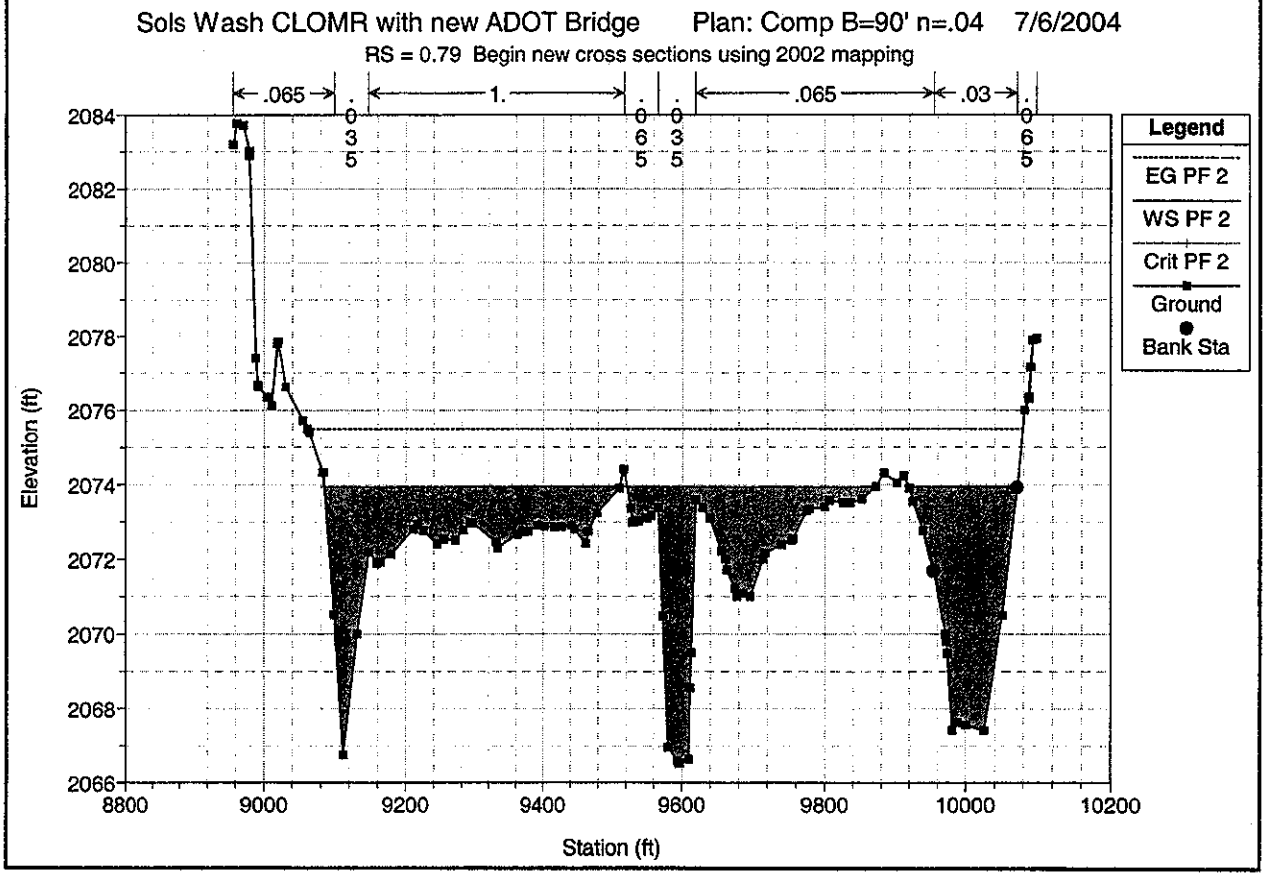
HEC-RAS Plan: n=.04 River: Sols Wash Reach: Reach 1 Profile: PF 2

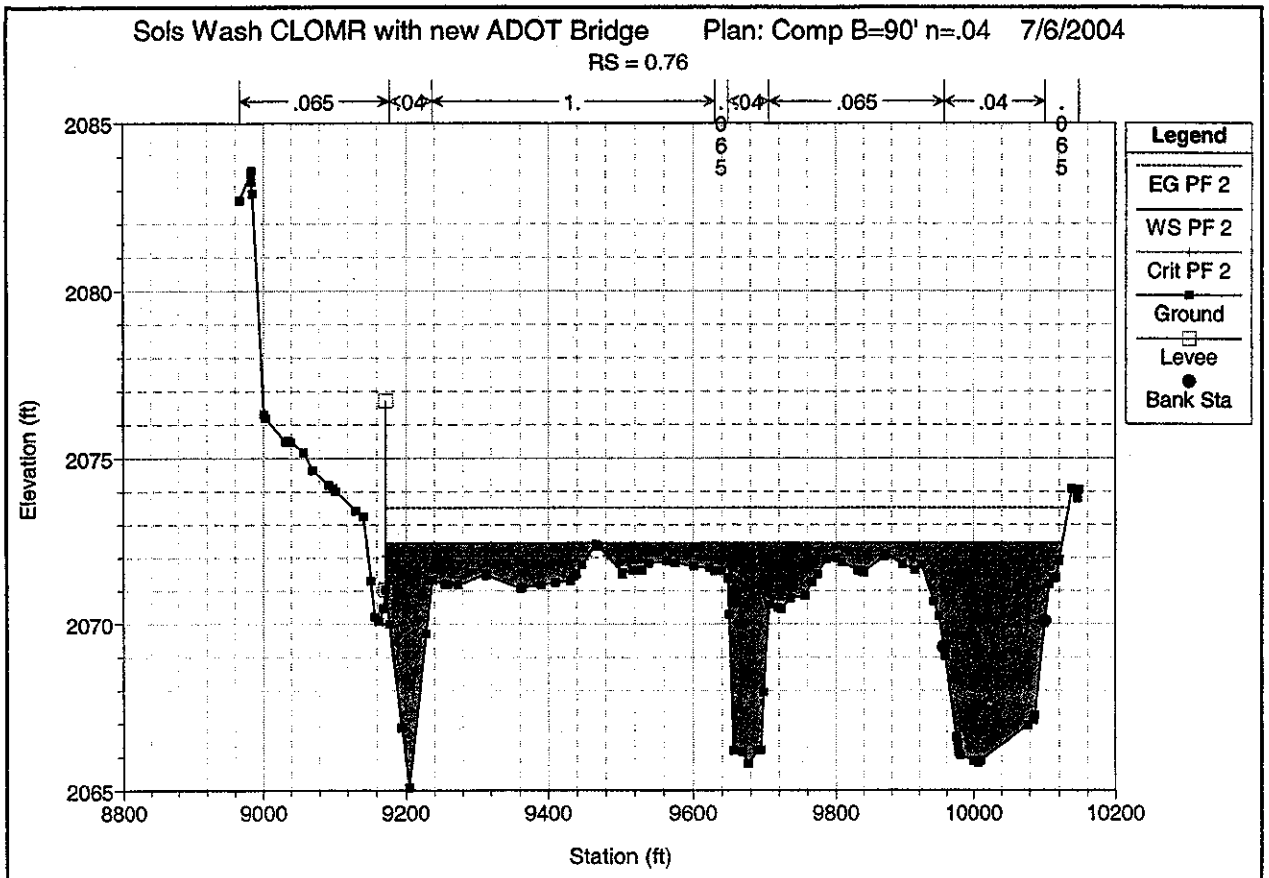
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.50	2088.50	2089.89	0.004414	12.19	2057.58	880.77	0.92
Reach 1	1.00	PF 2	14413.00	2078.10	2082.82	2084.10	2085.63	0.011161	16.55	1230.41	634.96	1.41
Reach 1	0.90	PF 2	14413.00	2073.10	2079.04	2079.13	2080.20	0.007034	12.18	2589.40	1343.27	0.94
Reach 1	0.79	PF 2	14413.00	2067.42	2073.80	2073.95	2075.52	0.010179	13.73	1789.32	909.50	1.13
Reach 1	0.75	PF 2	14413.00	2065.84	2072.44	2072.05	2073.52	0.007432	10.15	2075.44	952.12	0.75
Reach 1	0.71	PF 2	14413.00	2063.89	2071.54	2070.06	2072.14	0.003171	7.64	2739.48	840.65	0.51
Reach 1	0.66	PF 2	14413.00	2061.79	2070.45	2068.68	2071.28	0.003391	8.41	2317.23	703.22	0.53
Reach 1	0.61	PF 2	14459.00	2059.91	2067.40	2066.91	2069.81	0.009302	12.55	1198.64	201.64	0.86
Reach 1	0.57	PF 2	14459.00	2057.69	2065.74	2064.56	2067.73	0.007088	11.34	1285.28	187.90	0.76
Reach 1	0.52	PF 2	14459.00	2055.50	2064.85	2062.79	2066.25	0.004437	9.61	1584.66	221.72	0.61
Reach 1	0.48	PF 2	15045.00	2053.51	2064.11	2060.38	2065.27	0.002796	8.64	1745.25	240.36	0.50
Reach 1	0.43	PF 2	15045.00	2051.27	2063.64	2058.29	2064.63	0.001704	8.00	1881.09	201.36	0.41
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2061.09	2056.60	2062.21	0.002151	8.49	1772.94	265.99	0.45
Reach 1	0.35	PF 2	15045.00	2047.68	2057.98	2056.53	2060.84	0.005876	13.59	1116.43	120.91	0.78
Reach 1	0.27	PF 2	15045.00	2044.00	2056.07	2053.26	2058.47	0.004384	12.44	1209.23	111.13	0.66
Reach 1	0.22	PF 2	15045.00	2043.00	2052.04	2052.04	2056.06	0.010616	16.09	934.98	115.47	1.00
Reach 1	0.19	PF 2	15045.00	2040.69	2048.73	2049.70	2053.77	0.014942	18.02	834.87	117.83	1.19
Reach 1	.13	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2046.27	2047.25	2050.55	0.007350	17.58	1133.13	214.56	1.22
Reach 1	0.08	PF 2	15045.00	2036.99	2044.19	2042.48	2044.79	0.002917	7.66	3307.91	818.58	0.55
Reach 1	.05	PF 2	15045.00	2038.00	2043.52	2042.39	2044.34	0.002757	9.09	3336.53	1079.12	0.72

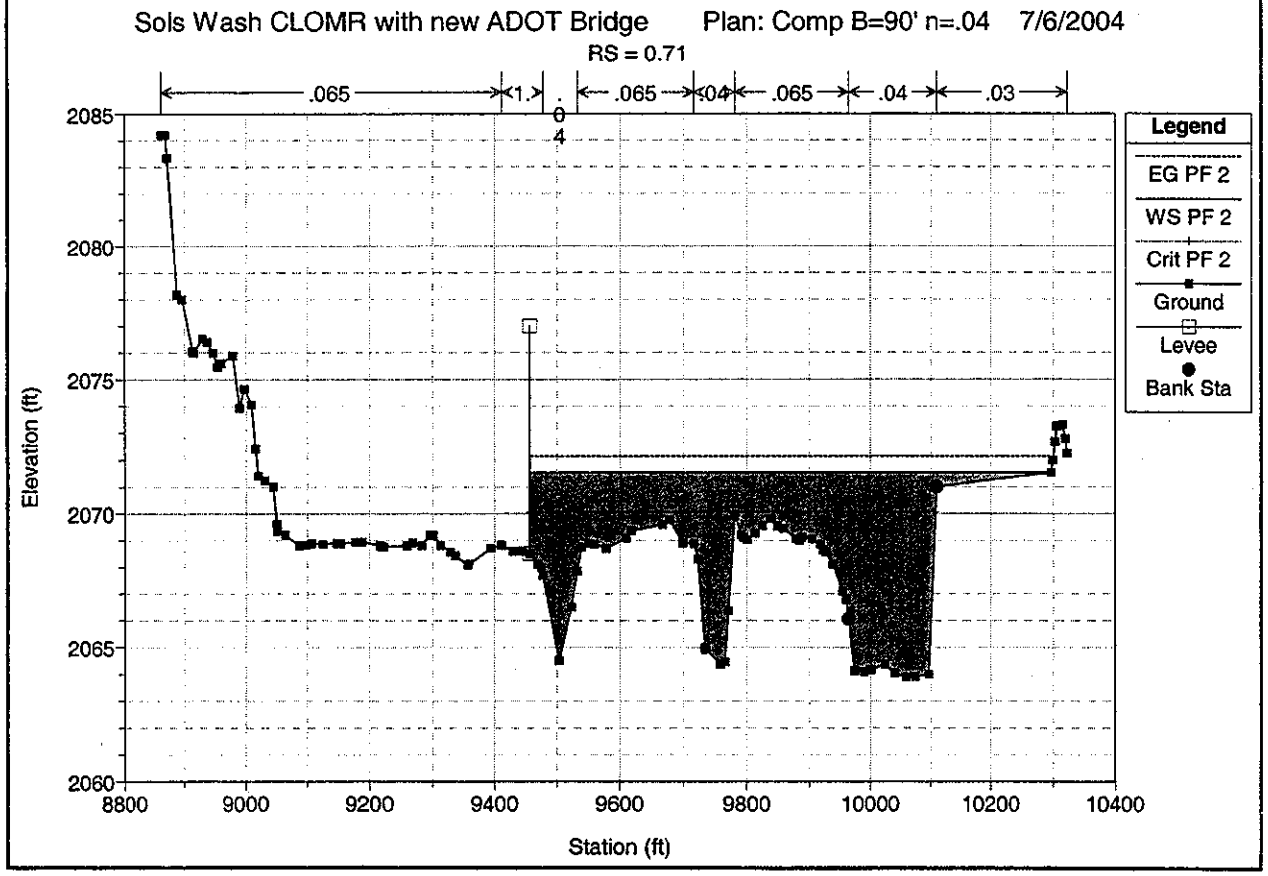

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 1.12 Cross Section 1.12 from CBA Study
.06
.025
.06
.06
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2094
2092
2090
2088
2086
2084
2082
9200
9400
9600
9800
10000
10200
10400
Station (ft)

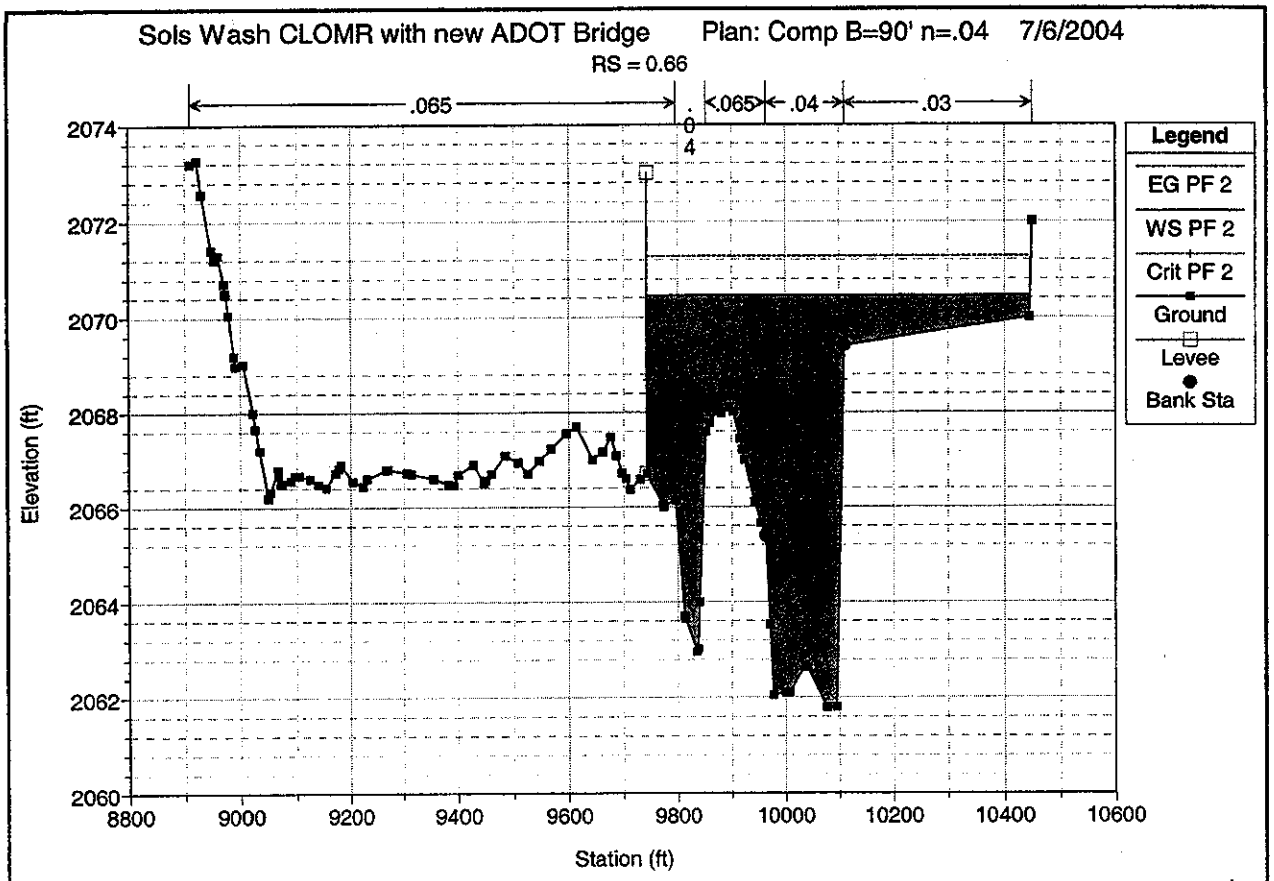

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 1.00 Cross Section 1.10 from CBA Study
1.
.065
.065
.025
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2100
2095
2090
2085
2080
2075
8000
8500
9000
9500
10000
10500
Station (ft)

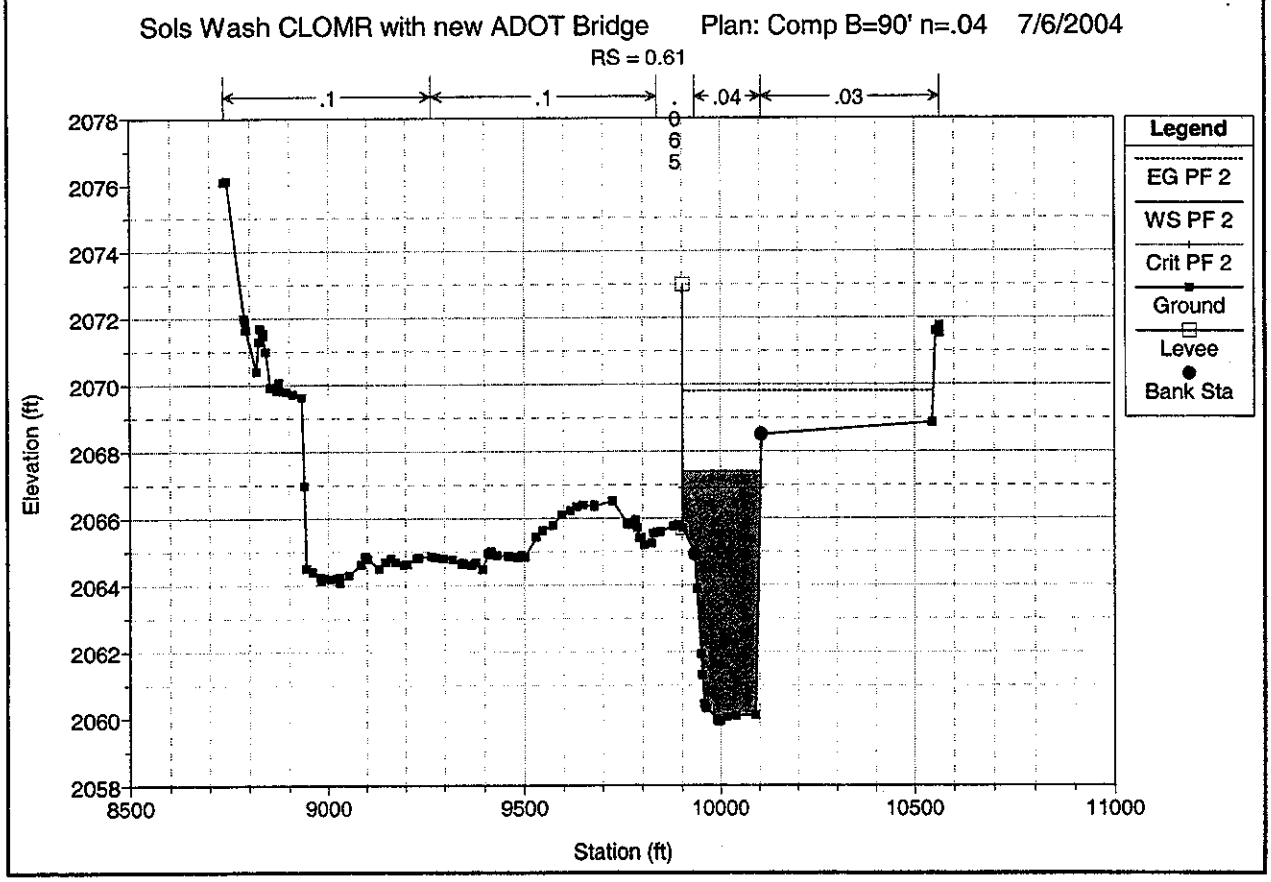

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.90 Cross Section 0.90 from CBA Study
1.
.065
.025
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2095
2090
2085
2080
2075
2070
8400
8600
8800
9000
9200
9400
9600
9800
10000
10200

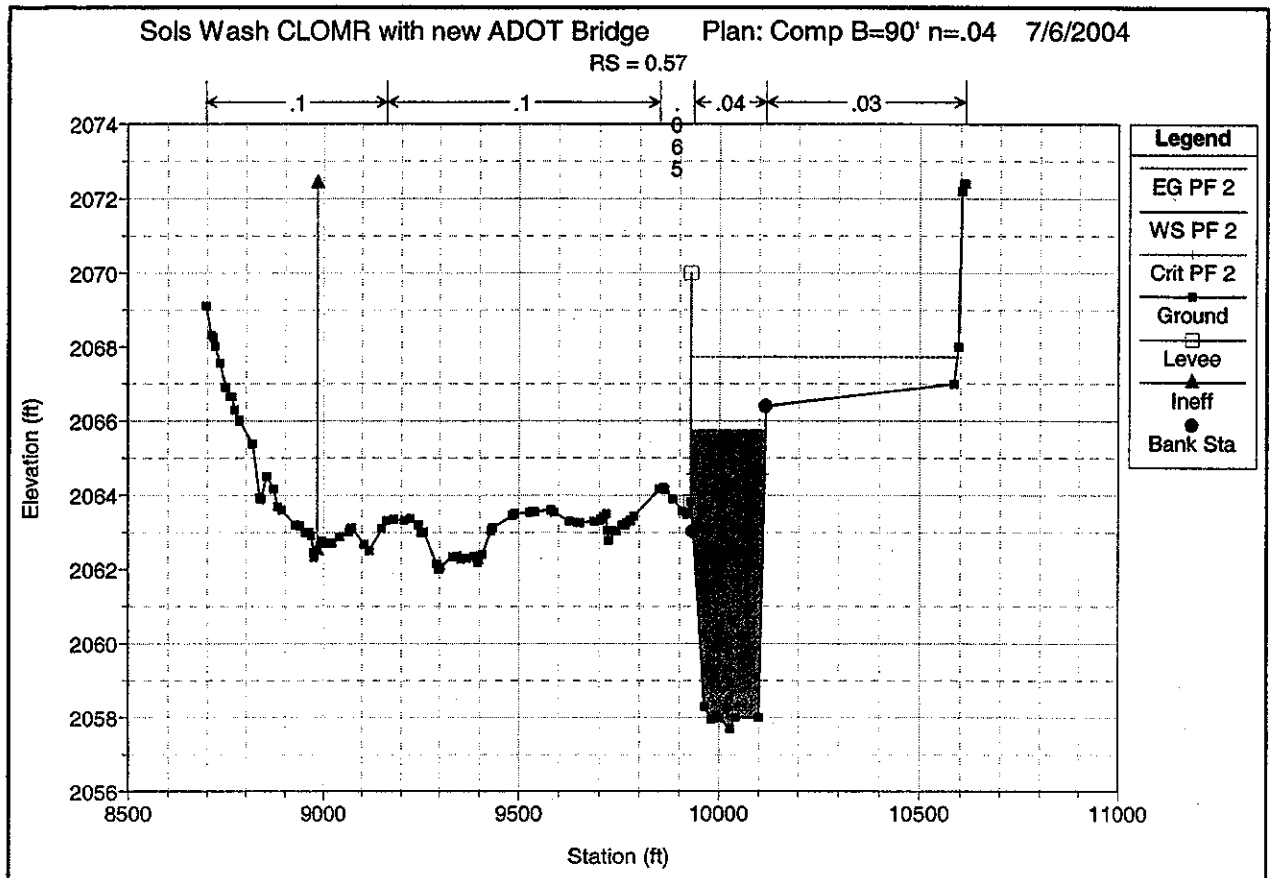

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.79 Begin new cross sections using 2002 mapping
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2084
2082
2080
2078
2076
2074
2072
2070
2068
2066
8800
9000
9200
9400
9600
9800
10000
10200

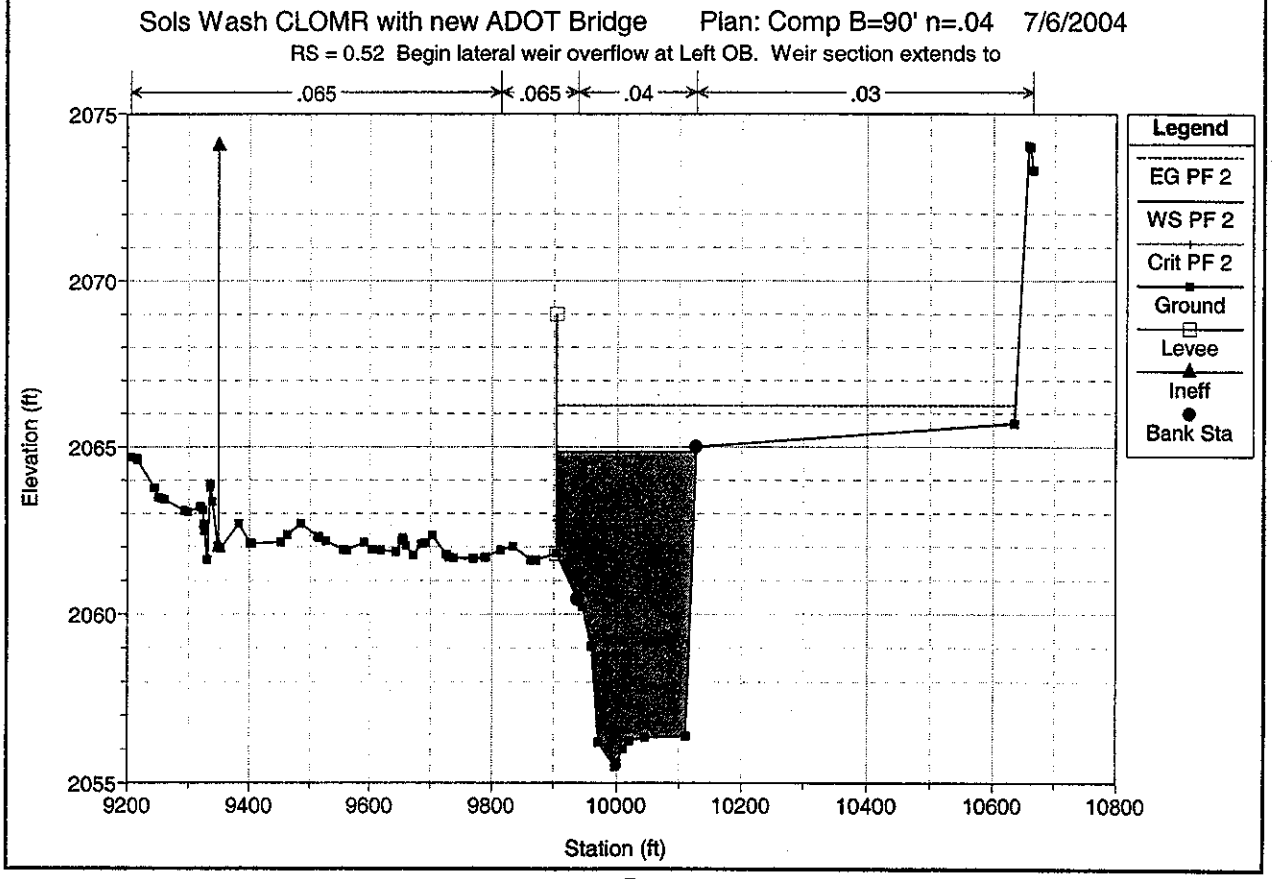

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.76
.065
.04
1.
.04
.065
.04
.065
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

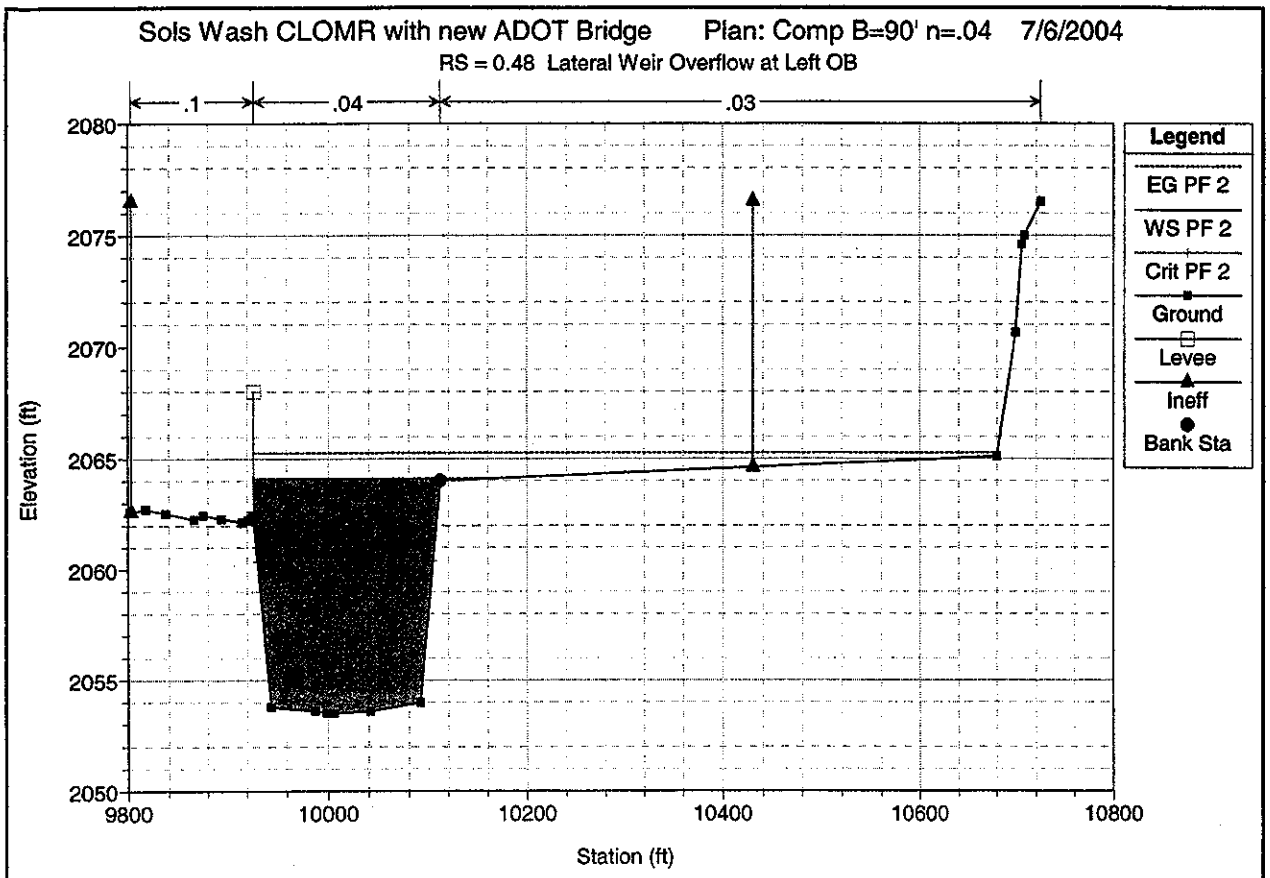

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.71
.065
1.
.04
.065
.04
.065
.04
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

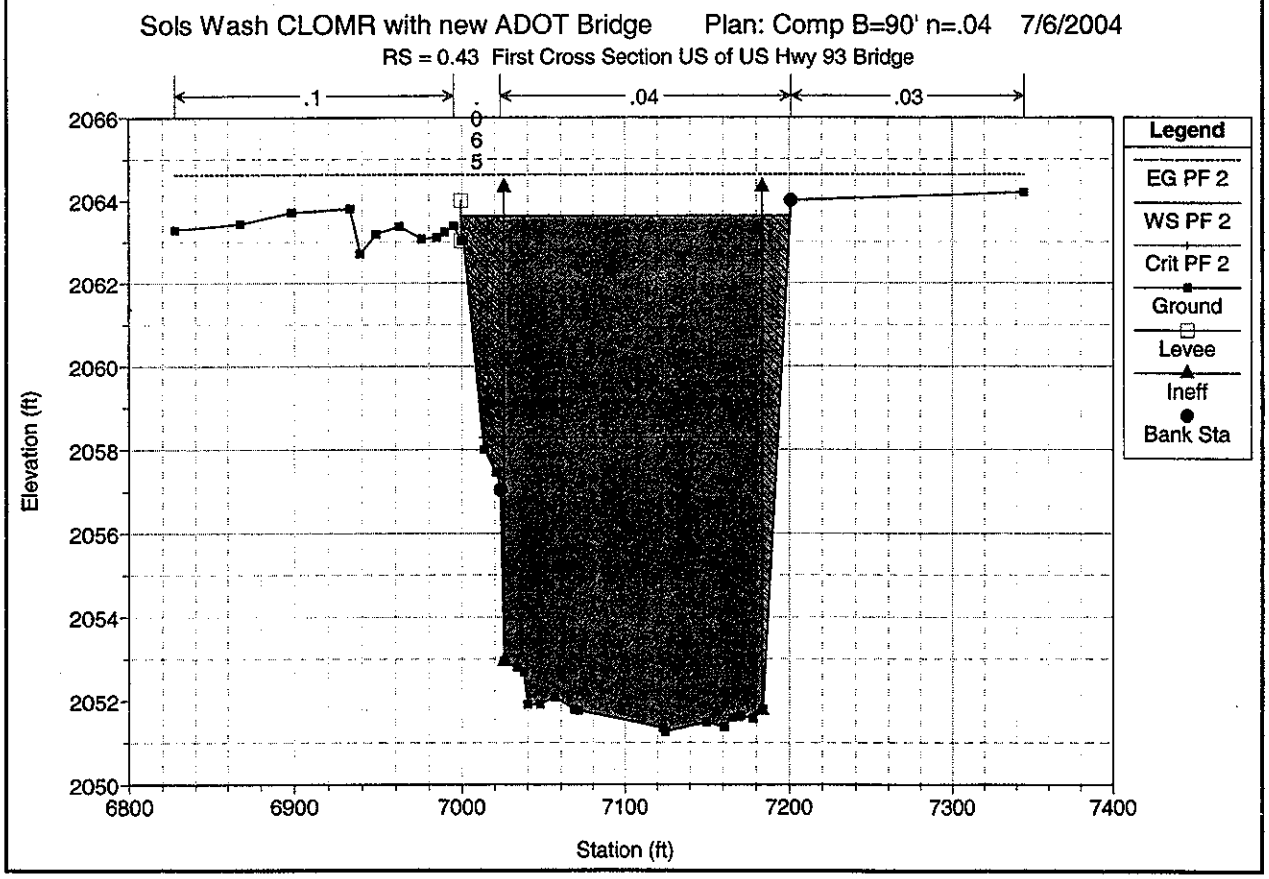

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.66
.065
.065
.04
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

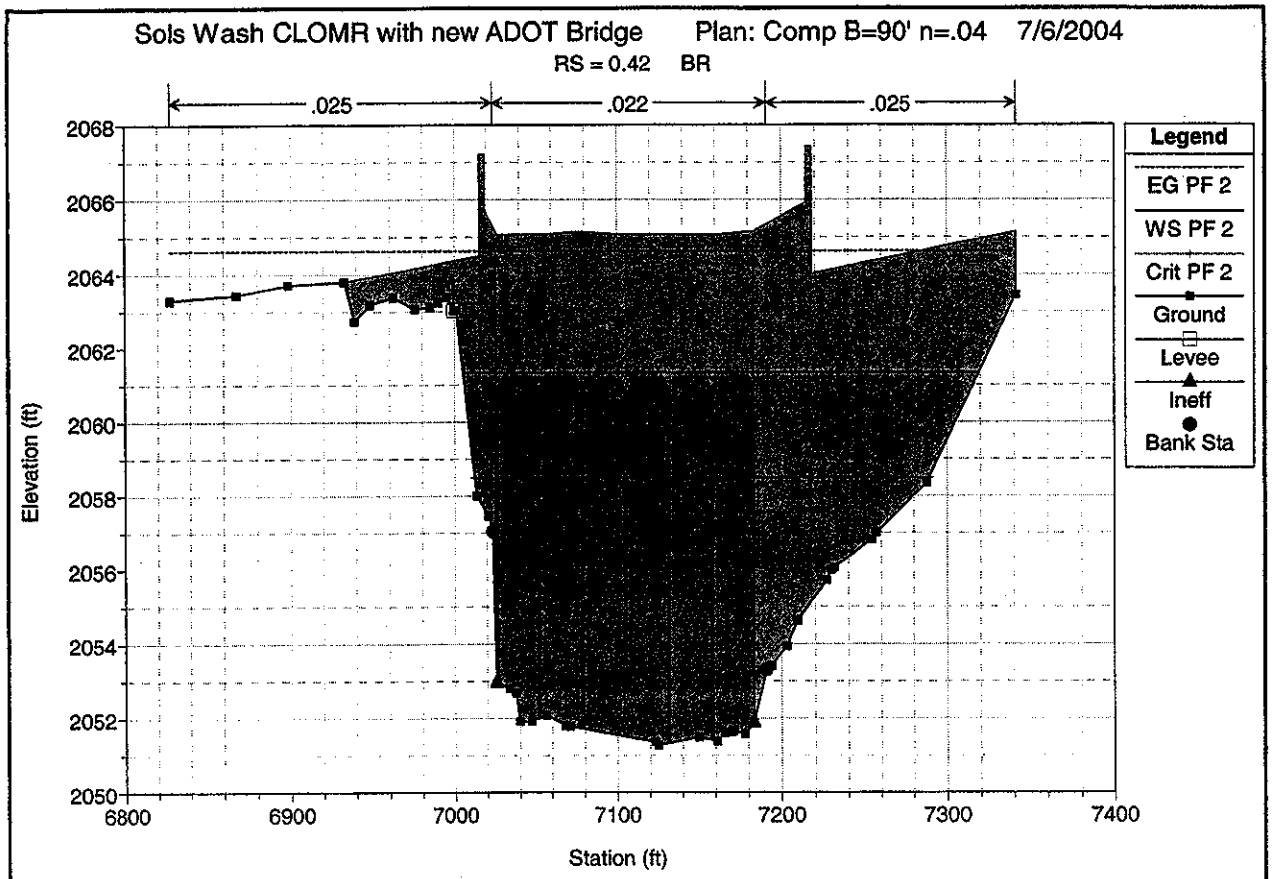

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.61
.1
.1
.04
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

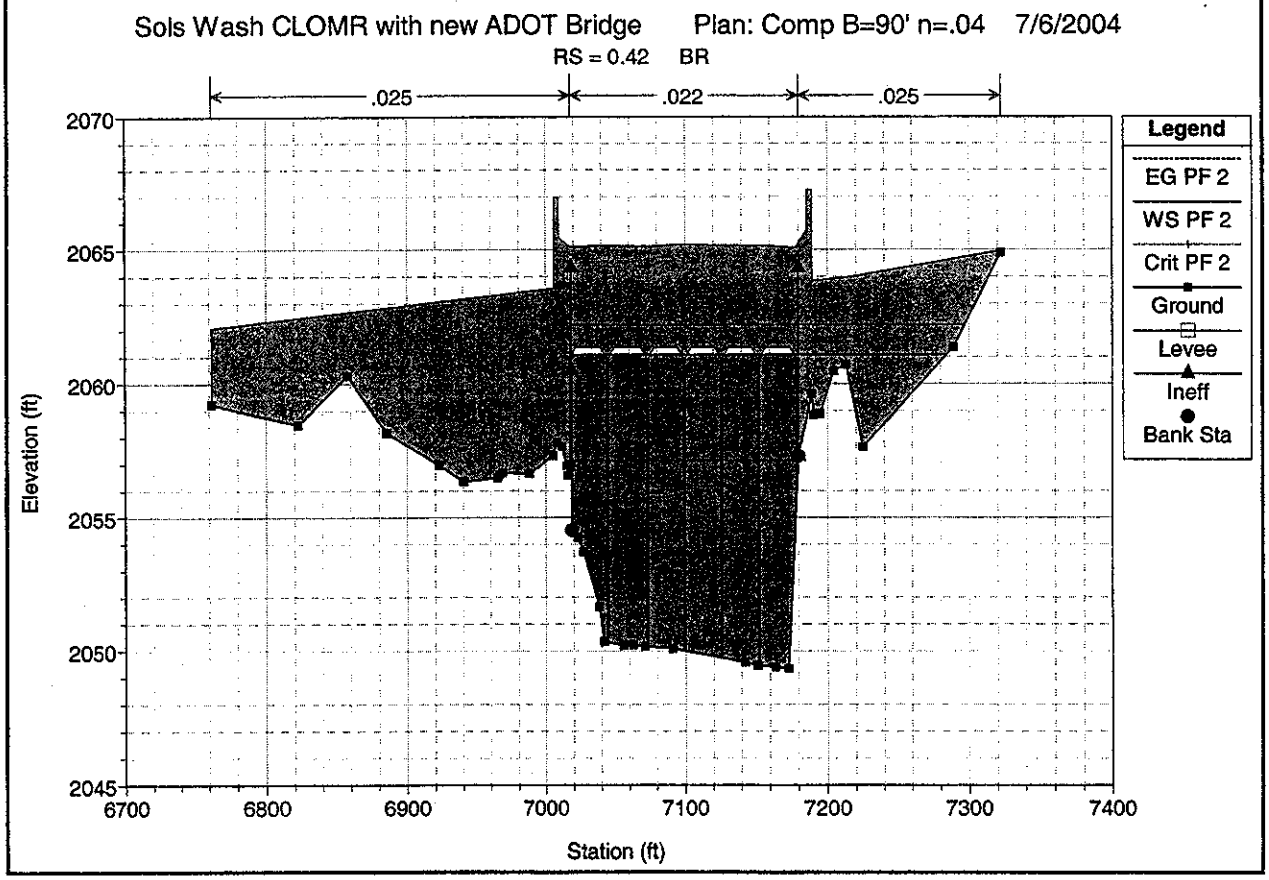

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.57
.1
.1
.065
.04
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
2058
2056
8500
9000
9500
10000
10500
11000

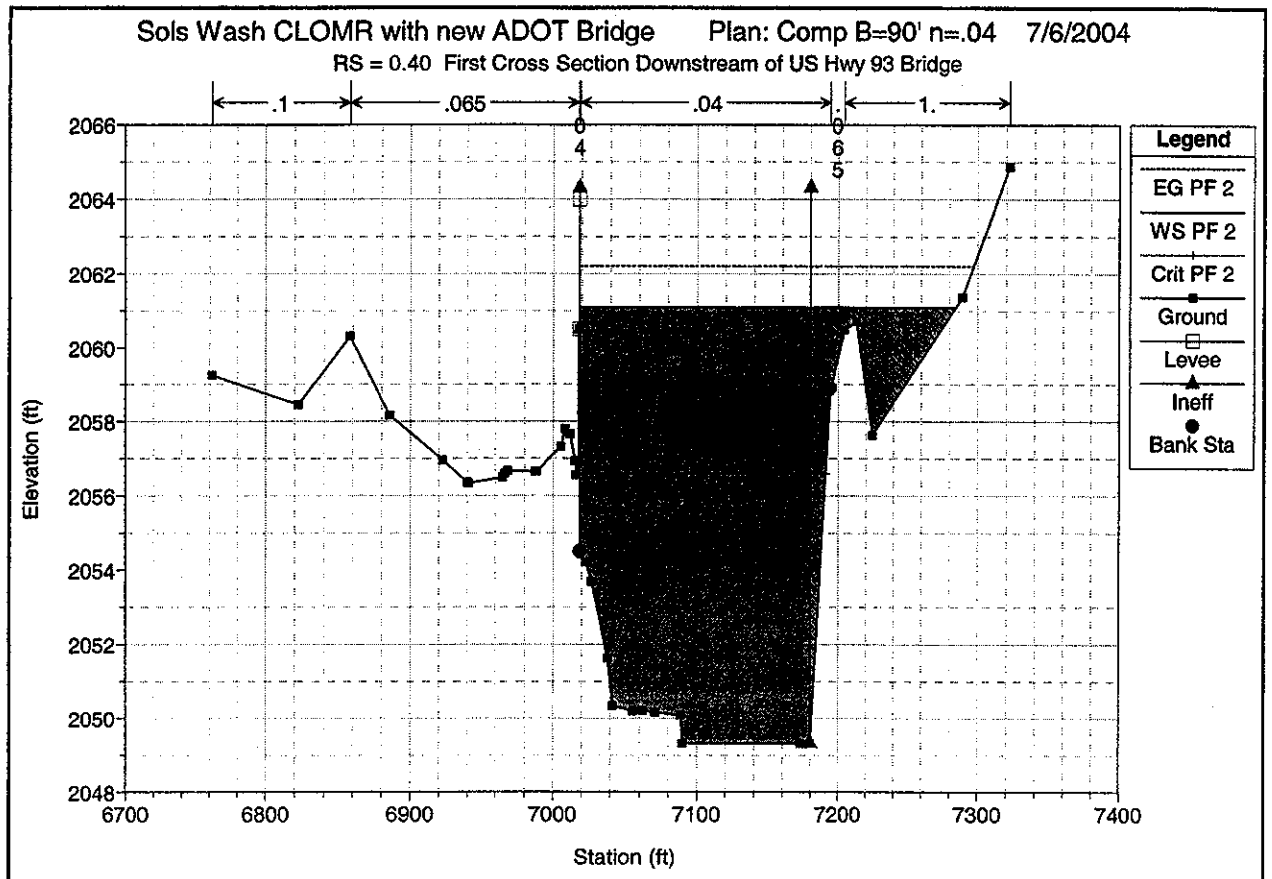

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.52 Begin lateral weir overflow at Left OB. Weir section extends to
.065
.065
.04
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2075
2070
2065
2060
2055
9200
9400
9600
9800
10000
10200
10400
10600
10800

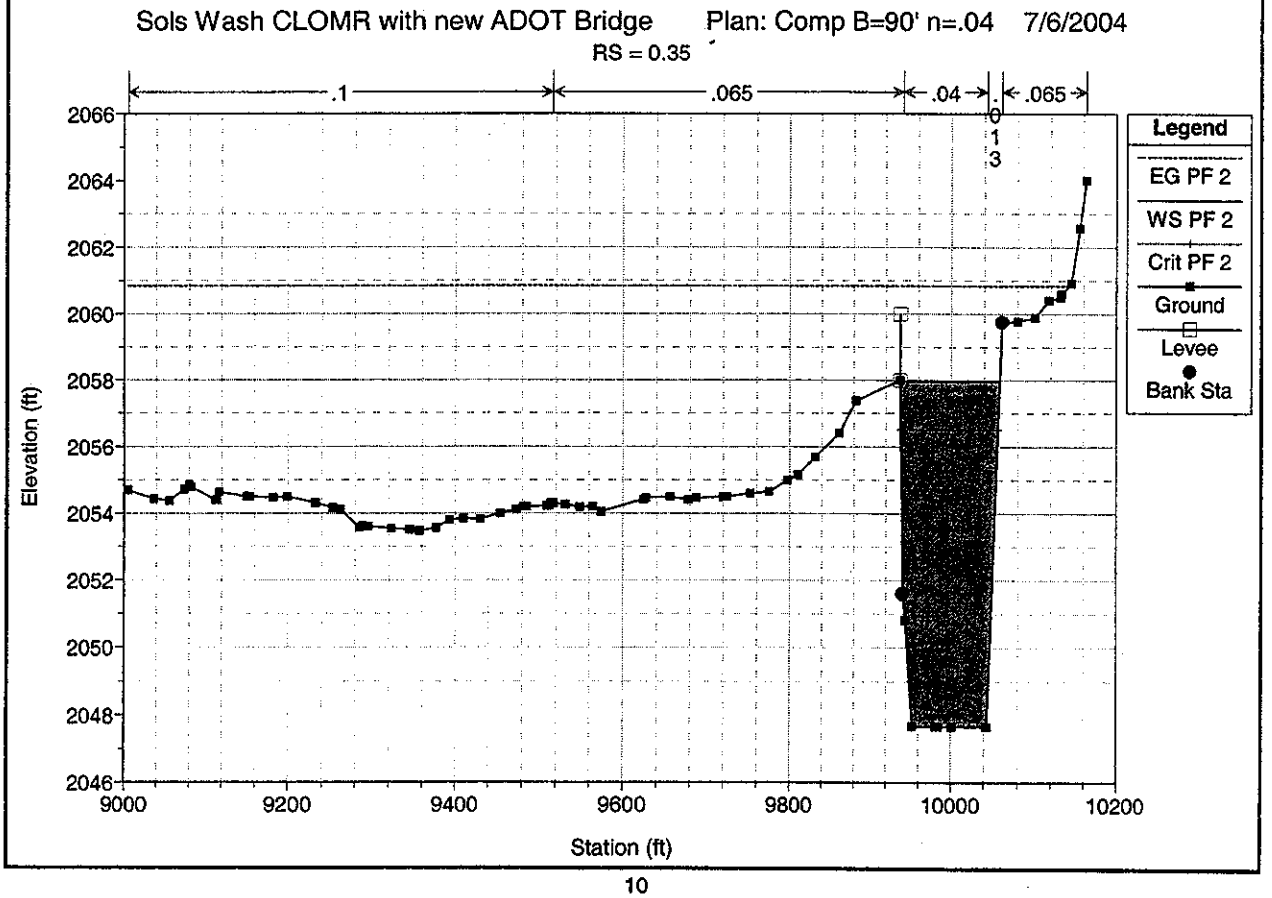

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.48 Lateral Weir Overflow at Left OB
.1
.04
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2080
2075
2070
2065
2060
2055
2050
9800
10000
10200
10400
10600
10800
Station (ft)

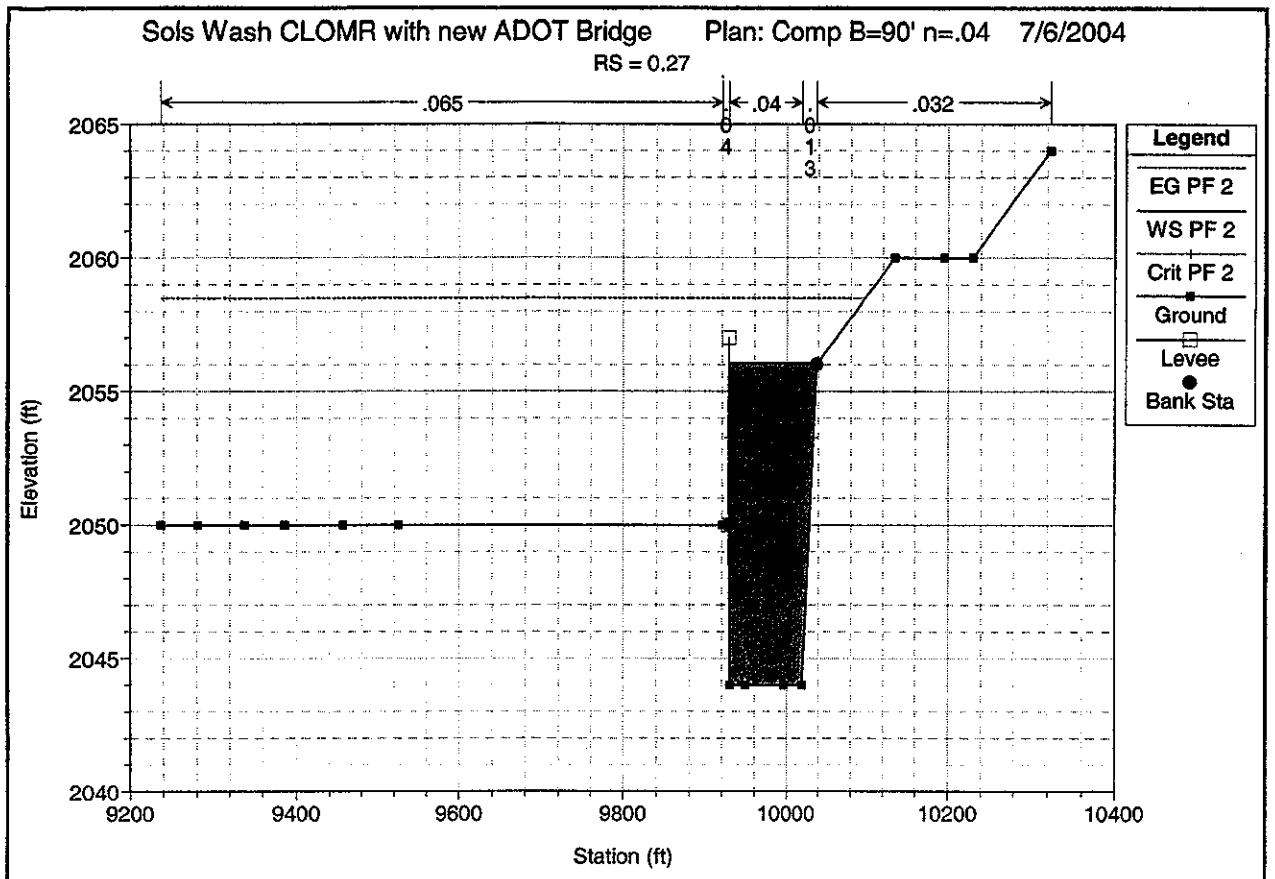

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.43 First Cross Section US of US Hwy 93 Bridge
.1
.04
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

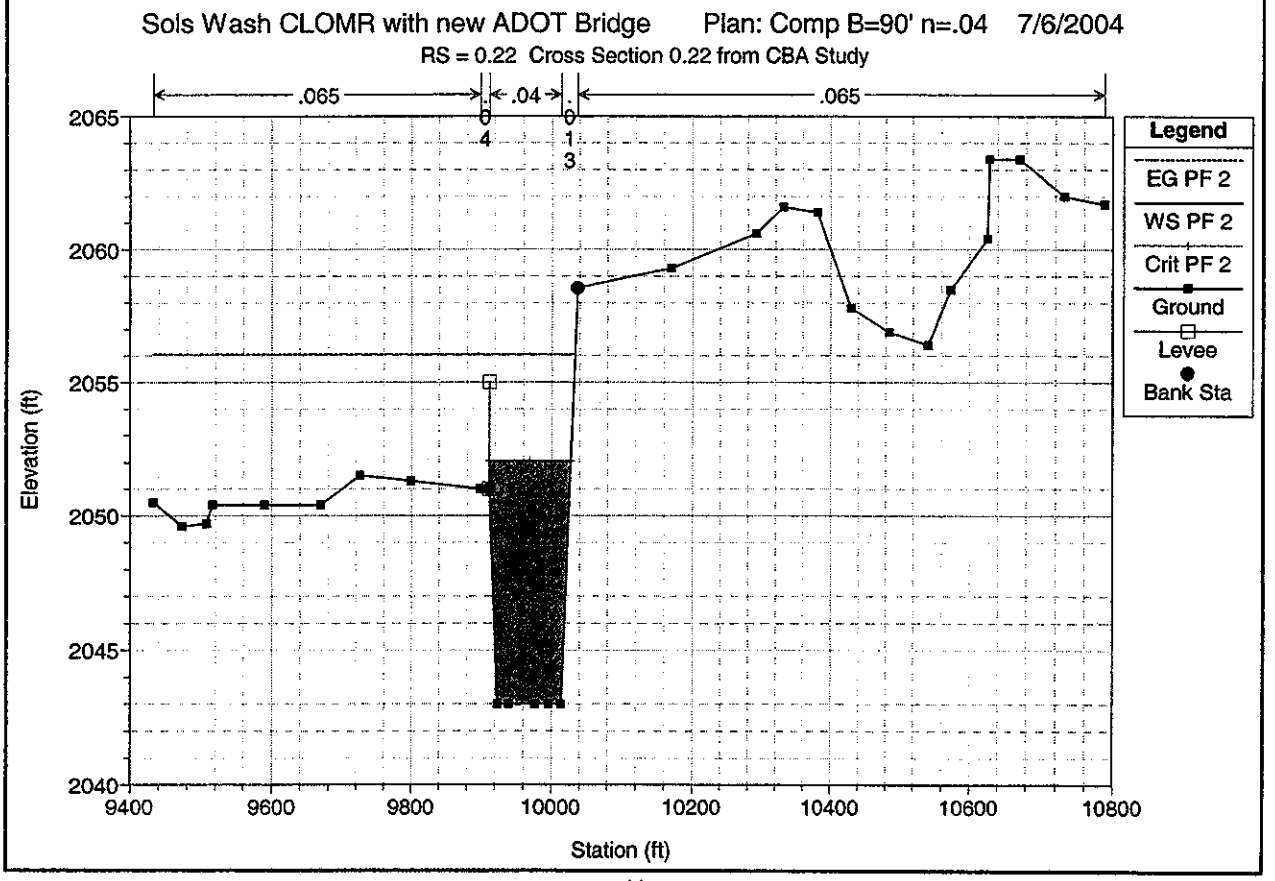

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2068
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

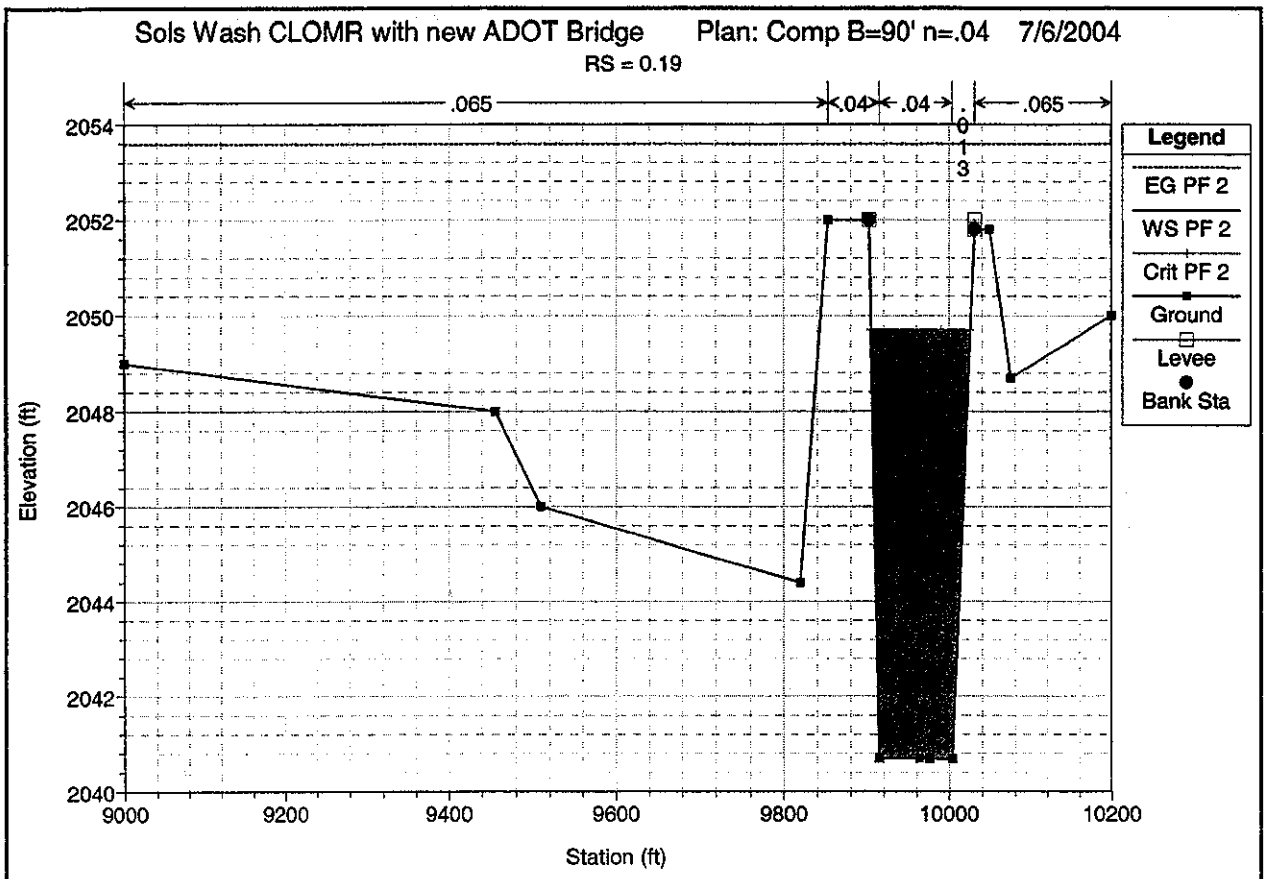

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2070
2065
2060
2055
2050
2045
6700
6800
6900
7000
7100
7200
7300
7400
Station (ft)

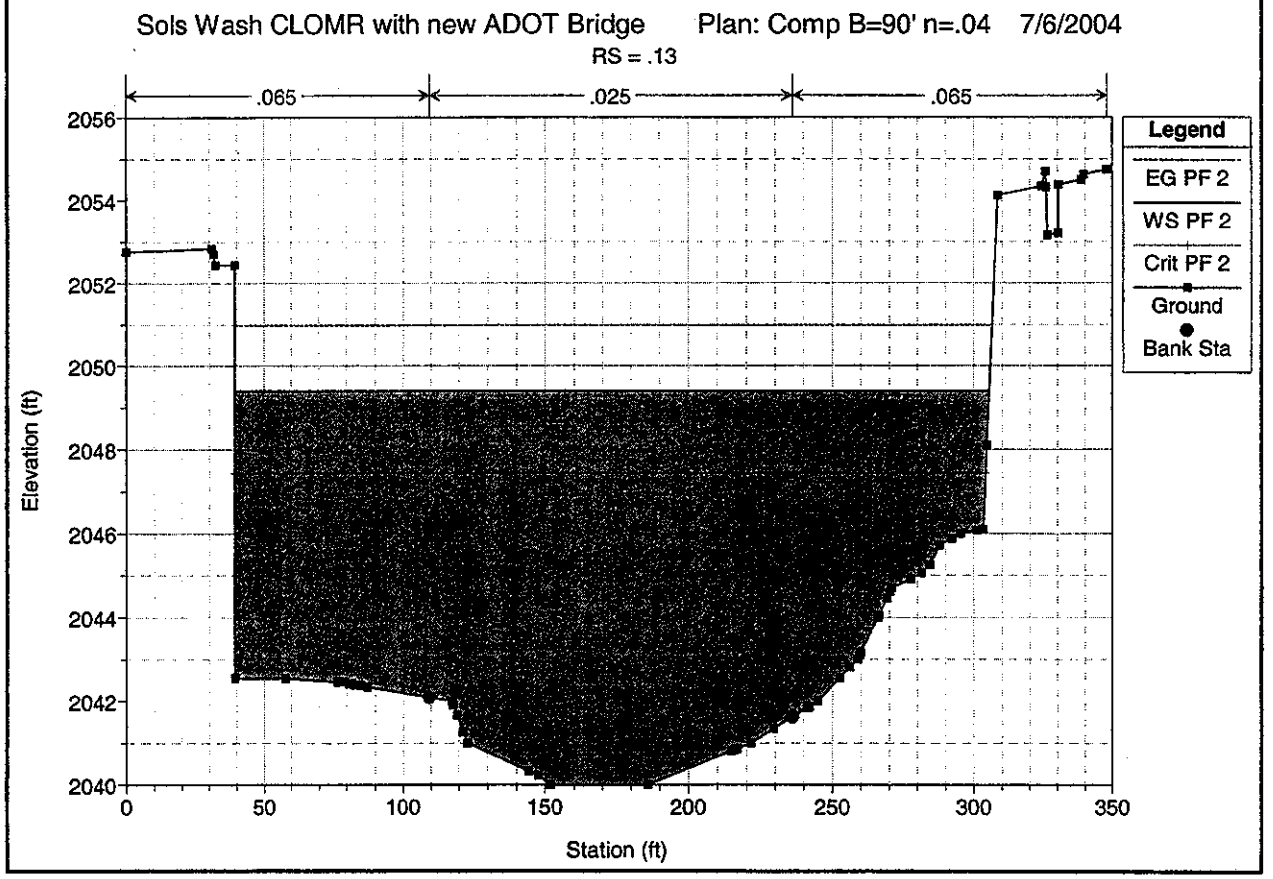

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.40 First Cross Section Downstream of US Hwy 93 Bridge
.1
.065
.04
1.
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

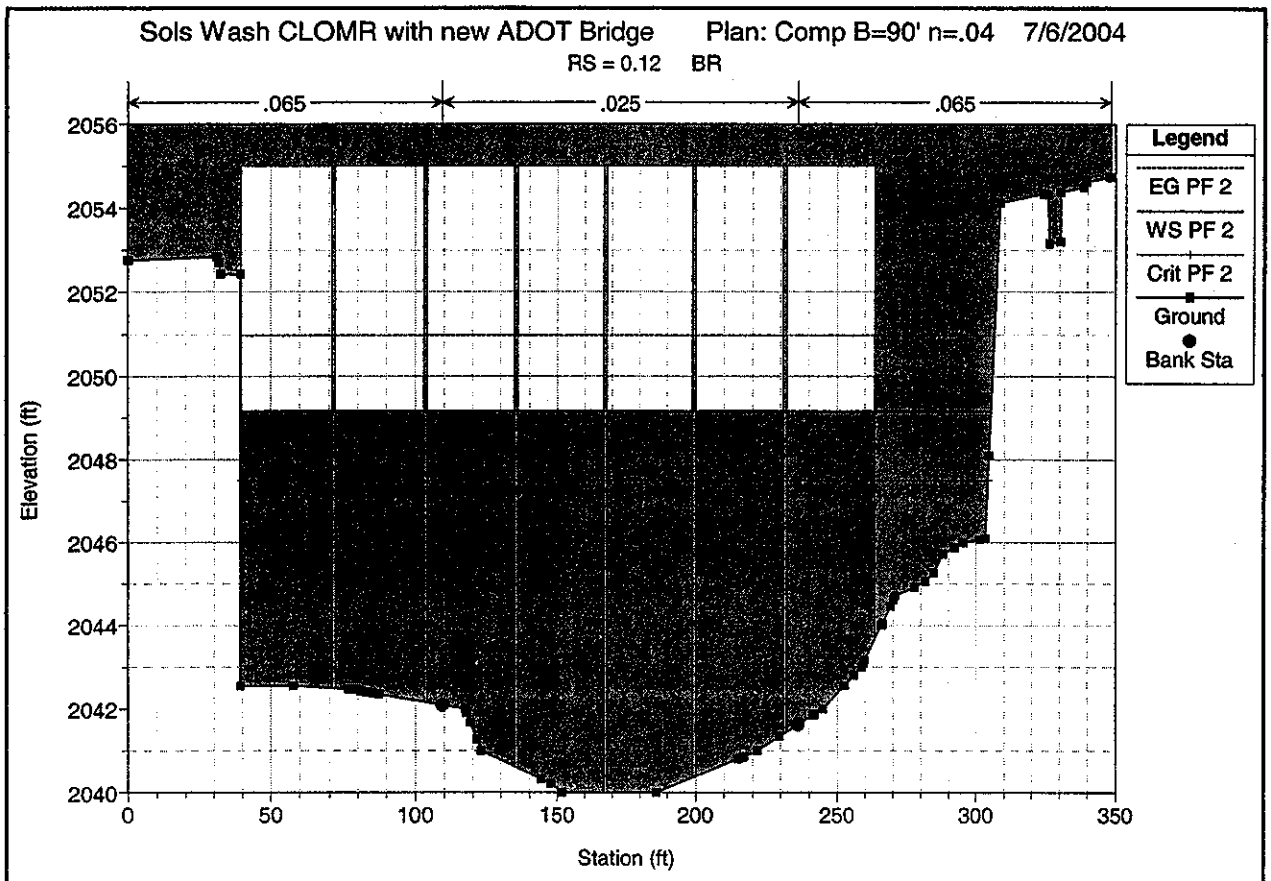

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.35
.1
.065
.04
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

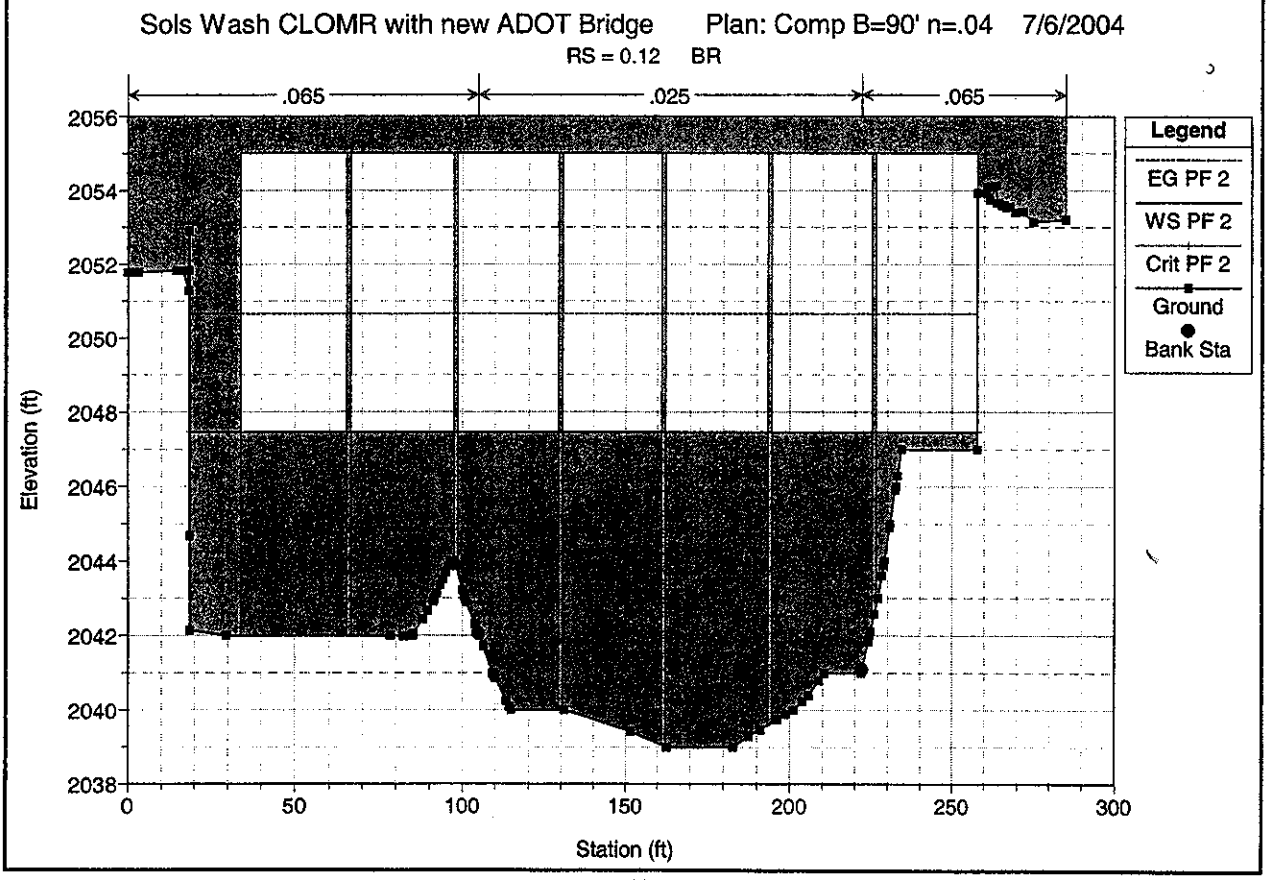

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.27
.065
.04
.032
0.4
0.13
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2065
2060
2055
2050
2045
2040
9200
9400
9600
9800
10000
10200
10400
Station (ft)

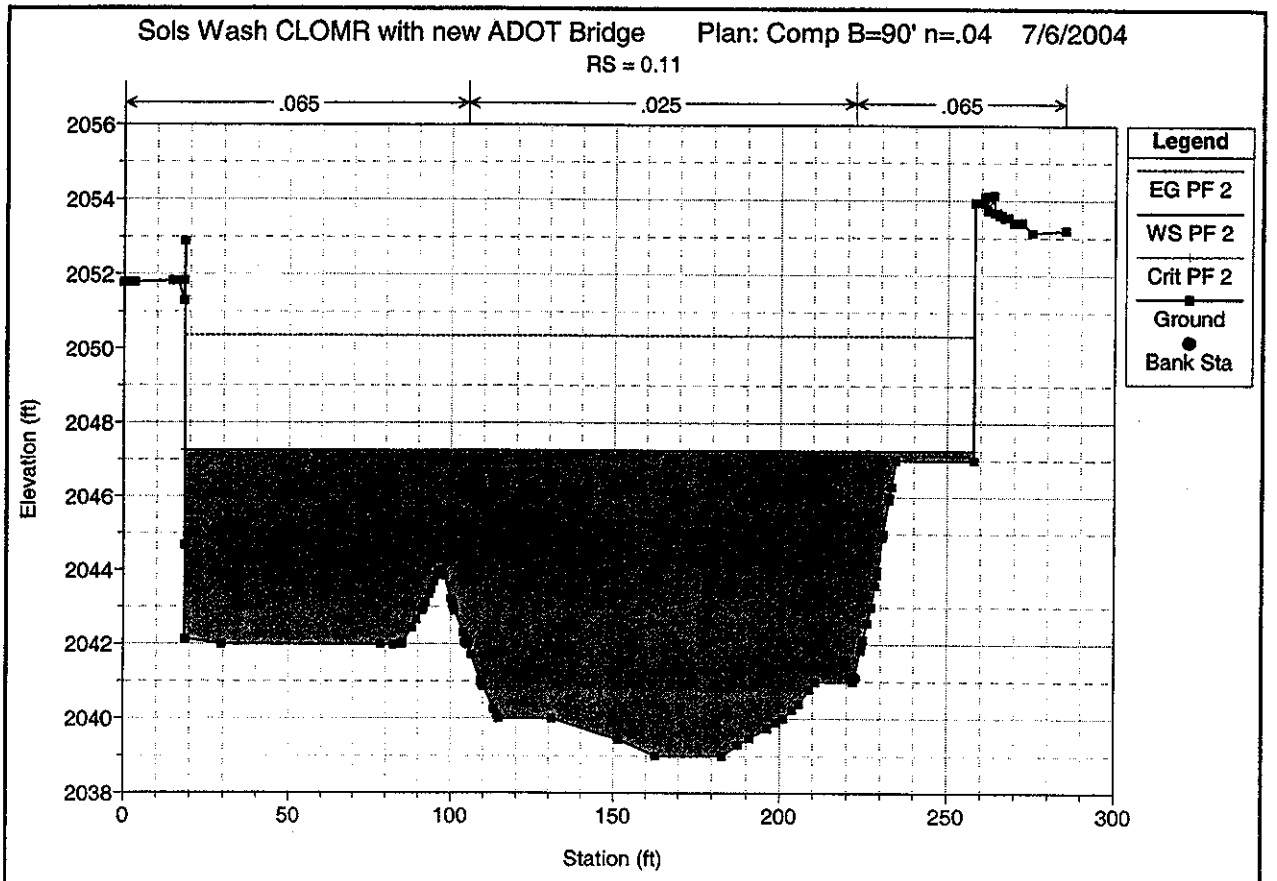

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.22 Cross Section 0.22 from CBA Study
.065
.04
.065
0.4
0.13
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2065
2060
2055
2050
2045
2040
9400
9600
9800
10000
10200
10400
10600
10800
Station (ft)

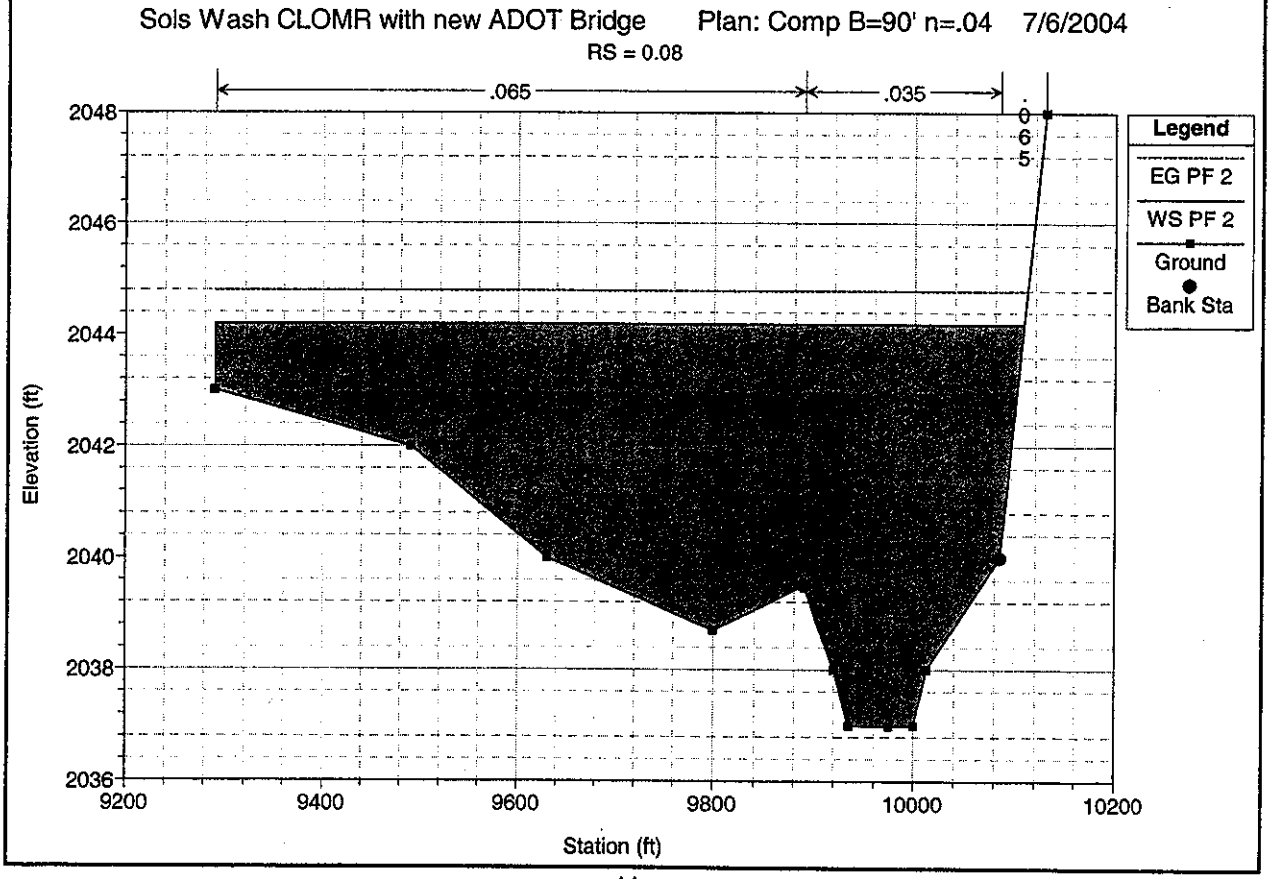

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.19
.065
.04
.04
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

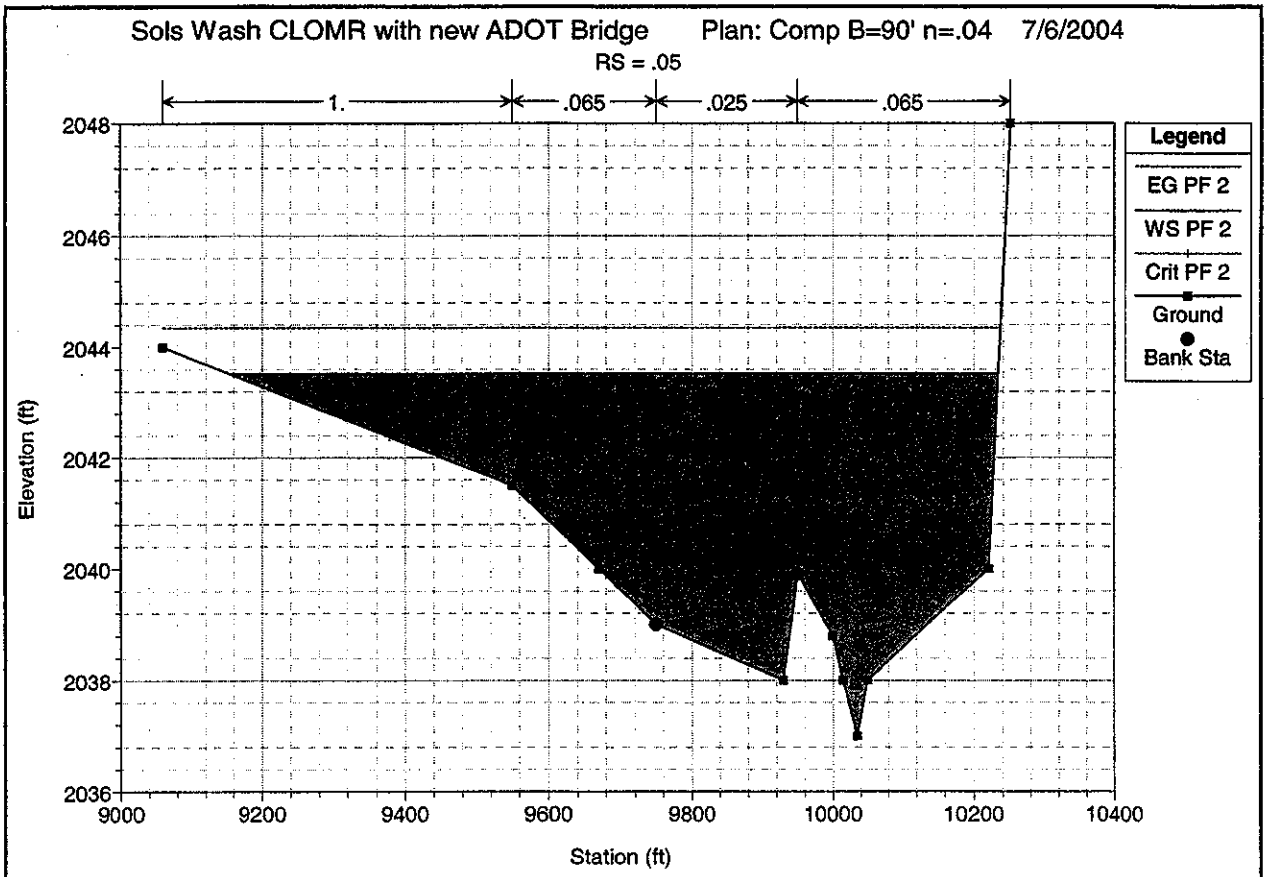

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = .13
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.11
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = 0.08
.065
.035
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.04 7/6/2004
RS = .05
1.
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

SUBCR.

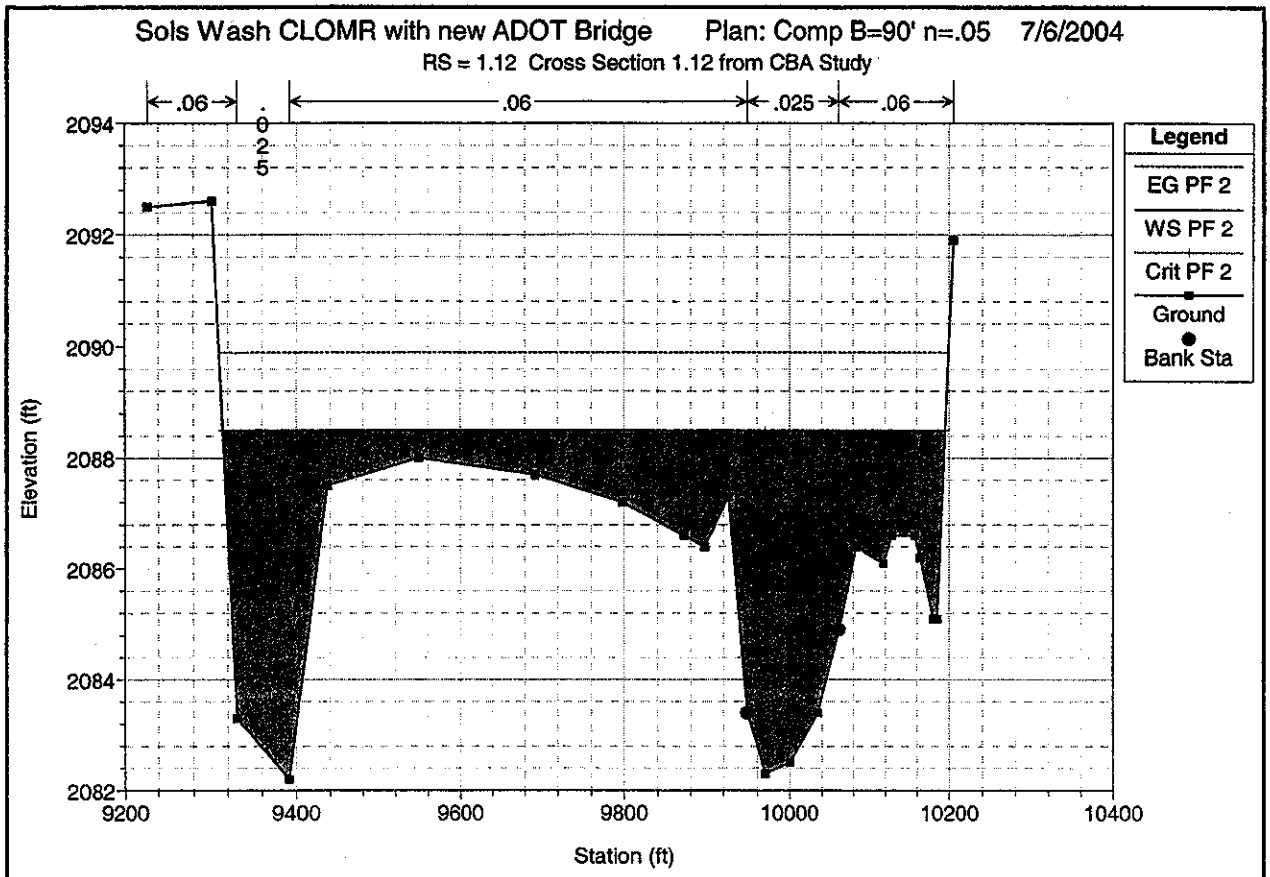
HEC-RAS Plan: n=.05 River: Sols Wash Reach: Reach 1 Profile: PF 2

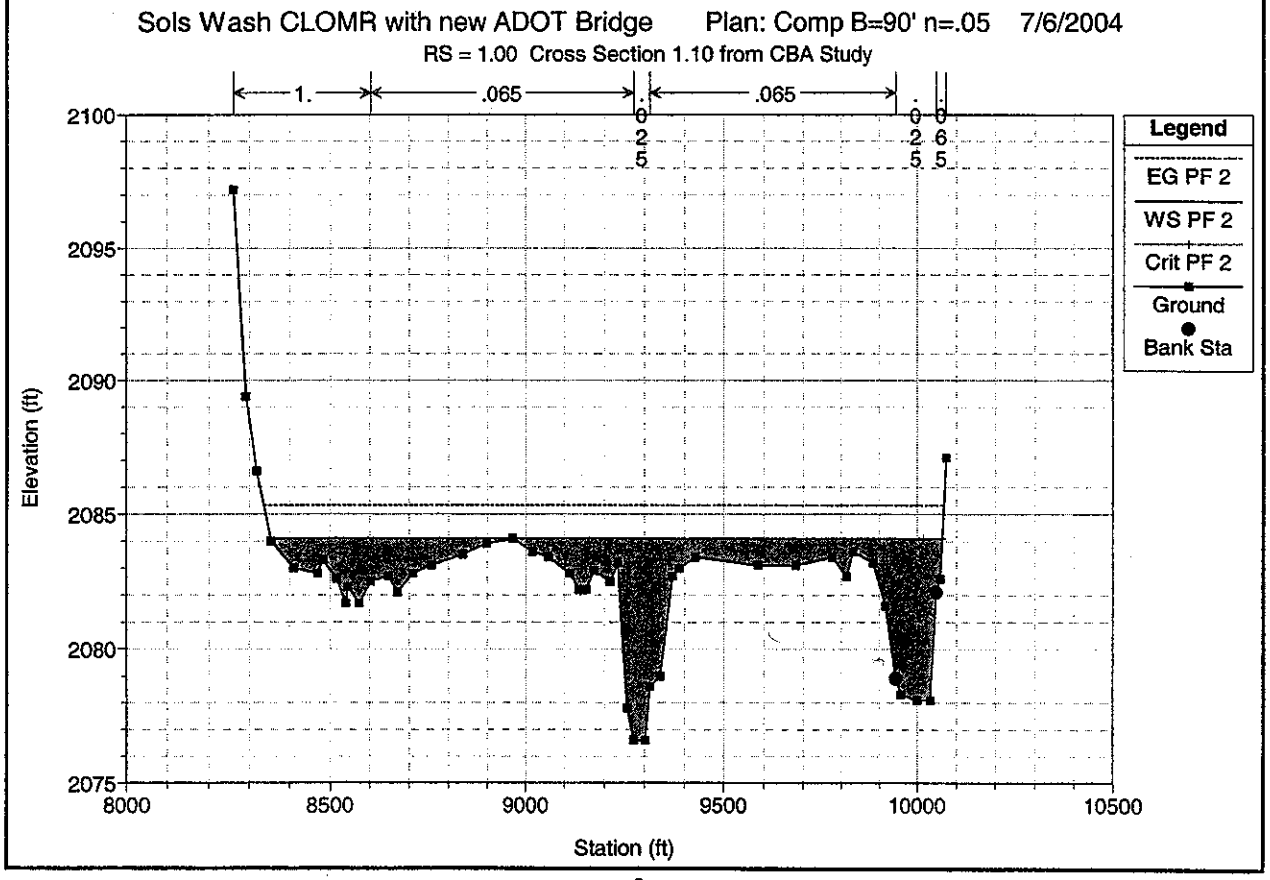
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.50	2088.50	2089.89	0.004414	12.19	2057.58	880.77	0.92
Reach 1	1.00	PF 2	14413.00	2078.10	2084.10	2084.10	2085.33	0.004281	12.19	2886.35	1711.00	0.91
Reach 1	0.90	PF 2	14413.00	2073.10	2079.13	2079.13	2080.20	0.006360	11.72	2697.71	1392.79	0.90
Reach 1	0.80	PF 2	14413.00	2067.42	2074.26	2073.95	2075.54	0.007061	12.15	2226.66	980.77	0.96
Reach 1	0.76	PF 2	14413.00	2065.84	2073.01	2072.07	2073.75	0.007464	8.67	2618.88	956.89	0.61
Reach 1	0.71	PF 2	14413.00	2063.89	2071.86	2070.08	2072.32	0.003635	6.74	3010.07	842.50	0.44
Reach 1	0.66	PF 2	14413.00	2061.79	2070.96	2068.53	2071.48	0.002978	6.58	2676.87	704.41	0.40
Reach 1	0.61	PF 2	14459.00	2059.91	2068.44	2066.90	2070.17	0.008823	10.68	1410.13	203.72	0.68
Reach 1	0.57	PF 2	14459.00	2057.69	2066.55	2064.52	2068.14	0.007731	10.14	1446.08	303.89	0.64
Reach 1	0.52	PF 2	14459.00	2055.50	2065.39	2062.82	2066.56	0.005389	8.85	1757.01	501.66	0.54
Reach 1	0.48	PF 2	15045.00	2053.51	2064.21	2060.38	2065.34	0.004207	8.54	1773.19	294.33	0.49
Reach 1	0.45	PF 2	15045.00	2051.27	2063.43	2058.29	2064.47	0.002820	8.14	1848.85	201.07	0.42
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2061.82	2056.59	2062.81	0.002713	7.96	1890.73	531.67	0.41
Reach 1	0.35	PF 2	15045.00	2047.68	2056.51	2056.51	2060.52	0.015837	16.09	940.56	117.89	1.00
Reach 1	0.29	PF 2	15045.00	2044.00	2054.12	2053.26	2057.65	0.002168	15.07	998.50	106.69	0.87
Reach 1	0.22	PF 2	15045.00	2043.00	2052.49	2052.04	2056.10	0.013802	15.24	986.92	116.14	0.92
Reach 1	0.19	PF 2	15045.00	2040.69	2049.70	2049.70	2053.59	0.014547	15.82	950.82	121.19	1.00
Reach 1	0.13	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2047.25	2047.25	2050.36	0.004473	15.08	1349.67	239.45	0.98
Reach 1	0.08	PF 2	15045.00	2036.99	2044.19		2044.79	0.002923	7.67	3305.61	818.56	0.55
Reach 1	.05	PF 2	15045.00	2038.00	2043.52	2042.38	2044.34	0.002757	9.09	3336.53	1079.12	0.72

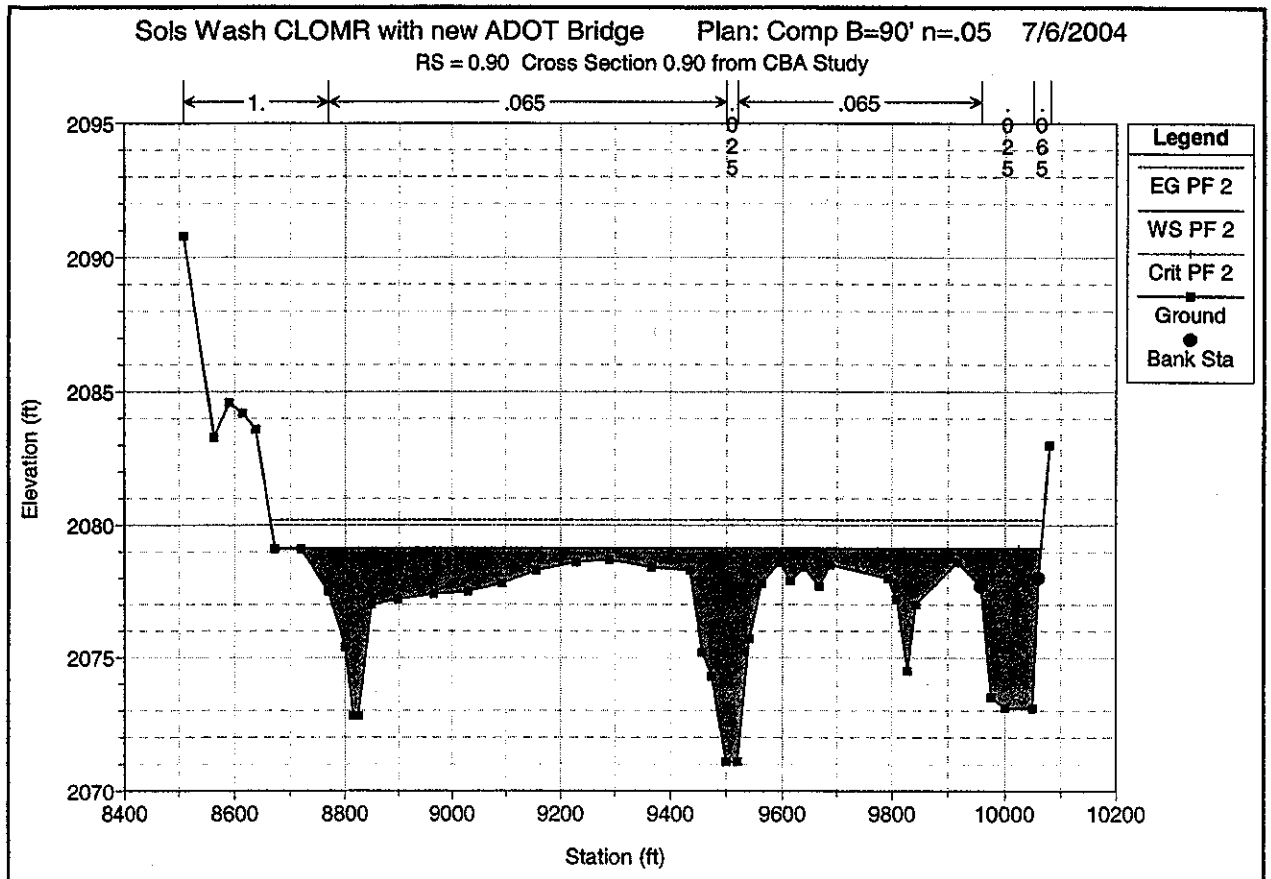
SENSITIVITY ANALYSIS n= .05

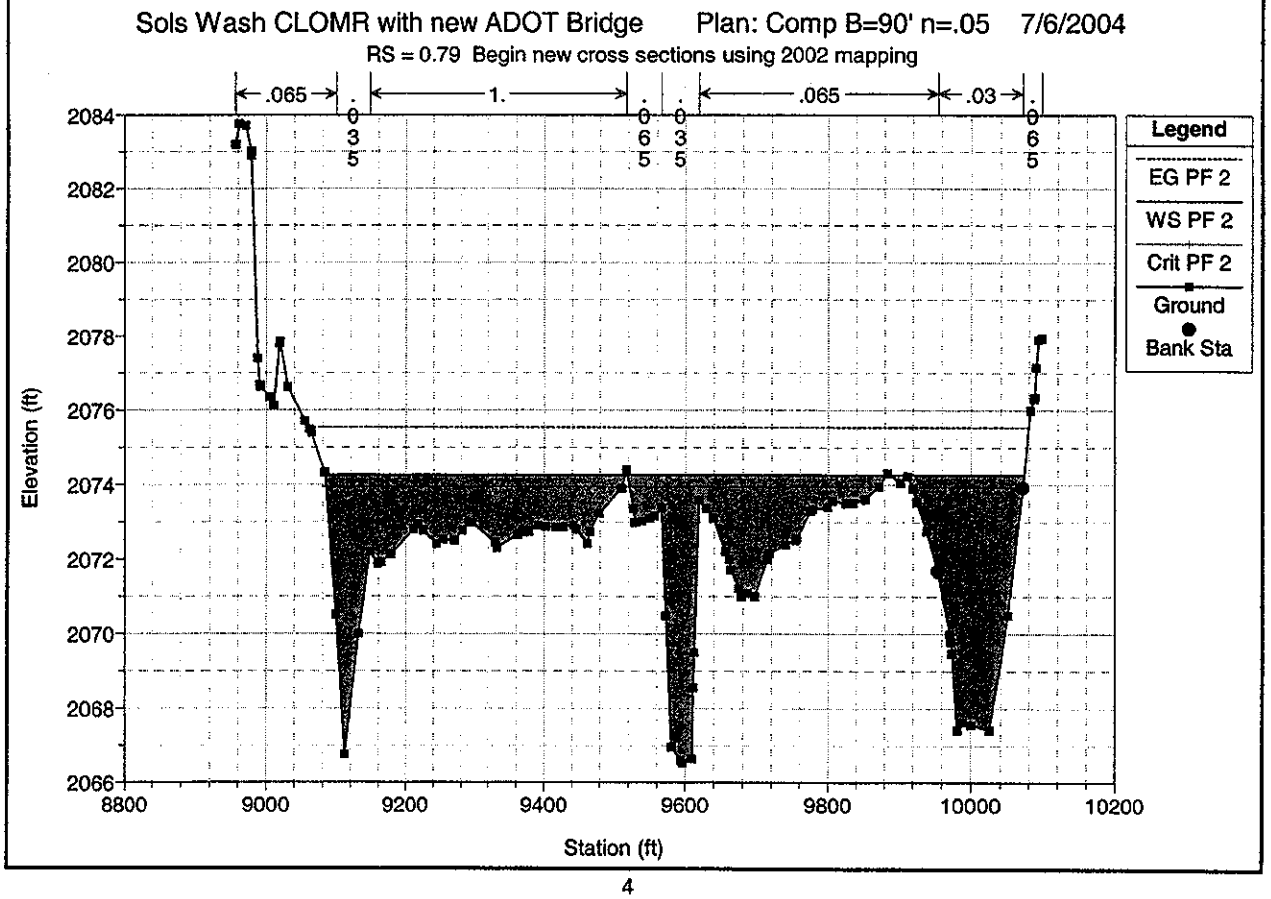
HEC-RAS Plan: n=.05 River: Sols Wash Reach: Reach 1 Profile: PF 2

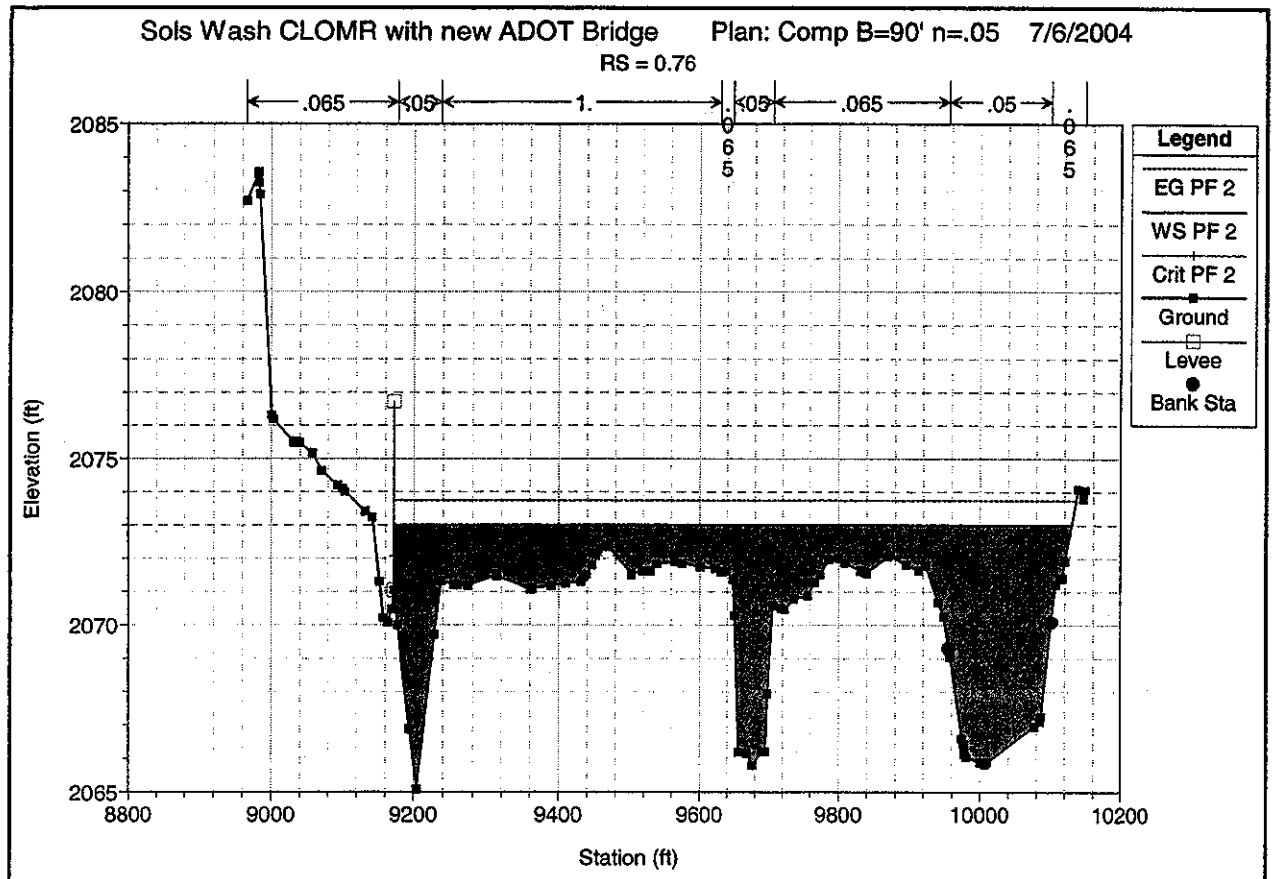
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.50	2088.50	2089.89	0.004414	12.19	2057.58	880.77	0.92
Reach 1	1.00	PF 2	14413.00	2078.10	2082.82	2084.10	2085.63	0.011161	16.55	1230.41	634.96	1.41
Reach 1	0.90	PF 2	14413.00	2073.10	2079.04	2079.13	2080.20	0.007034	12.18	2569.40	1343.27	0.94
Reach 1	0.79	PF 2	14413.00	2067.42	2074.26	2073.95	2075.54	0.007061	12.15	2226.66	980.77	0.96
Reach 1	0.76	PF 2	14413.00	2065.84	2073.01	2072.07	2073.75	0.007464	8.67	2618.88	956.89	0.61
Reach 1	0.70	PF 2	14413.00	2063.89	2071.86	2070.08	2072.32	0.003635	6.74	3010.07	842.50	0.44
Reach 1	0.66	PF 2	14413.00	2061.79	2070.96	2068.53	2071.48	0.002978	6.58	2676.87	704.41	0.40
Reach 1	0.61	PF 2	14459.00	2059.91	2068.44	2066.90	2070.17	0.008823	10.68	1410.13	203.72	0.68
Reach 1	0.57	PF 2	14459.00	2057.69	2066.55	2064.52	2068.14	0.007731	10.14	1446.08	303.89	0.64
Reach 1	0.52	PF 2	14459.00	2055.50	2065.39	2062.82	2066.56	0.005389	8.85	1757.01	501.66	0.54
Reach 1	0.48	PF 2	15045.00	2053.51	2064.21	2060.38	2065.34	0.004207	8.54	1773.19	294.33	0.49
Reach 1	0.43	PF 2	15045.00	2051.27	2063.43	2058.29	2064.47	0.002820	8.14	1848.85	201.07	0.42
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2049.33	2061.82	2056.59	2062.81	0.002713	7.96	1890.73	531.67	0.41
Reach 1	0.35	PF 2	15045.00	2047.68	2056.51	2056.51	2060.52	0.015837	16.09	940.56	117.89	1.00
Reach 1	0.27	PF 2	15045.00	2044.00	2054.12	2053.26	2057.65	0.002168	15.07	998.50	106.69	0.87
Reach 1	0.22	PF 2	15045.00	2043.00	2052.49	2052.04	2056.10	0.013802	15.24	986.92	116.14	0.92
Reach 1	0.18	PF 2	15045.00	2040.69	2049.70	2049.70	2053.59	0.014547	15.82	950.82	121.19	1.00
Reach 1	0.13	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2046.27	2047.25	2050.55	0.007350	17.58	1133.13	214.56	1.22
Reach 1	0.09	PF 2	15045.00	2038.99	2044.19	2042.48	2044.79	0.002917	7.66	3307.91	818.58	0.55
Reach 1	.05	PF 2	15045.00	2038.00	2043.52	2042.39	2044.34	0.002757	9.09	3336.53	1079.12	0.72

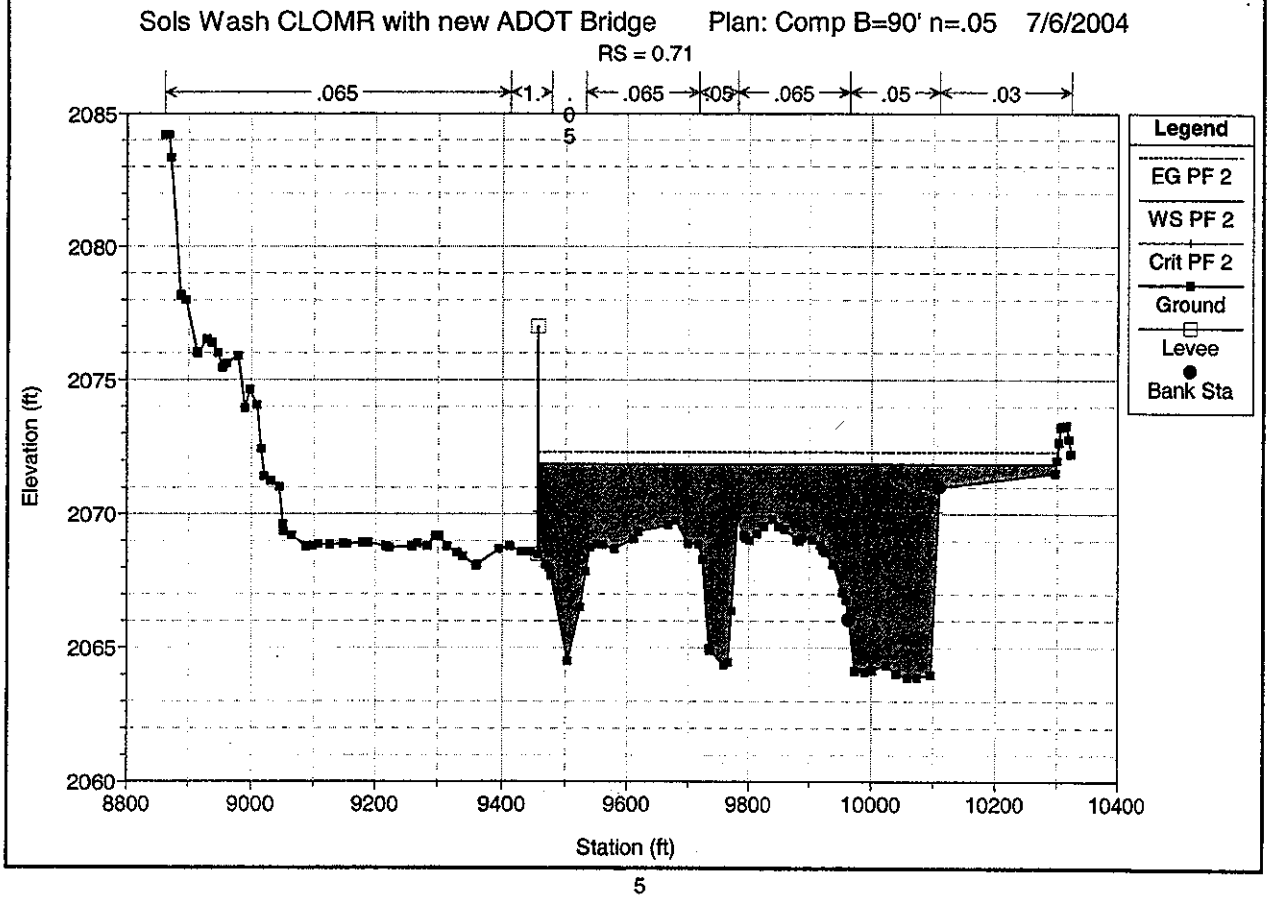

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 1.12 Cross Section 1.12 from CBA Study
.06
.025
.06
.06
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

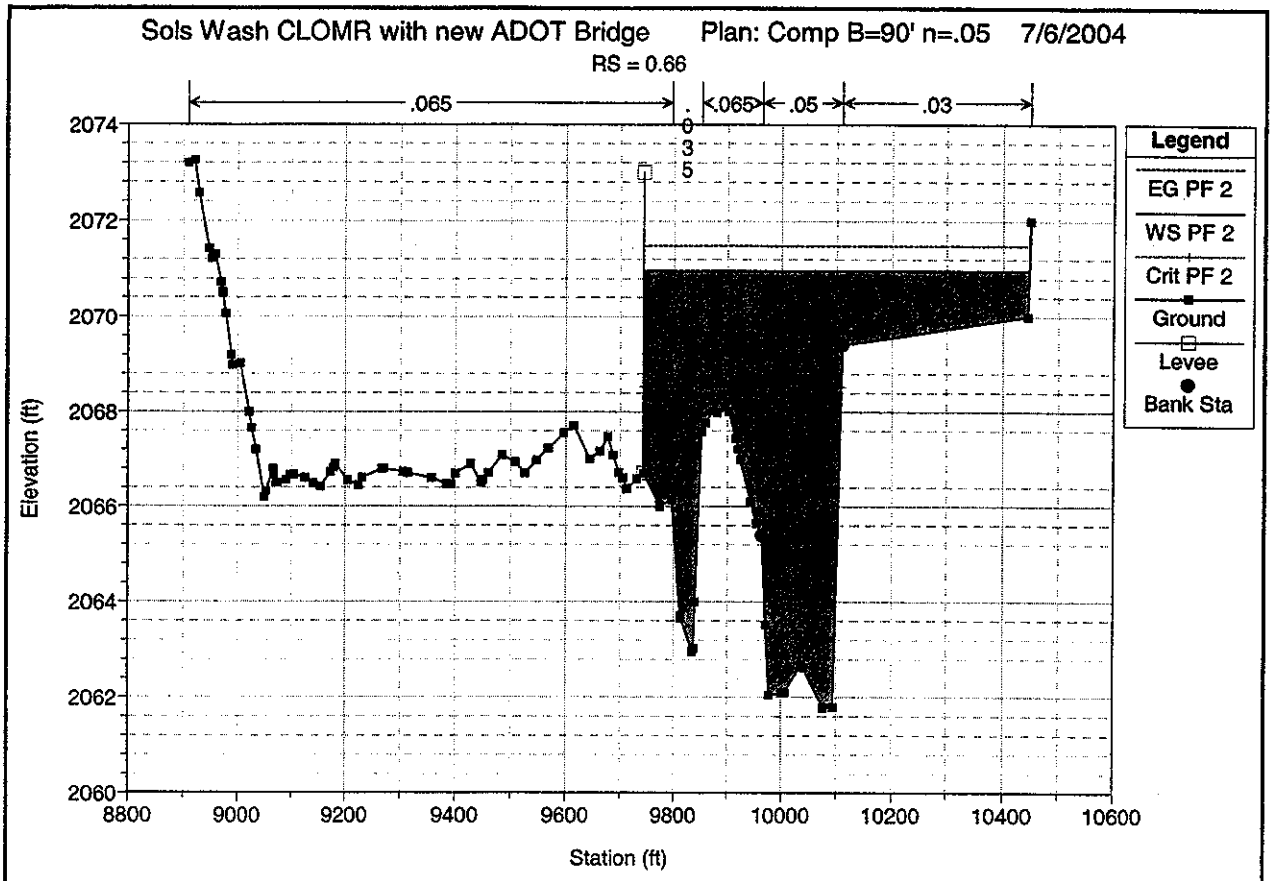

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 1.00 Cross Section 1.10 from CBA Study
1.
.065
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)

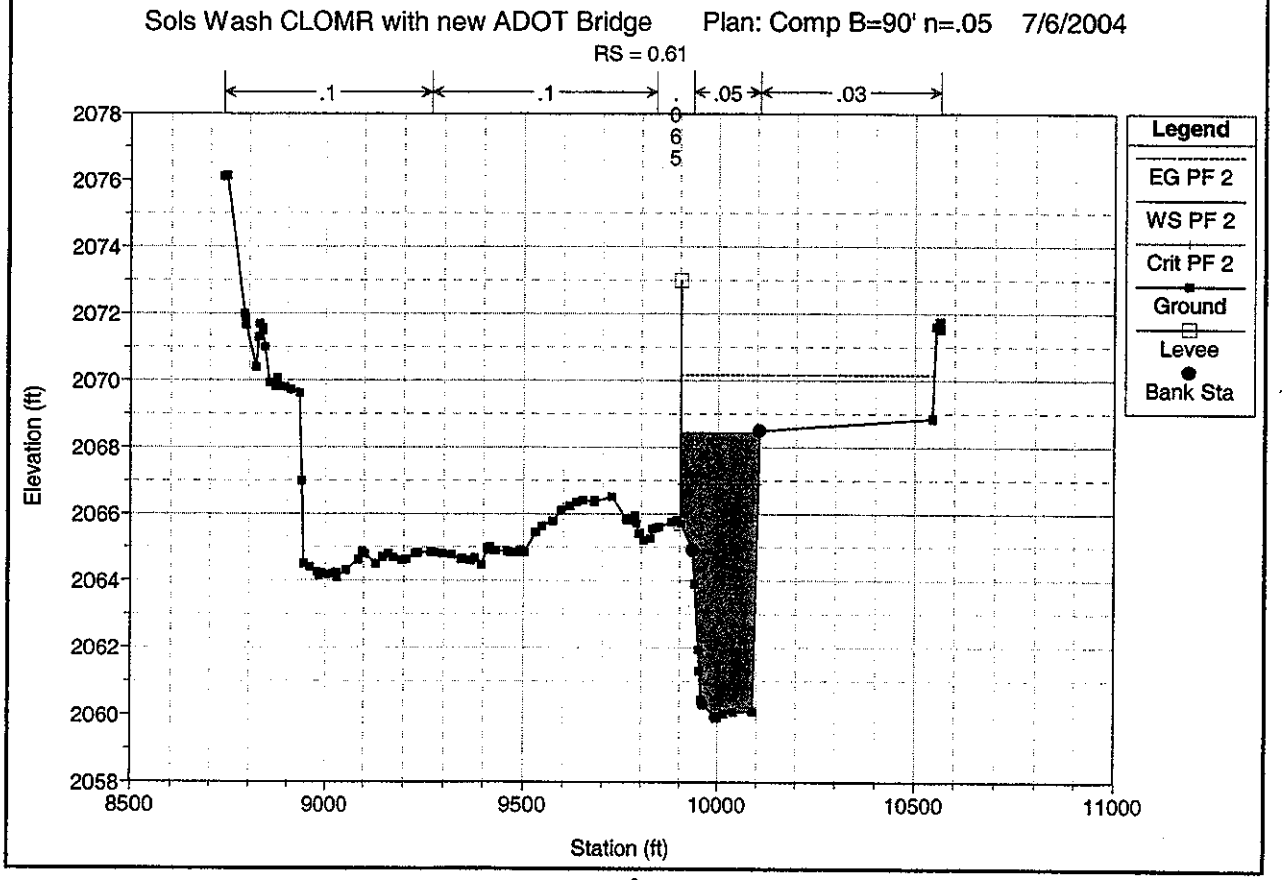

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.90 Cross Section 0.90 from CBA Study
1.
.065
.065
.025
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2095
2090
2085
2080
2075
2070
8400
8600
8800
9000
9200
9400
9600
9800
10000
10200

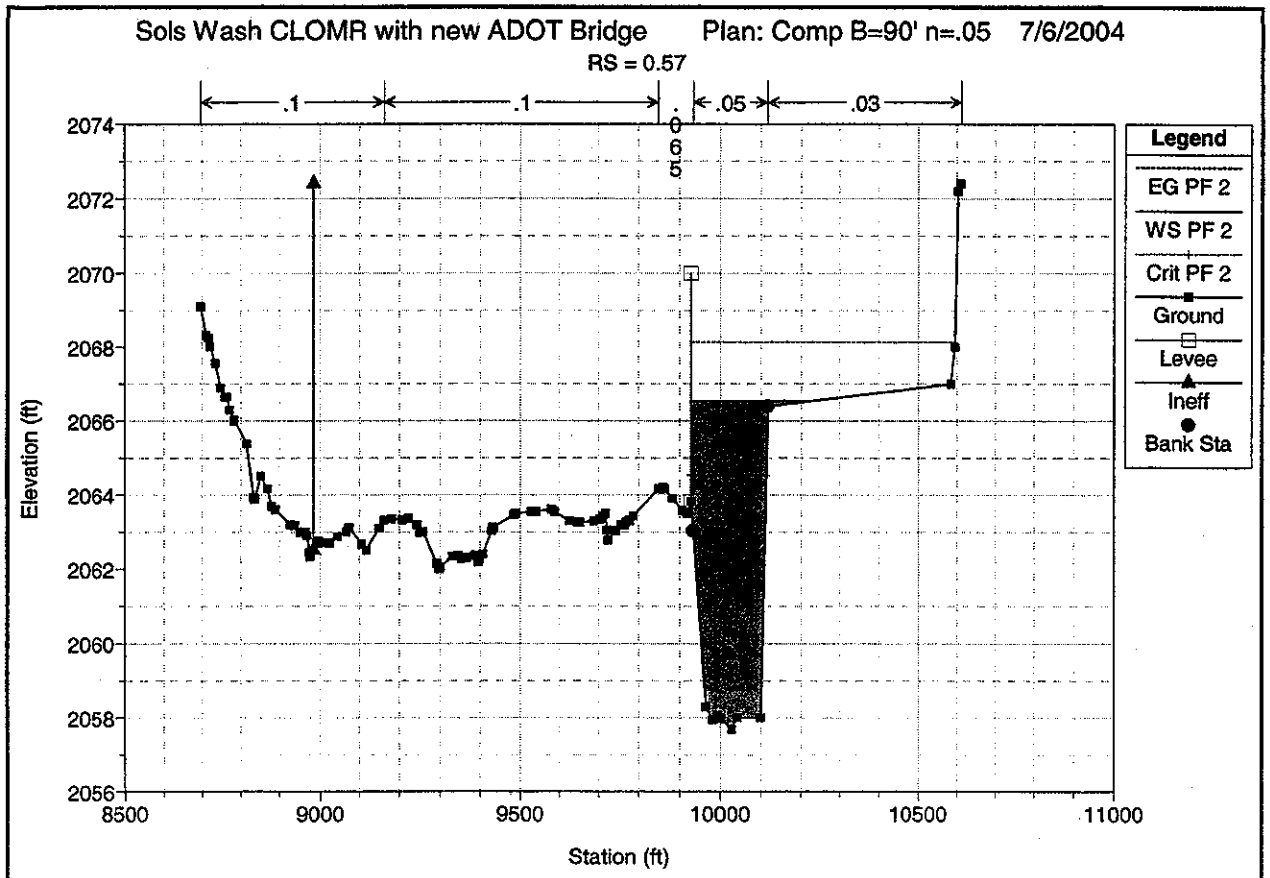

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.79 Begin new cross sections using 2002 mapping
.065
1.
.065
.03
.035
.065
.035
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
2084
2082
2080
2078
2076
2074
2072
2070
2068
2066
8800
9000
9200
9400
9600
9800
10000
10200

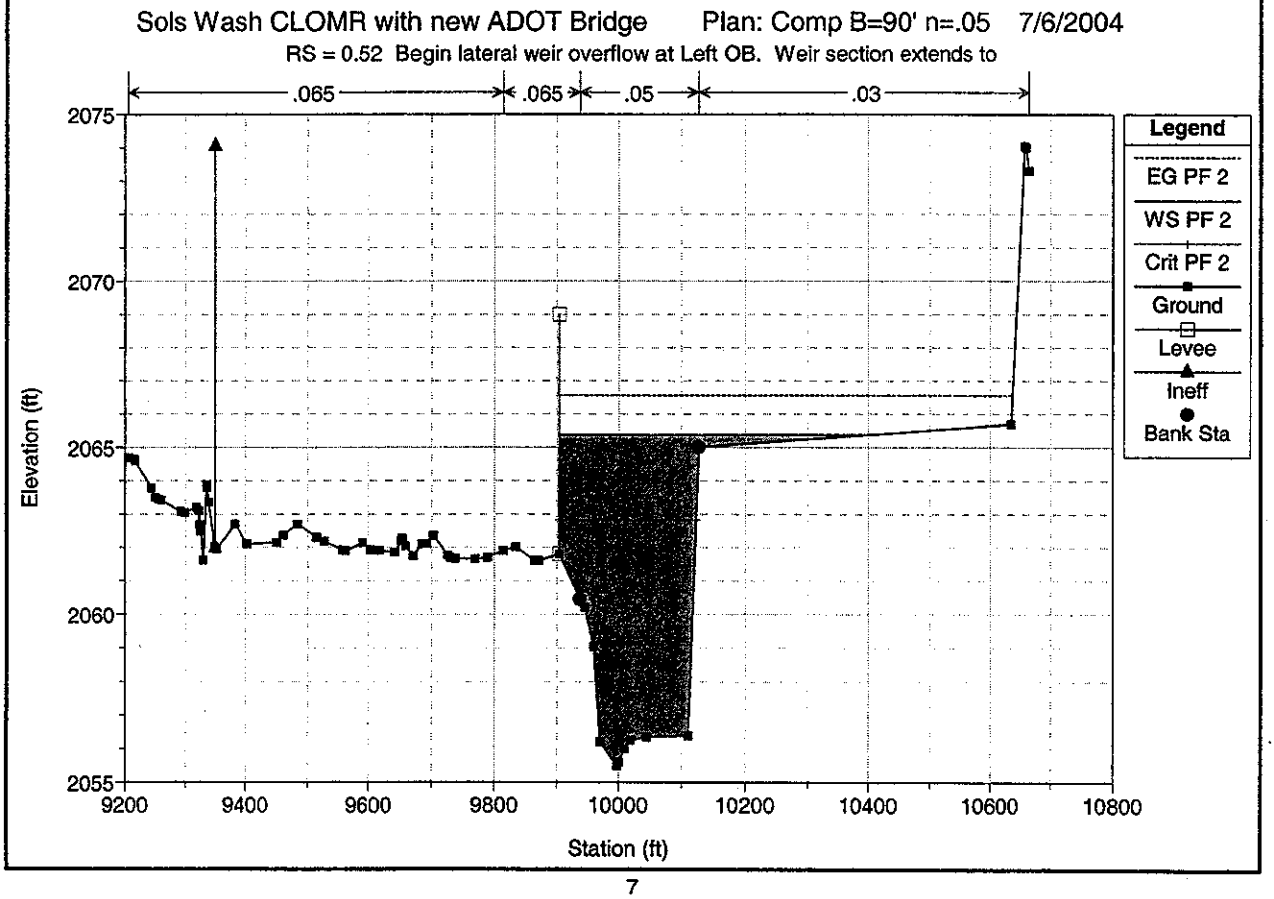

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.76
.065
.05
1.
.05
.065
.05
.065
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

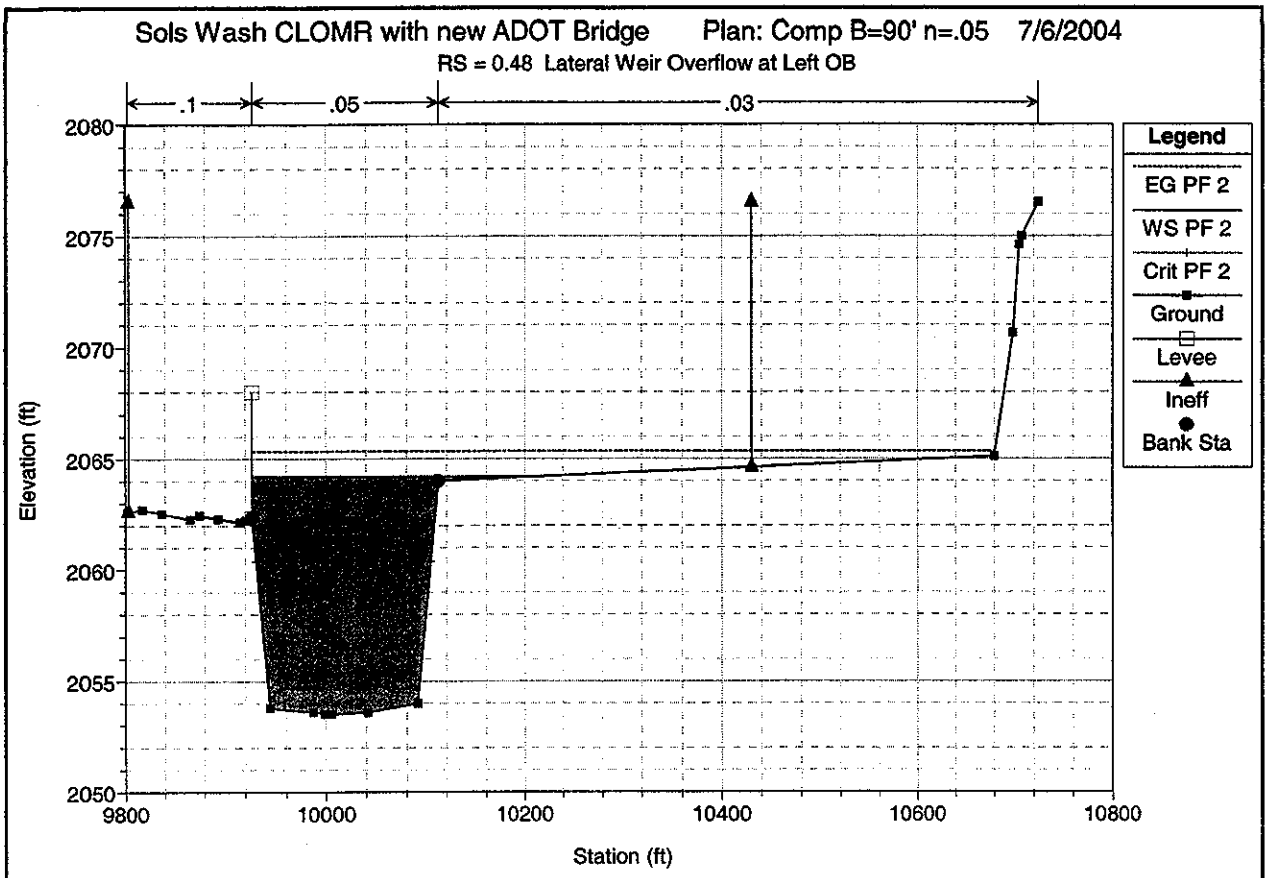

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.71
.065
1.
.05
.065
.05
.065
.05
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

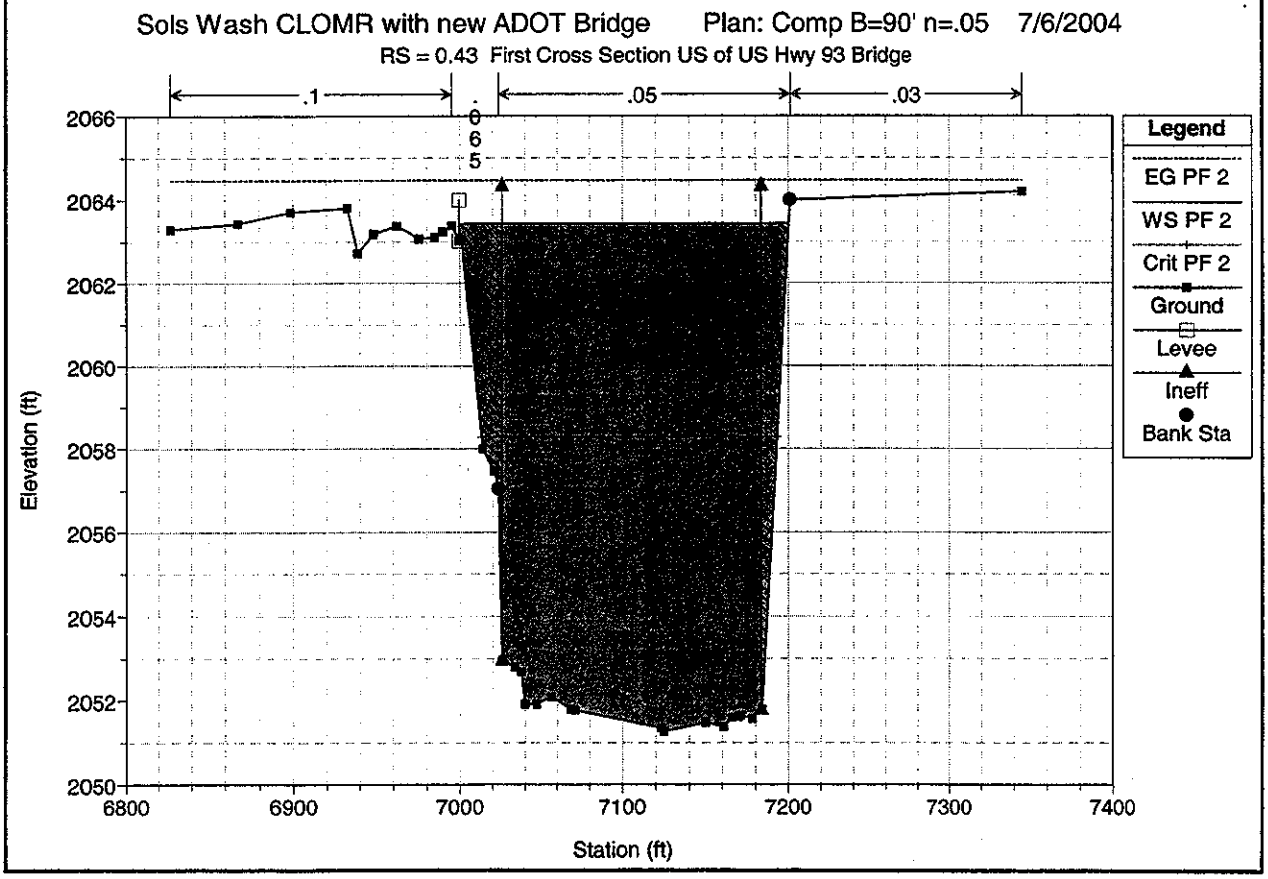

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.66
.065
.065
.05
.03
.035
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
10600

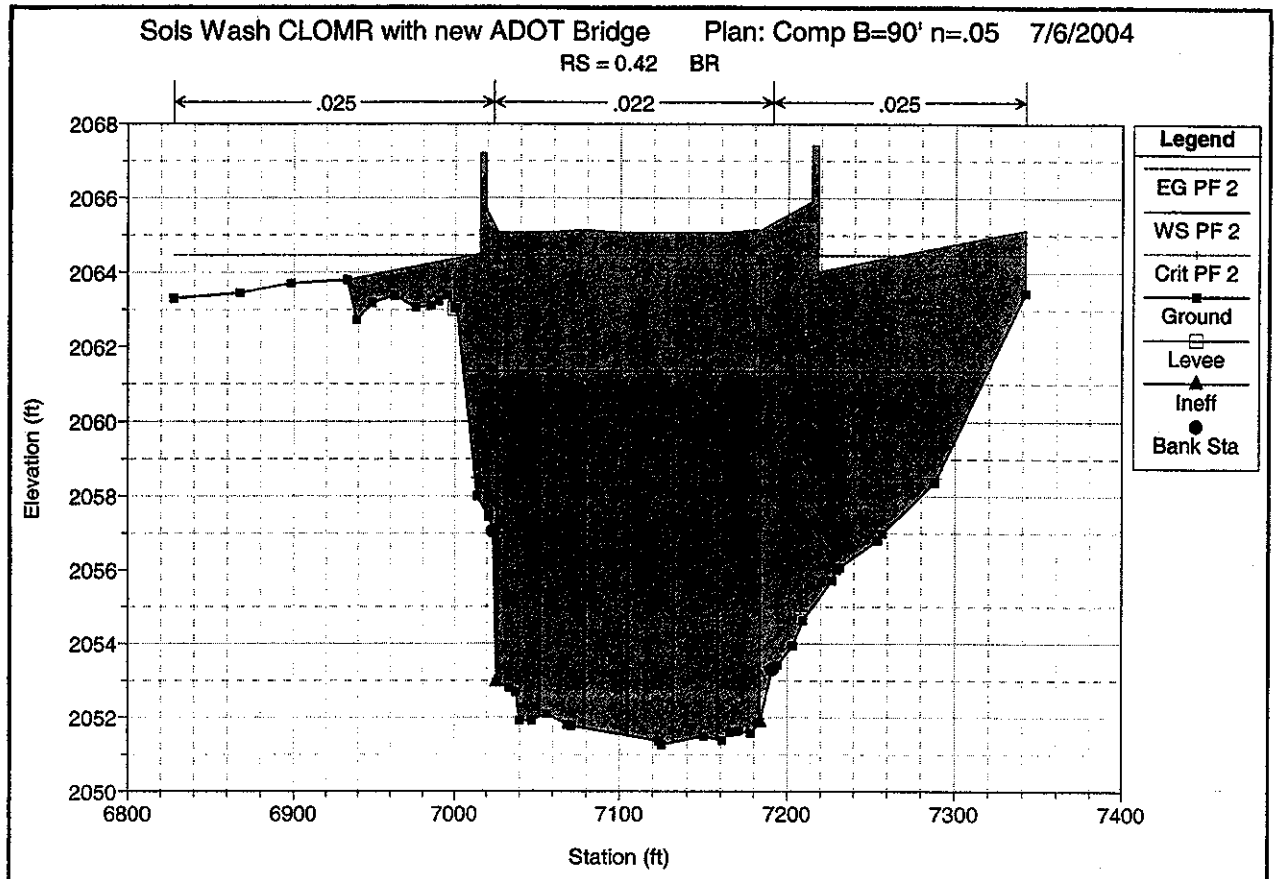

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.61
.1
.1
.05
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
2078
2076
2074
2072
2070
2068
2066
2064
2062
2060
2058
8500
9000
9500
10000
10500
11000

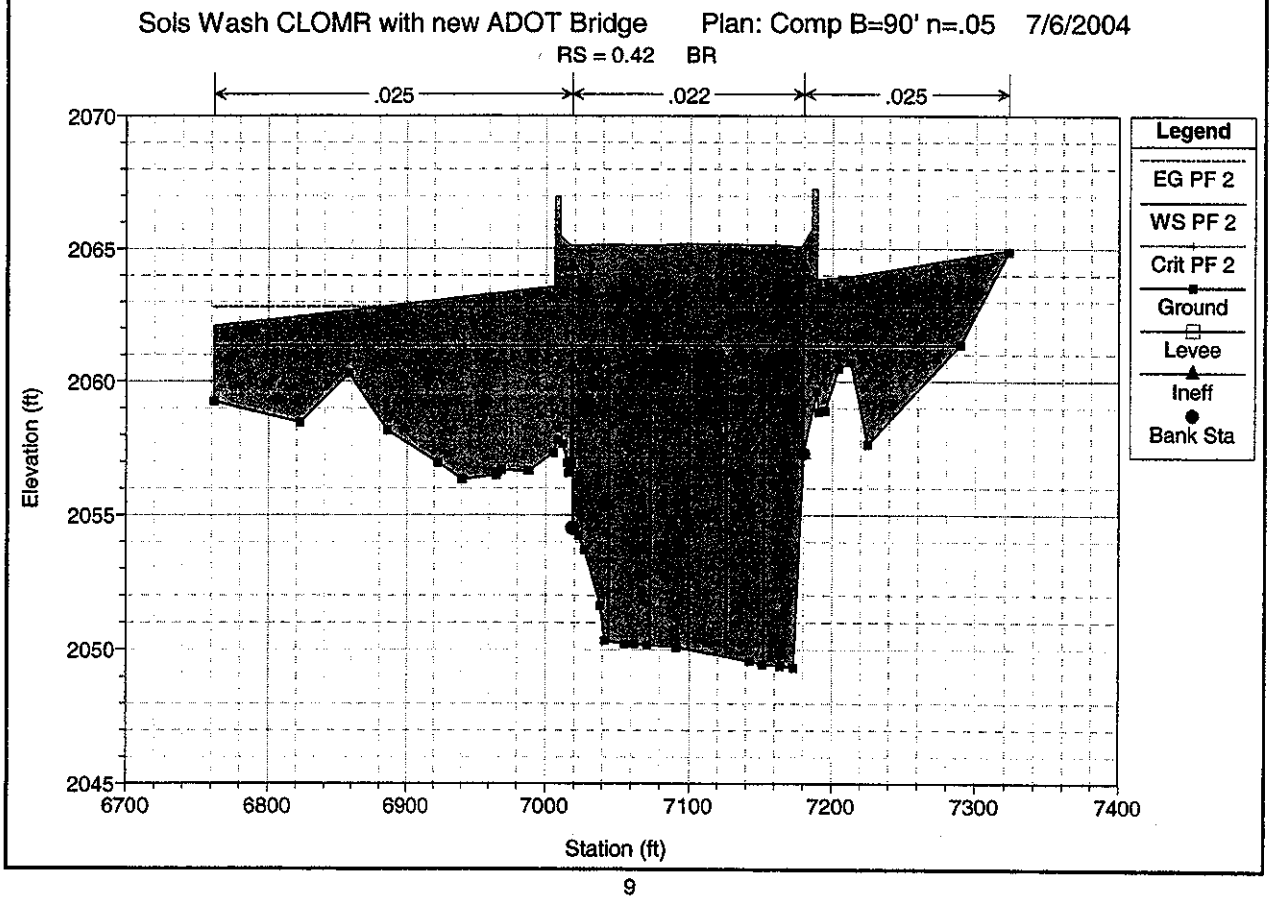

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.57
.1
.1
.065
.05
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
2058
2056
8500
9000
9500
10000
10500
11000

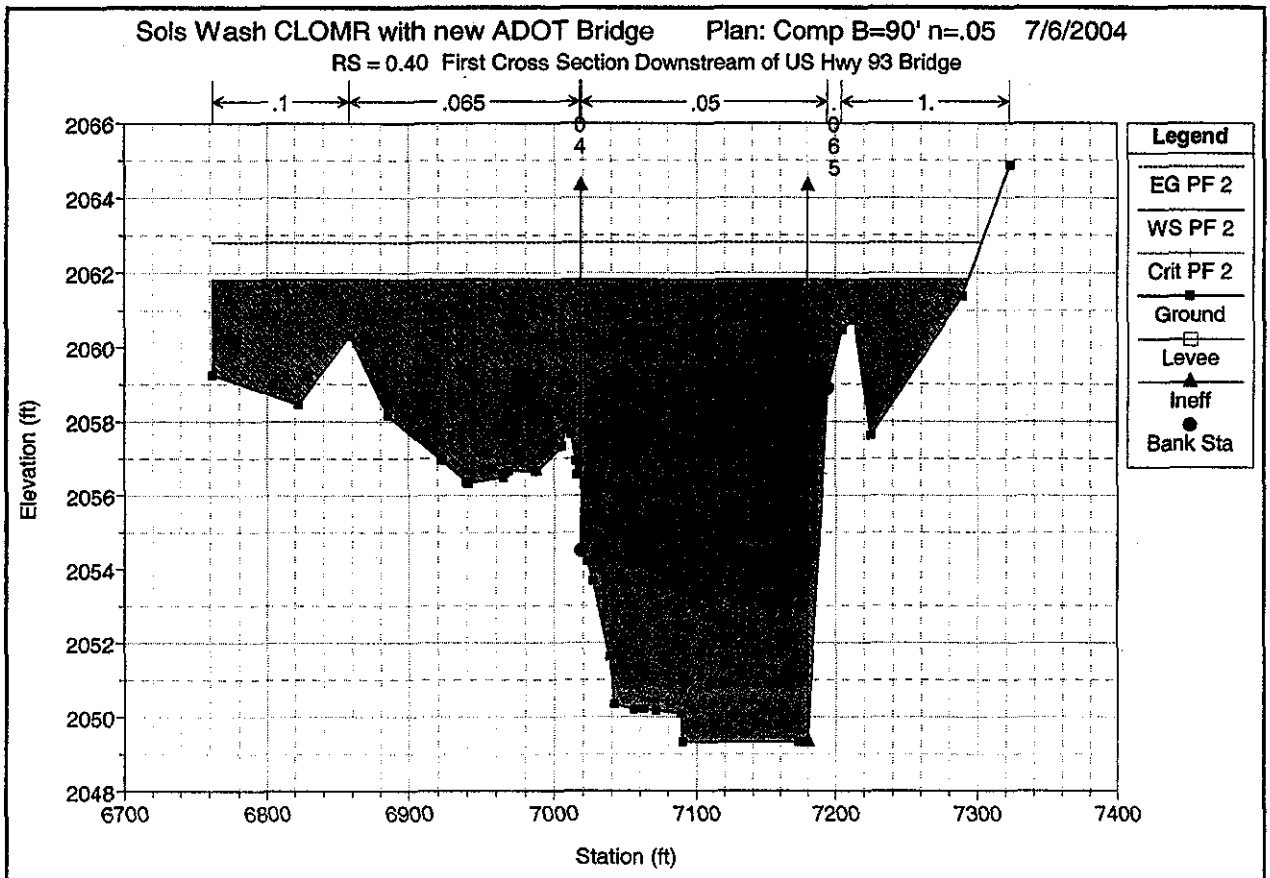

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.52 Begin lateral weir overflow at Left OB. Weir section extends to
.065
.065
.05
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2075
2070
2065
2060
2055
9200
9400
9600
9800
10000
10200
10400
10600
10800

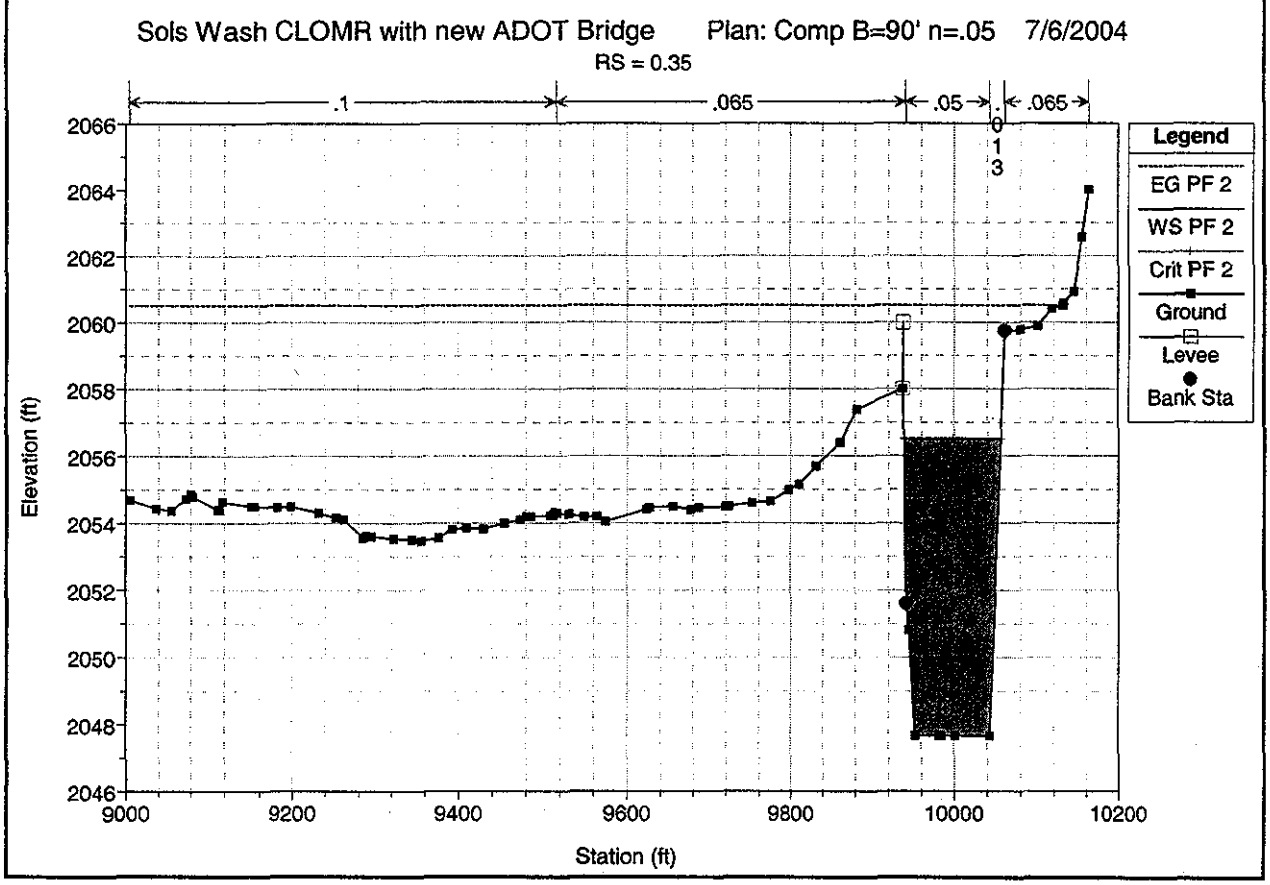

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.48 Lateral Weir Overflow at Left OB
.1
.05
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2080
2075
2070
2065
2060
2055
2050
9800
10000
10200
10400
10600
10800
Station (ft)

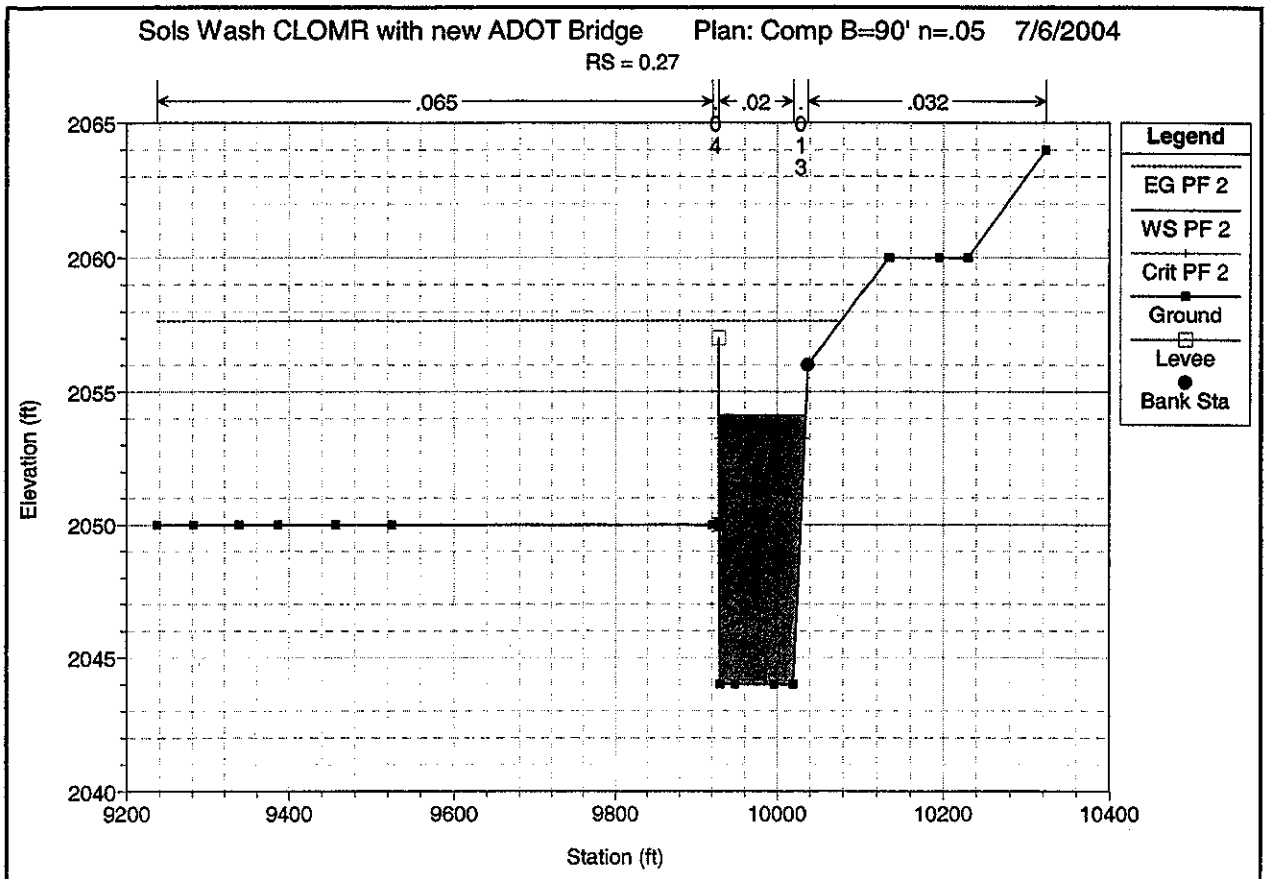

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.43 First Cross Section US of US Hwy 93 Bridge
.1
.065
.05
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

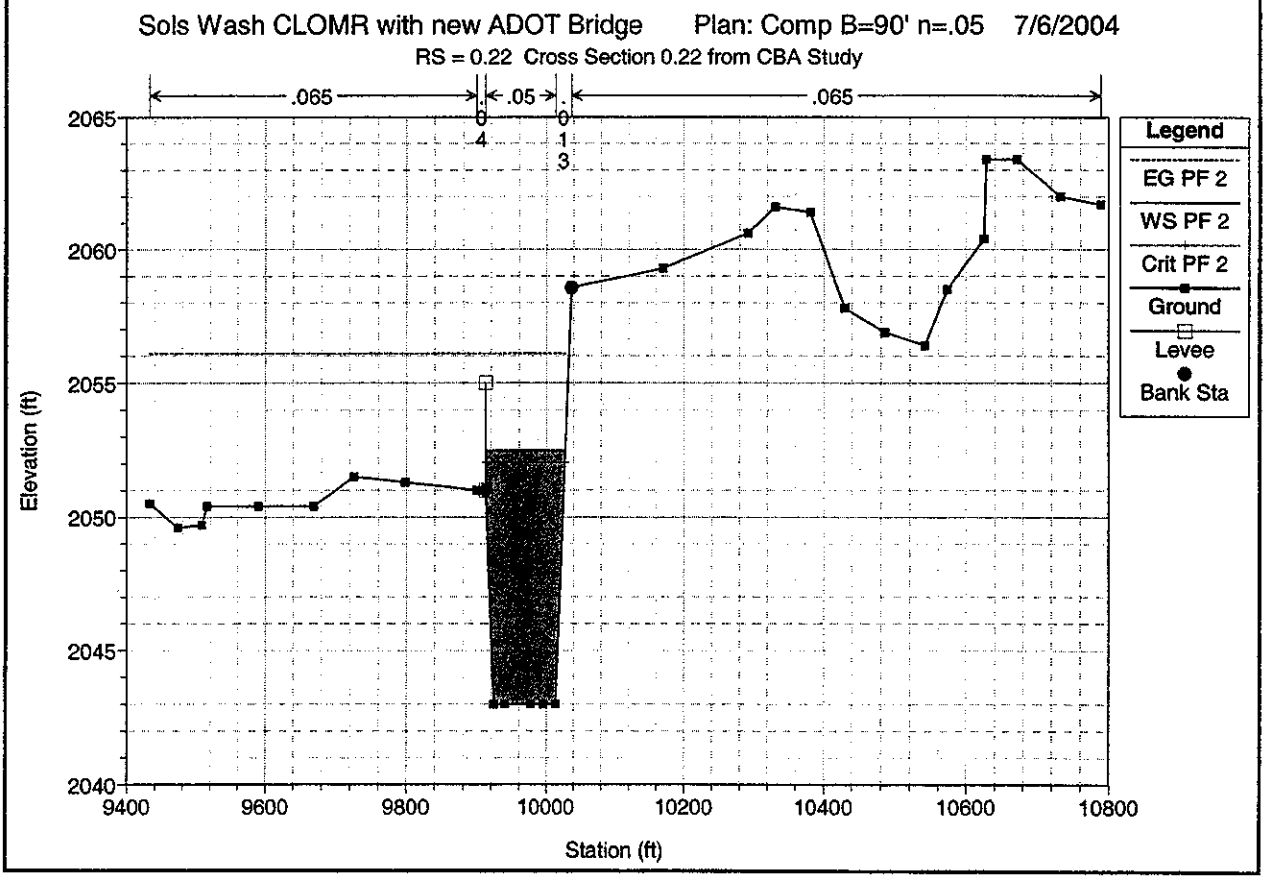

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2068
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

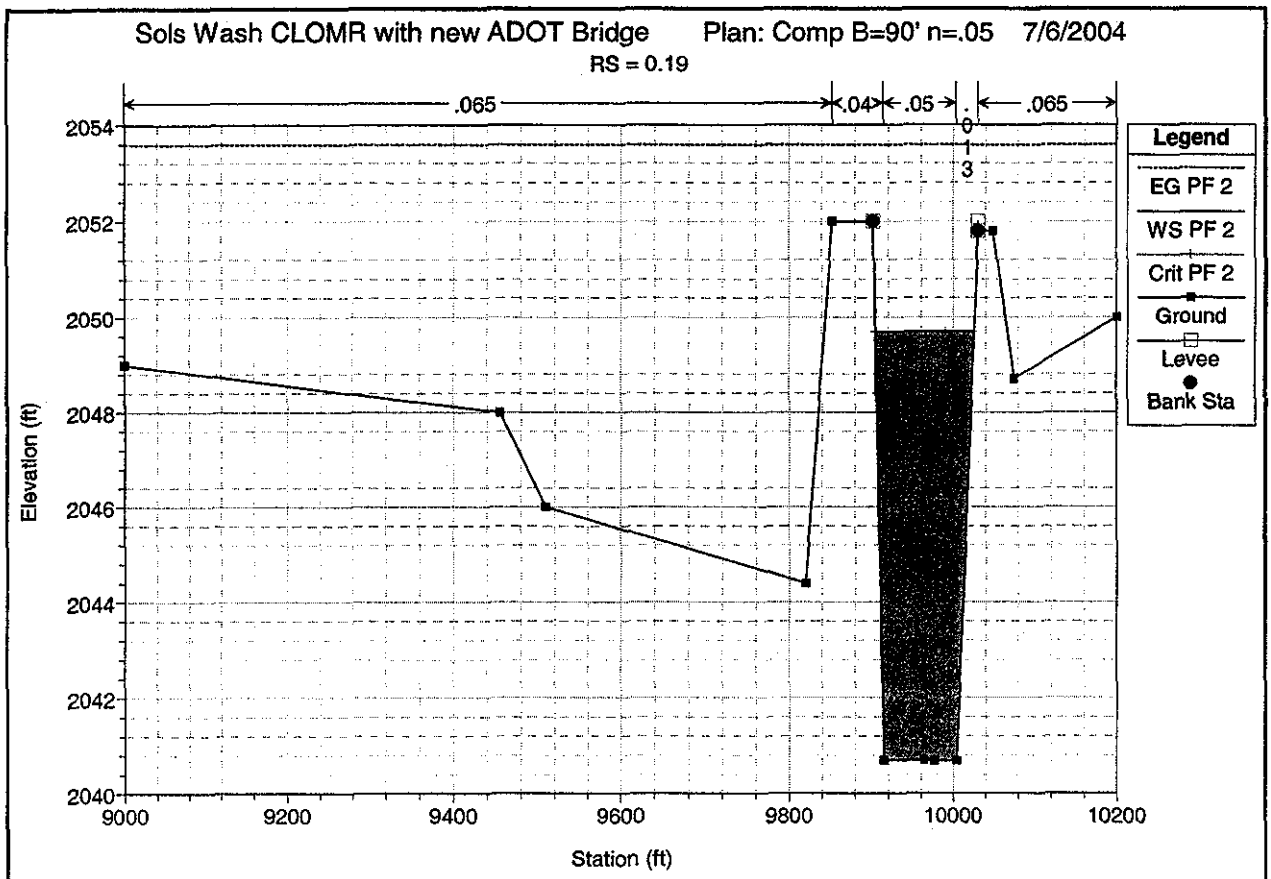

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2070
2065
2060
2055
2050
2045
6700
6800
6900
7000
7100
7200
7300
7400
Station (ft)

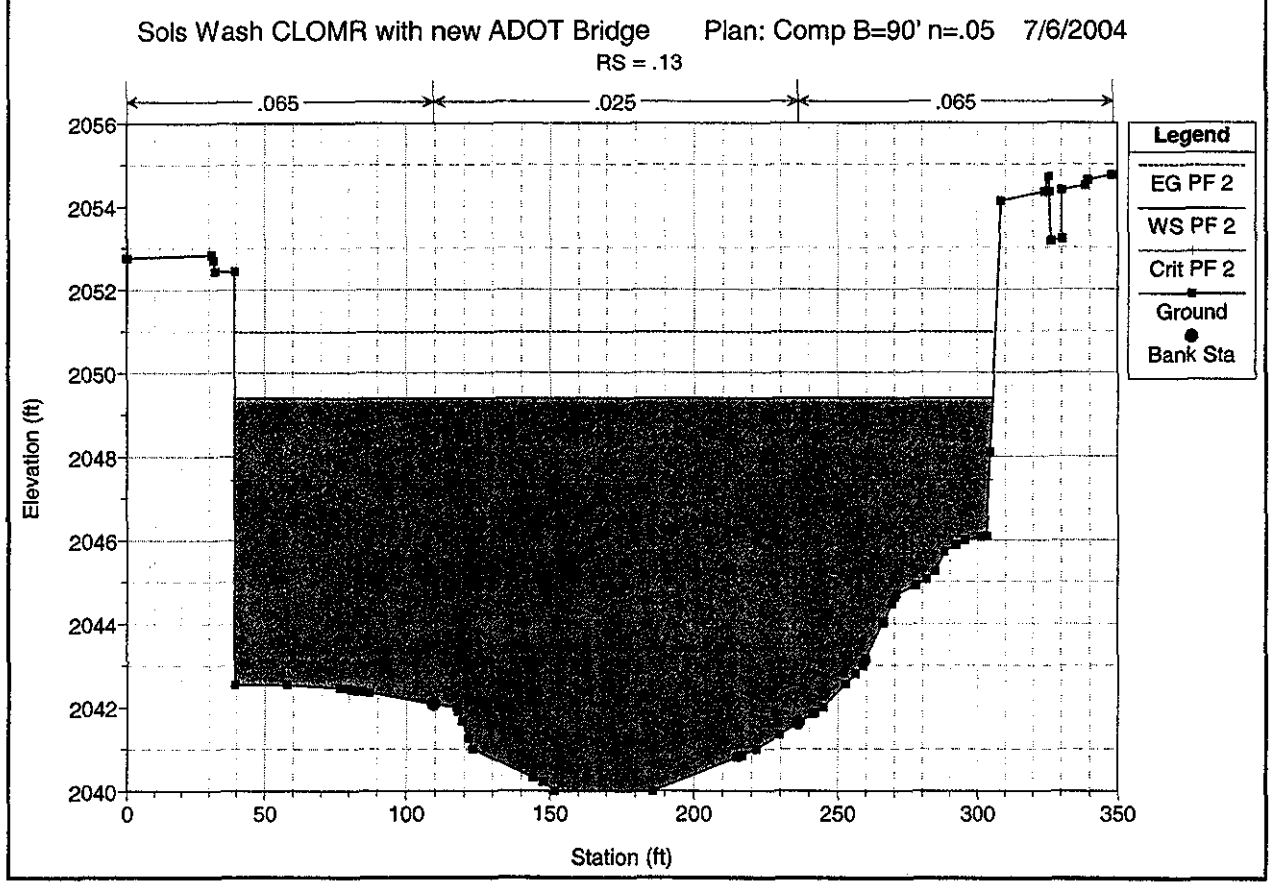

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.40 First Cross Section Downstream of US Hwy 93 Bridge
.1
.065
.05
1.
0
4
0
6
5
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2066
2064
2062
2060
2058
2056
2054
2052
2050
2048
6700
6800
6900
7000
7100
7200
7300
7400
Station (ft)

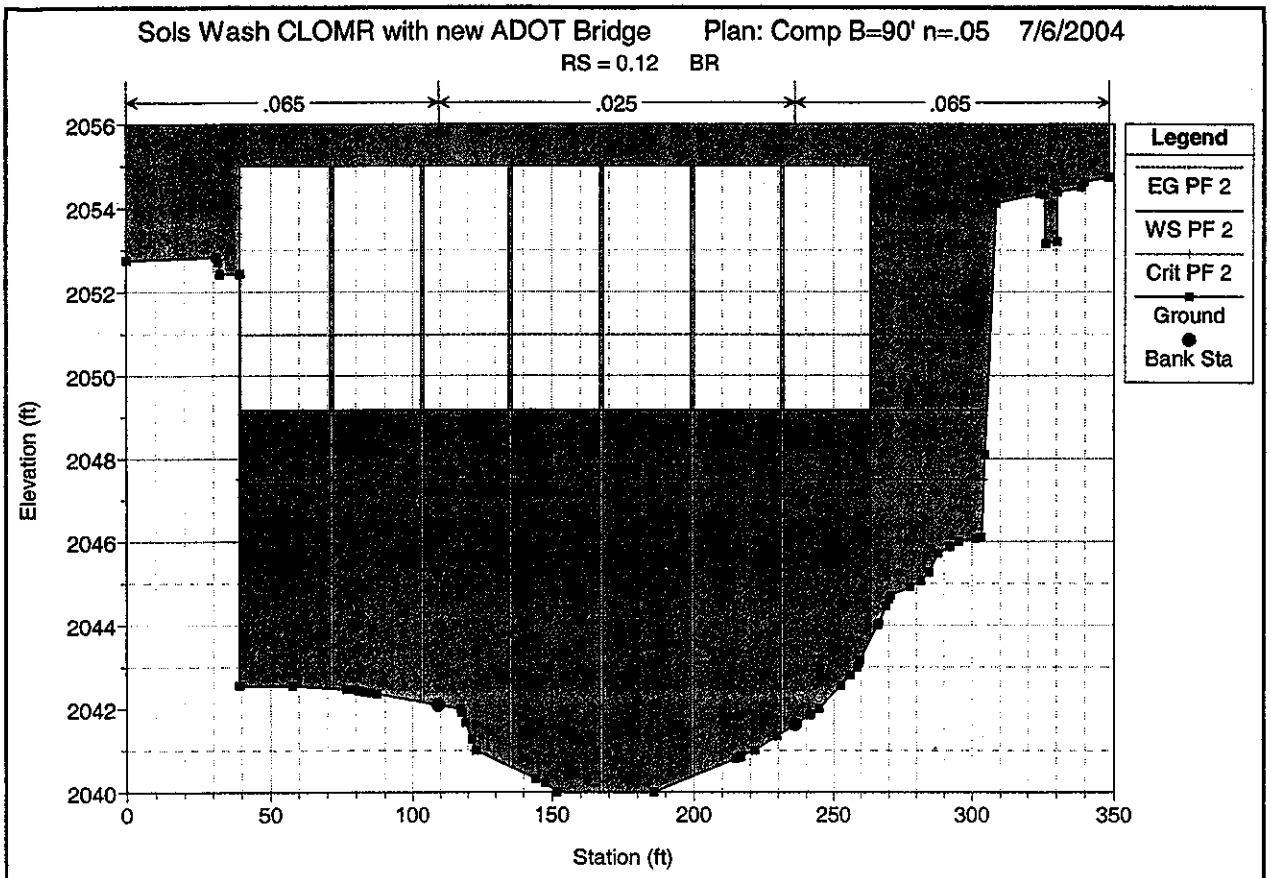

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.35
.1
.065
.05
.065
0
1
3
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2066
2064
2062
2060
2058
2056
2054
2052
2050
2048
2046
9000
9200
9400
9600
9800
10000
10200
Station (ft)

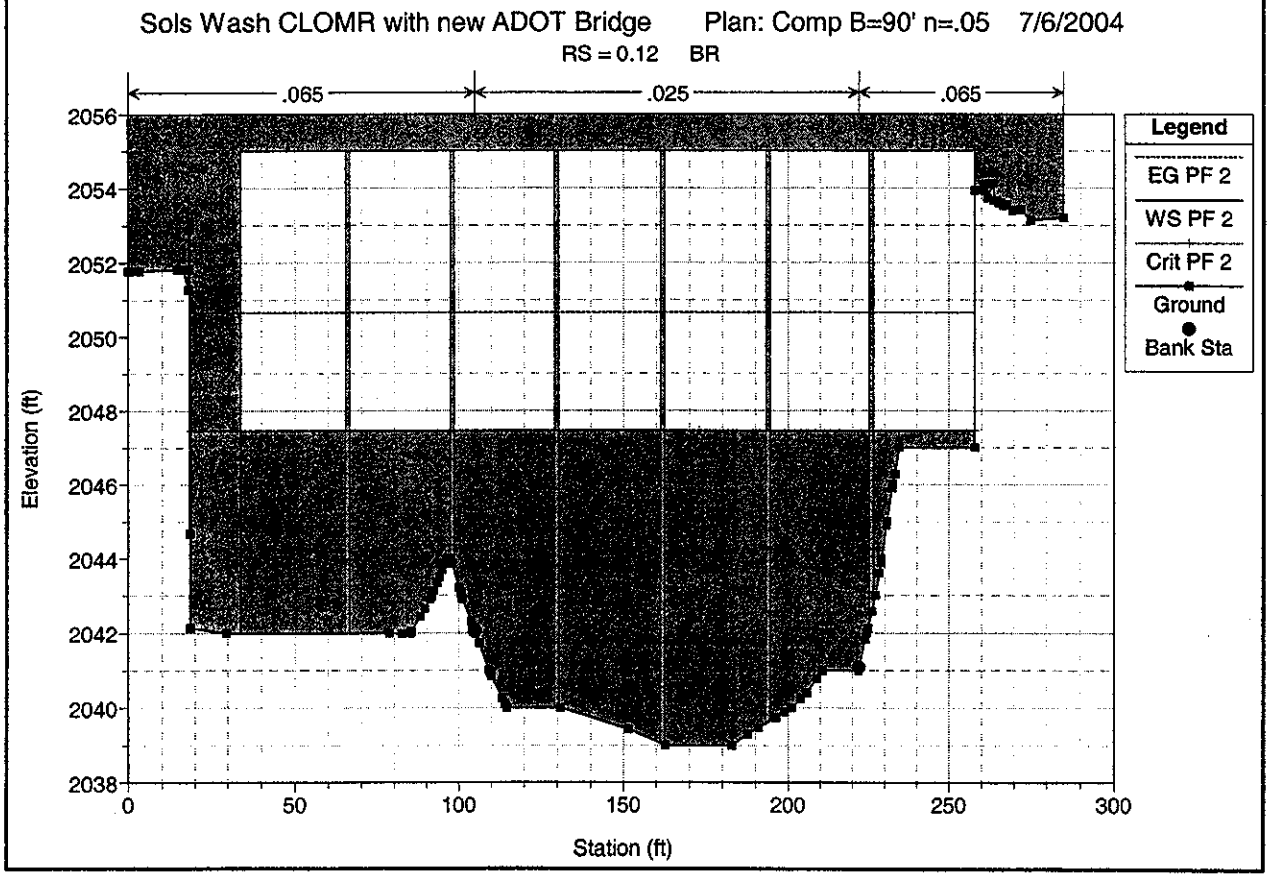

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.27
.065
.02
.032
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

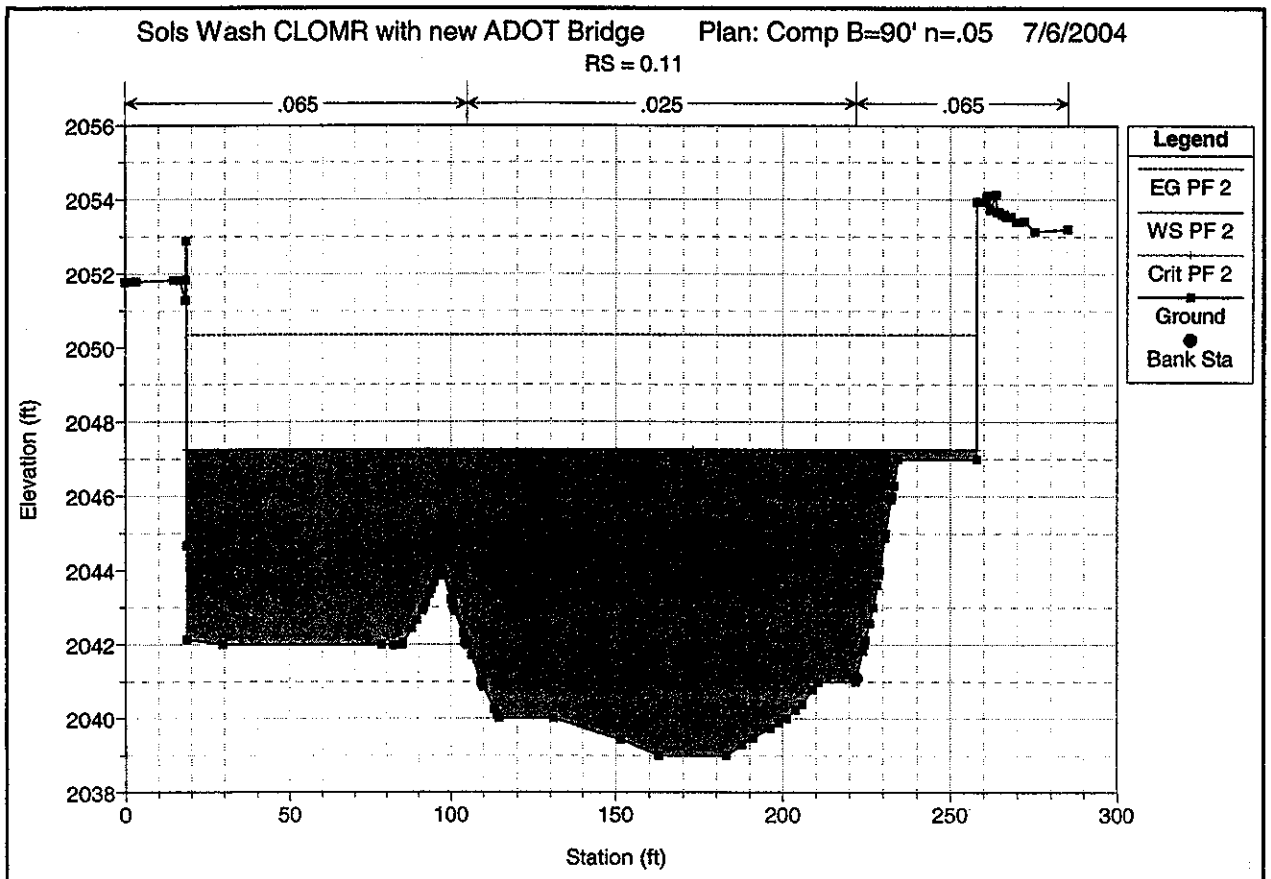

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.22 Cross Section 0.22 from CBA Study
.065
.05
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

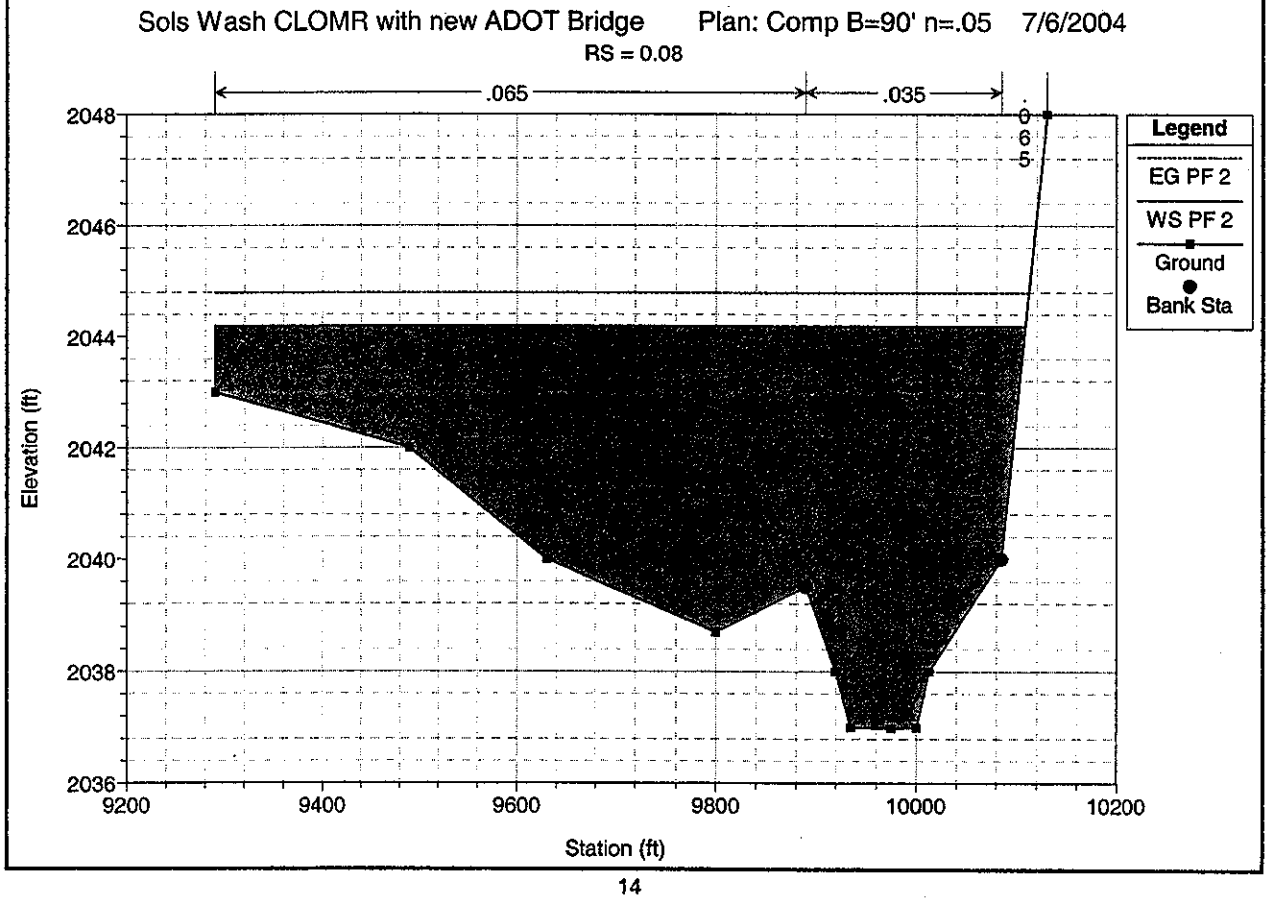

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.19
.065
.04
.05
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

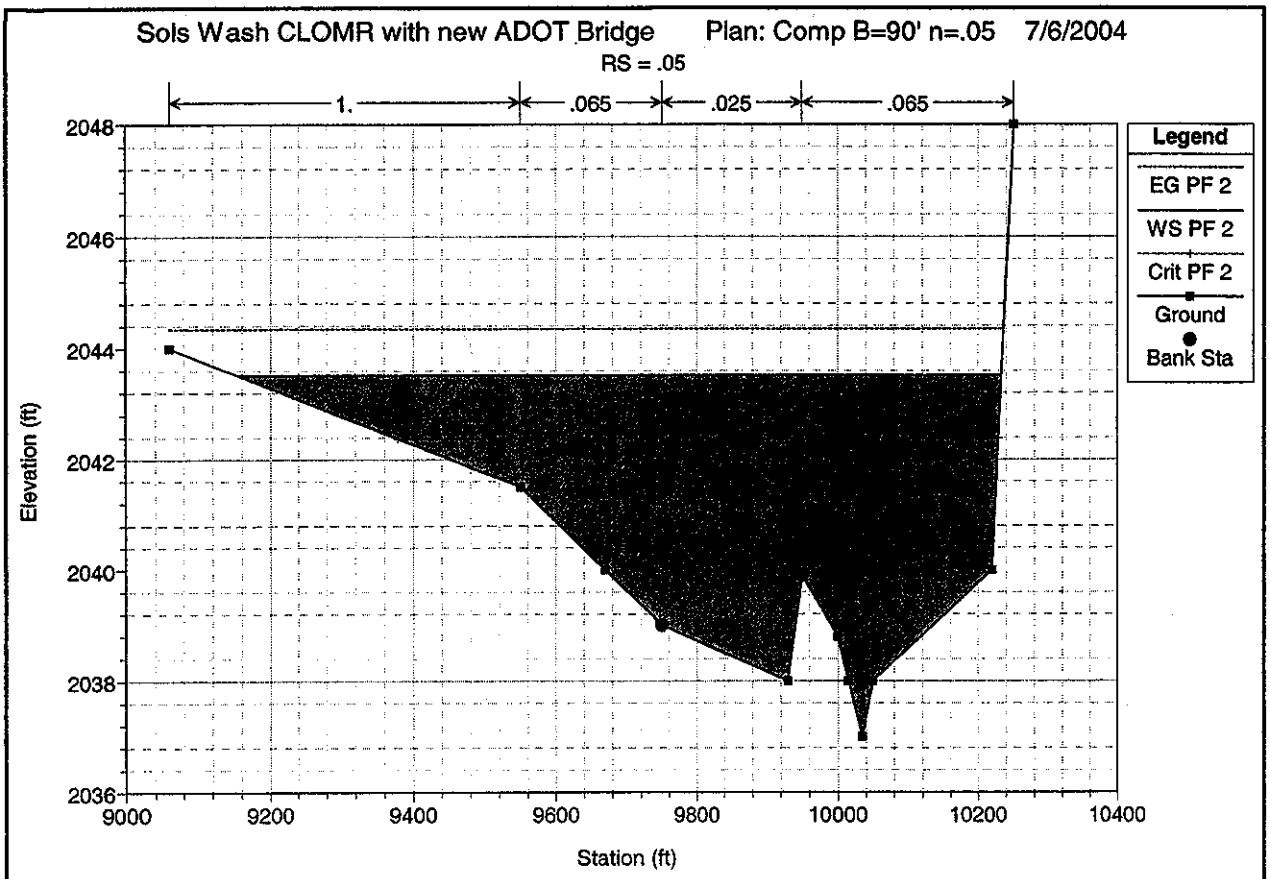

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = .13
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
0
50
100
150
200
250
300
350
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
2038
0
50
100
150
200
250
300
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.11
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = 0.08
.065
.035
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90' n=.05 7/6/2004
RS = .05
1.
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

ATTACHMENT M:
HYDRAULIC ANALYSIS
WITH 10' DROP

HEC-RAS Plan: 10' Drop River: Sols Wash Reach: Reach 1 Profile: PF 2

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.50	2088.50	2089.89	0.004414	12.19	2057.58	880.77	0.92
Reach 1	1.00	PF 2	14413.00	2078.10	2084.10	2084.10	2085.33	0.004281	12.19	2886.35	1711.00	0.91
Reach 1	0.90	PF 2	14413.00	2073.10	2079.13	2079.13	2080.20	0.006360	11.72	2697.71	1392.79	0.90
Reach 1	0.79	PF 2	14413.00	2067.42	2073.90	2073.90	2075.50	0.009363	13.32	1886.69	924.15	1.09
Reach 1	0.76	PF 2	14413.00	2065.84	2071.96	2071.96	2073.62	0.006730	12.15	1633.80	881.70	0.94
Reach 1	0.71	PF 2	14413.00	2063.89	2071.02	2070.12	2071.96	0.002965	9.37	2351.77	664.94	0.64
Reach 1	0.66	PF 2	14413.00	2061.79	2069.70	2068.75	2071.10	0.003460	10.59	1815.94	534.05	0.70
Reach 1	0.61	PF 2	14459.00	2059.91	2066.89	2066.89	2069.77	0.006845	13.67	1097.00	200.63	0.97
Reach 1	0.57	PF 2	14459.00	2057.69	2064.67	2064.53	2067.46	0.006828	13.41	1084.72	185.75	0.97
Reach 1	0.52	PF 2	14459.00	2055.50	2064.21	2062.80	2065.92	0.003372	10.60	1441.83	220.48	0.70
Reach 1	0.48	PF 2	15045.00	2053.51	2063.88	2060.38	2065.10	0.001701	8.85	1700.96	184.51	0.51
Reach 1	0.43	PF 2	15045.00	2051.27	2063.63	2058.29	2064.63	0.000959	8.00	1880.90	329.63	0.41
Reach 1	0.42	PF 2	Bridge									
Reach 1	0.40	PF 2	15045.00	2040.17	2054.82	2049.35	2056.04	0.001197	8.86	1698.34	169.36	0.48
Reach 1	0.35	PF 2	15045.00	2040.14	2053.94	2049.31	2055.56	0.001738	10.21	1473.13	123.54	0.52
Reach 1	0.27	PF 2	15045.00	2040.09	2052.51	2049.16	2054.46	0.003400	11.19	1344.61	123.46	0.60
Reach 1	0.22	PF 2	15045.00	2040.06	2050.63	2049.10	2053.41	0.002348	13.38	1124.48	122.29	0.78
Reach 1	0.18	PF 2	15045.00	2040.04	2048.97	2048.97	2052.80	0.003646	15.69	958.71	123.81	0.99
Reach 1	0.13	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1952.46	265.99	0.66
Reach 1	0.12	PF 2	Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2047.25	2047.25	2050.36	0.004473	15.08	1349.67	239.45	0.98
Reach 1	0.06	PF 2	15045.00	2036.99	2044.19		2044.79	0.002923	7.67	3305.61	818.56	0.55
Reach 1	.05	PF 2	15045.00	2038.00	2043.52	2042.38	2044.34	0.002757	9.09	3336.53	1079.12	0.72

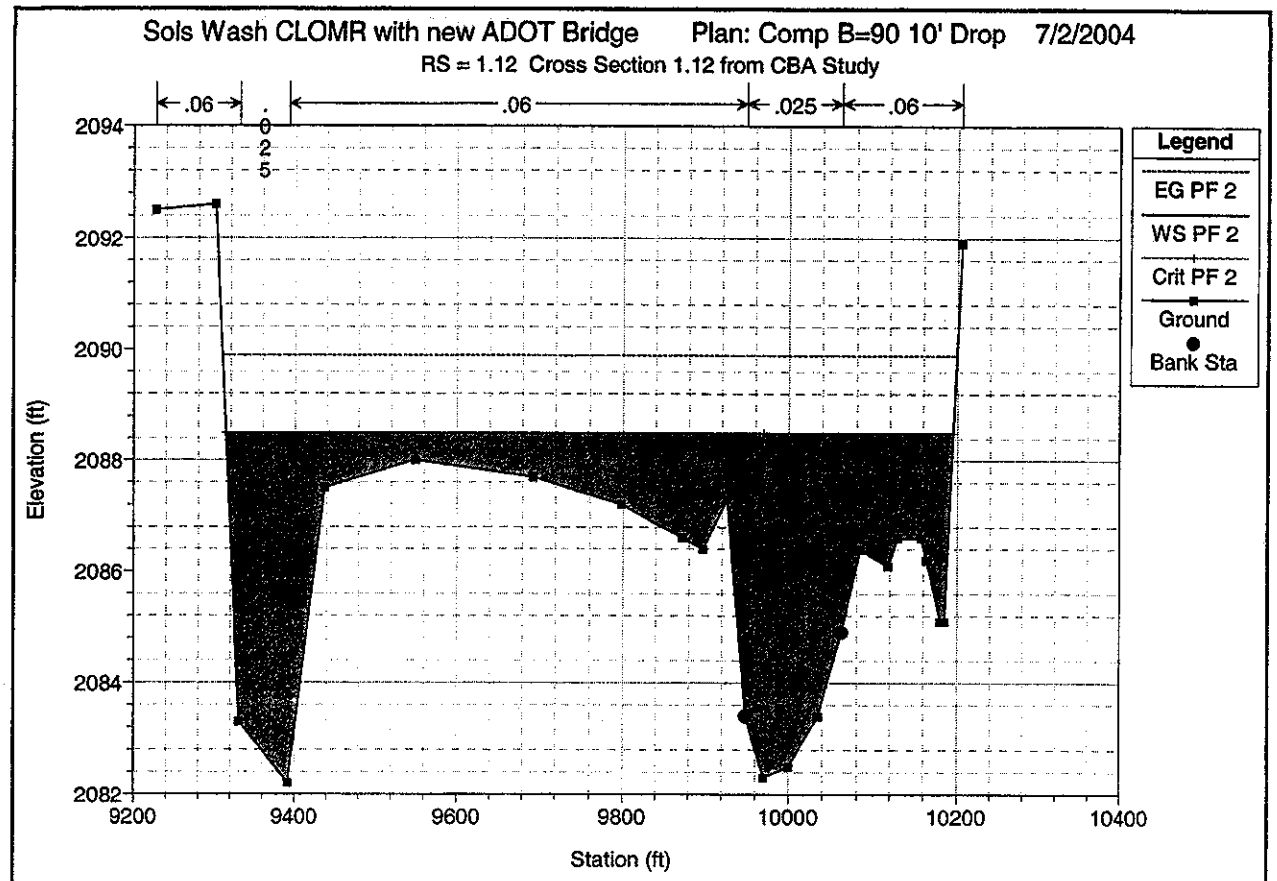
10' DROP

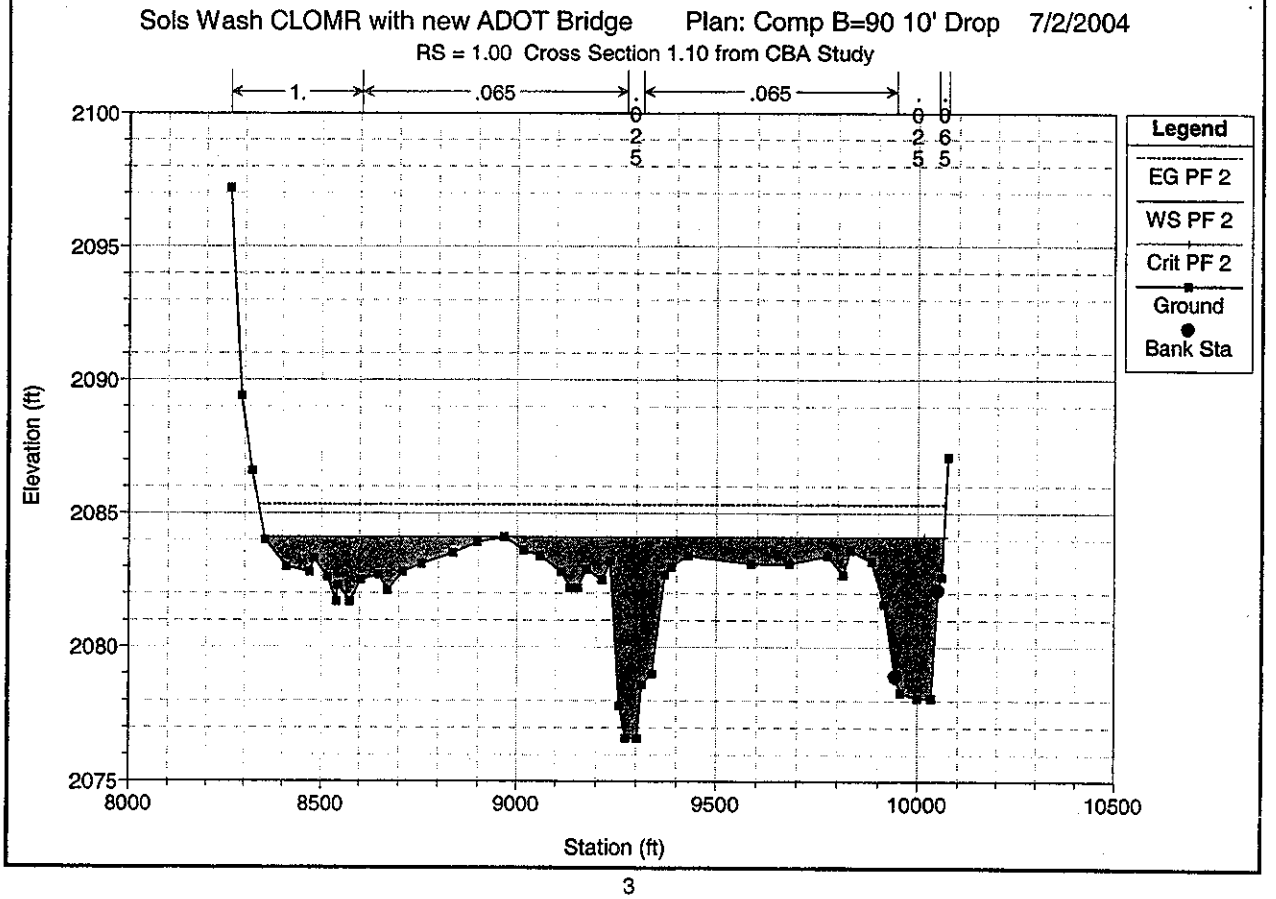
EMBER

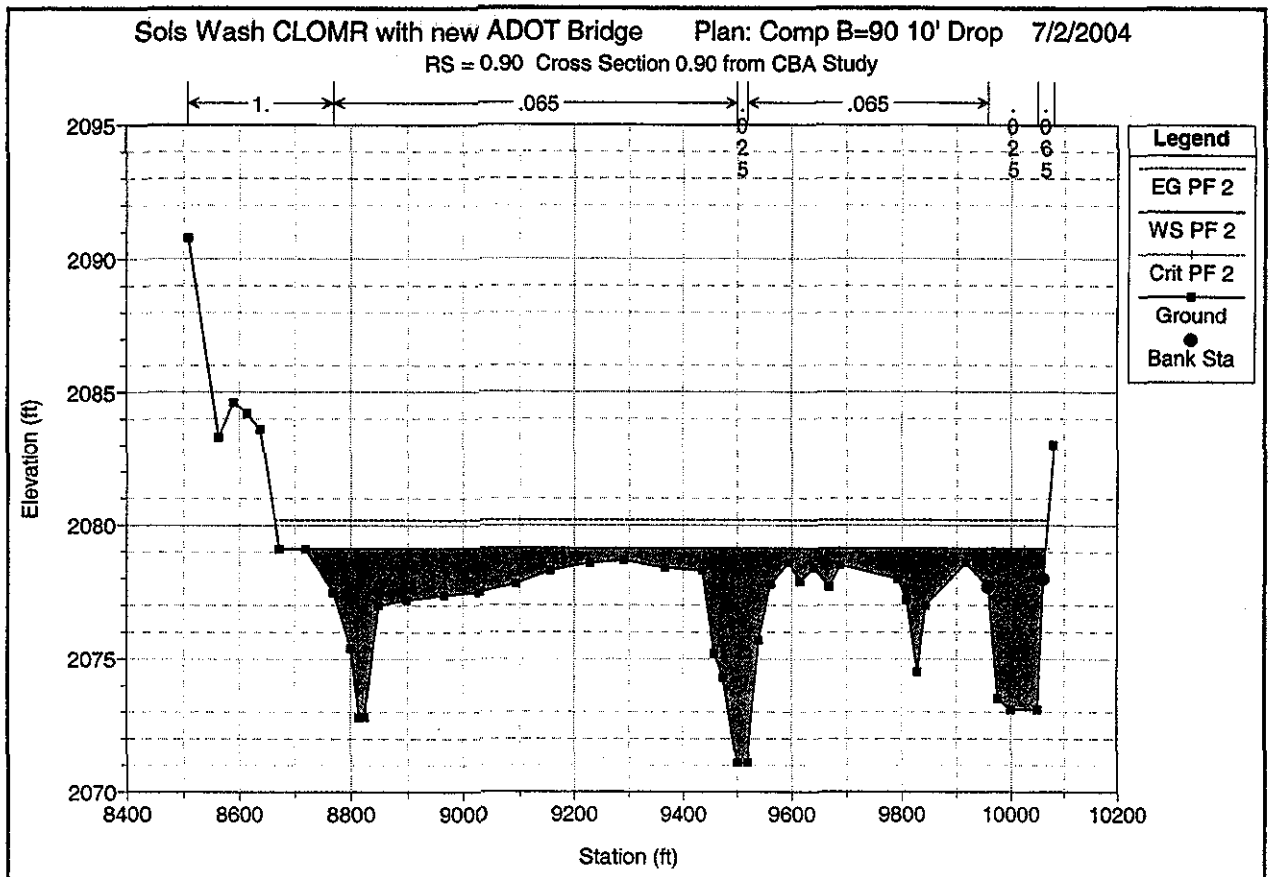
HEC-RAS Plan: 10' Drop River: Sols Wash Reach: Reach 1 Profile: PF 2

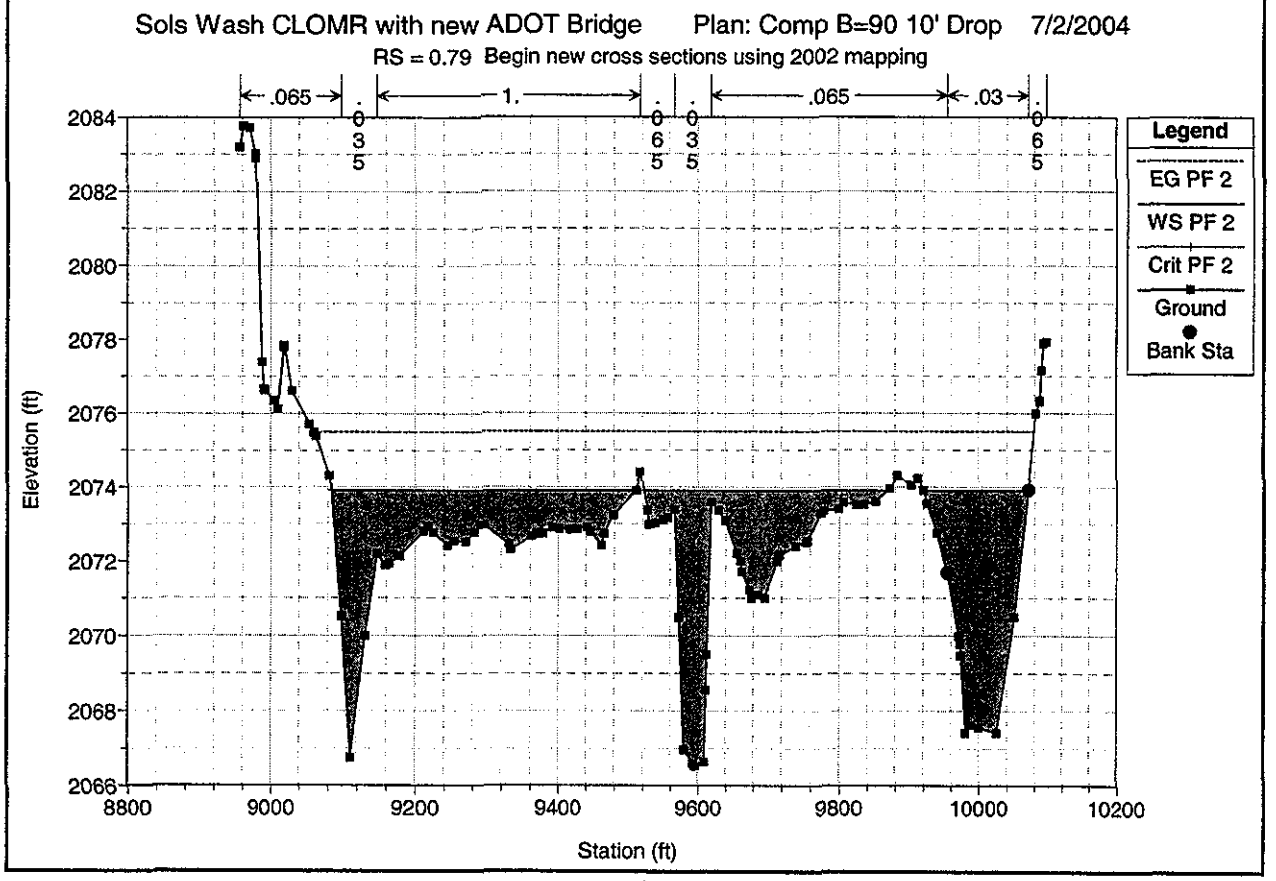
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1.12	PF 2	14413.00	2082.30	2088.50	2088.50	2089.89	0.004414	12.19	2057.58	880.77	0.92
Reach 1	1.00	PF 2	14413.00	2078.10	2082.82	2084.10	2085.63	0.011161	16.55	1230.41	634.96	1.41
Reach 1	0.90	PF 2	14413.00	2073.10	2079.04	2079.13	2080.20	0.007034	12.18	2569.40	1343.27	0.94
Reach 1	0.79	PF 2	14413.00	2067.42	2073.80	2073.90	2075.52	0.010167	13.72	1790.65	909.70	1.13
Reach 1	0.76	PF 2	14413.00	2065.84	2071.90	2071.96	2073.63	0.007057	12.34	1577.68	859.98	0.96
Reach 1	0.71	PF 2	14413.00	2063.89	2071.02	2070.12	2071.96	0.002965	9.37	2351.77	664.94	0.64
Reach 1	0.66	PF 2	14413.00	2061.79	2069.70	2066.75	2071.10	0.003460	10.59	1815.94	534.05	0.70
Reach 1	0.61	PF 2	14459.00	2059.91	2066.89	2066.89	2069.77	0.006845	13.67	1097.00	200.63	0.97
Reach 1	0.57	PF 2	14459.00	2057.69	2063.82	2064.53	2067.60	0.011173	15.61	928.21	184.03	1.21
Reach 1	0.52	PF 2	14459.00	2055.50	2064.21	2062.80	2065.92	0.003372	10.60	1441.83	220.48	0.70
Reach 1	0.48	PF 2	15045.00	2053.51	2063.88	2060.38	2065.10	0.001701	8.85	1700.96	184.51	0.51
Reach 1	0.43	PF 2	15045.00	2051.27	2063.63	2058.29	2064.63	0.000959	8.00	1880.90	329.63	0.41
Reach 1	0.42		Bridge									
Reach 1	0.40	PF 2	15045.00	2040.17	2054.82	2049.35	2056.04	0.001197	8.86	1698.34	169.36	0.48
Reach 1	0.35	PF 2	15045.00	2040.14	2053.94	2049.31	2055.56	0.001738	10.21	1473.13	123.54	0.52
Reach 1	0.27	PF 2	15045.00	2040.09	2052.51	2049.16	2054.46	0.003400	11.19	1344.61	123.46	0.60
Reach 1	0.22	PF 2	15045.00	2040.06	2050.63	2049.10	2053.41	0.002348	13.38	1124.48	122.29	0.78
Reach 1	0.19	PF 2	15045.00	2040.04	2048.97	2048.97	2052.80	0.003846	15.69	958.71	123.81	0.99
Reach 1	0.13	PF 2	15045.00	2040.00	2049.40	2047.44	2050.98	0.001910	11.06	1962.46	265.99	0.66
Reach 1	0.12		Bridge									
Reach 1	0.11	PF 2	15045.00	2039.00	2046.27	2047.25	2050.55	0.007350	17.58	1133.13	214.56	1.22
Reach 1	0.08	PF 2	15045.00	2036.99	2044.19	2042.48	2044.79	0.002917	7.66	3307.91	818.58	0.55
Reach 1	0.05	PF 2	15045.00	2038.00	2043.52	2042.39	2044.34	0.002757	9.09	3336.53	1079.12	0.72

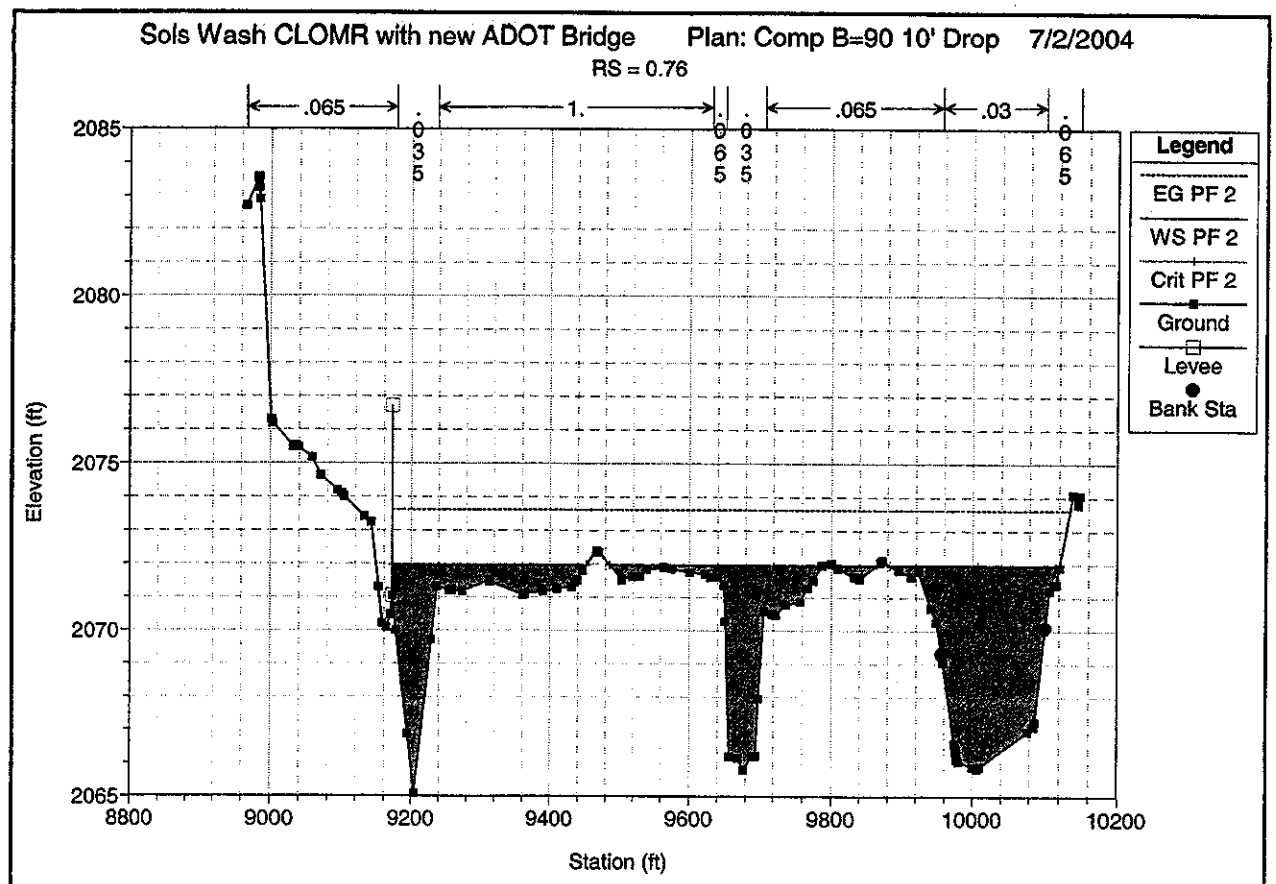
MODEL 10' DROP
MIXED

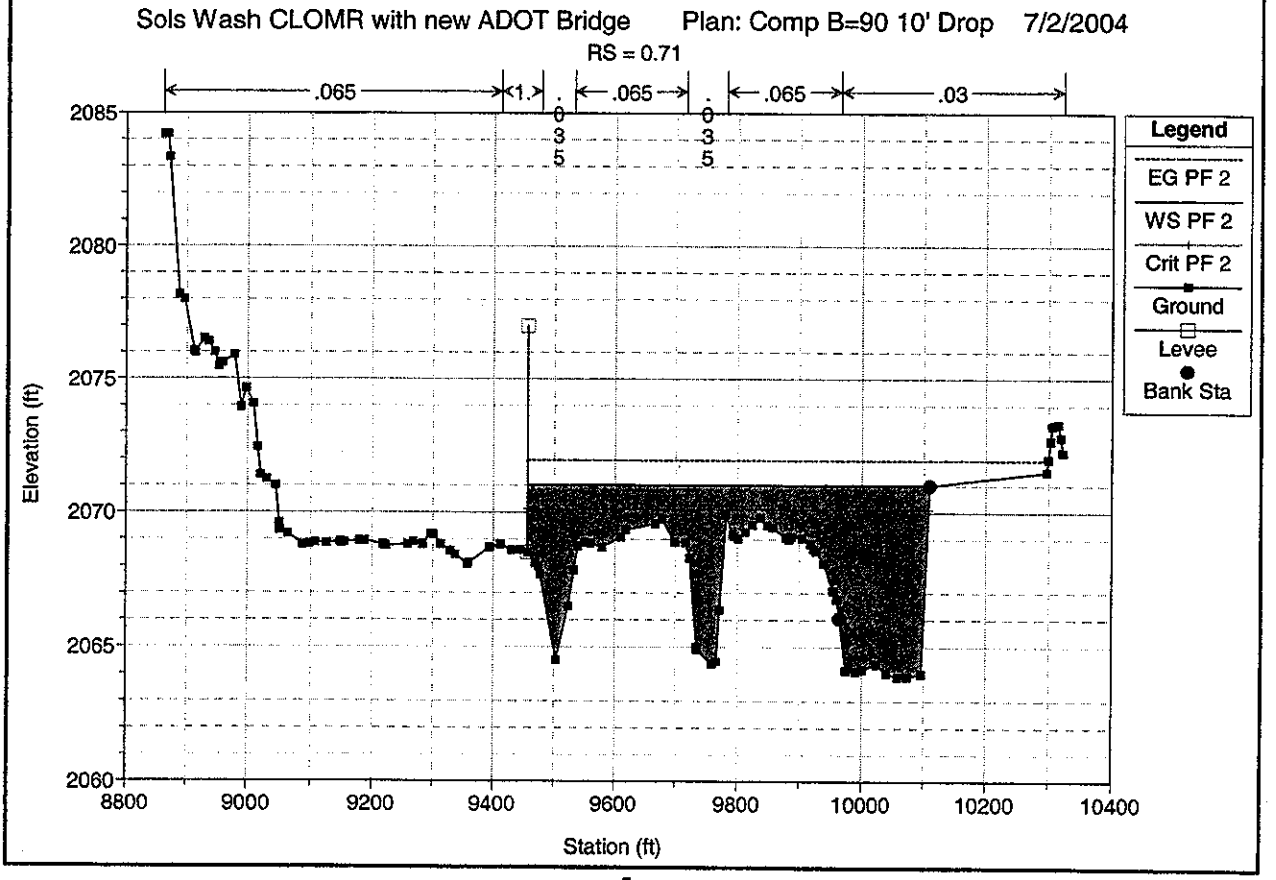

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 1.12 Cross Section 1.12 from CBA Study
.06
.025
.06
.025
.06
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2094
2092
2090
2088
2086
2084
2082
9200
9400
9600
9800
10000
10200
10400
Station (ft)

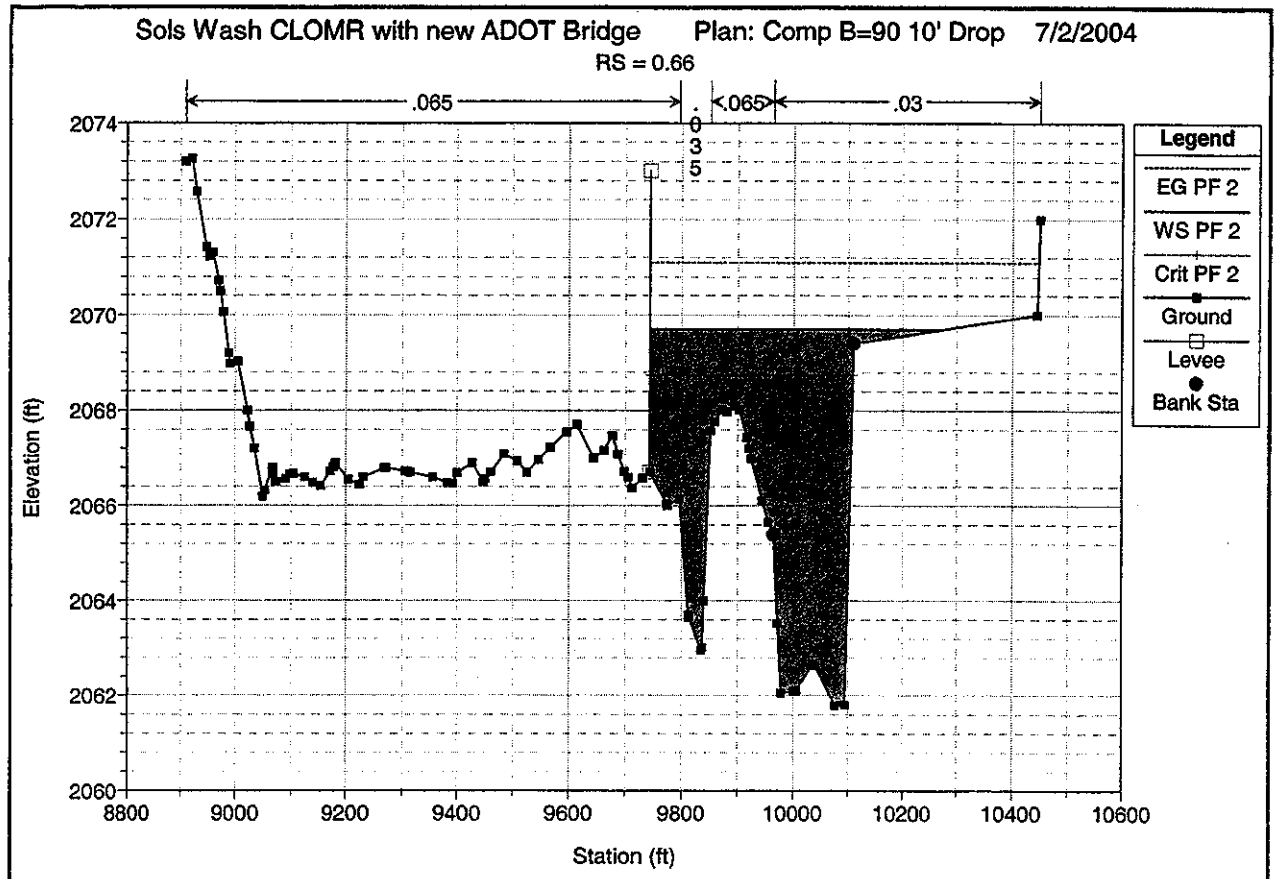

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 1.00 Cross Section 1.10 from CBA Study
1.
.065
.025
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2100
2095
2090
2085
2080
2075
8000
8500
9000
9500
10000
10500
Station (ft)

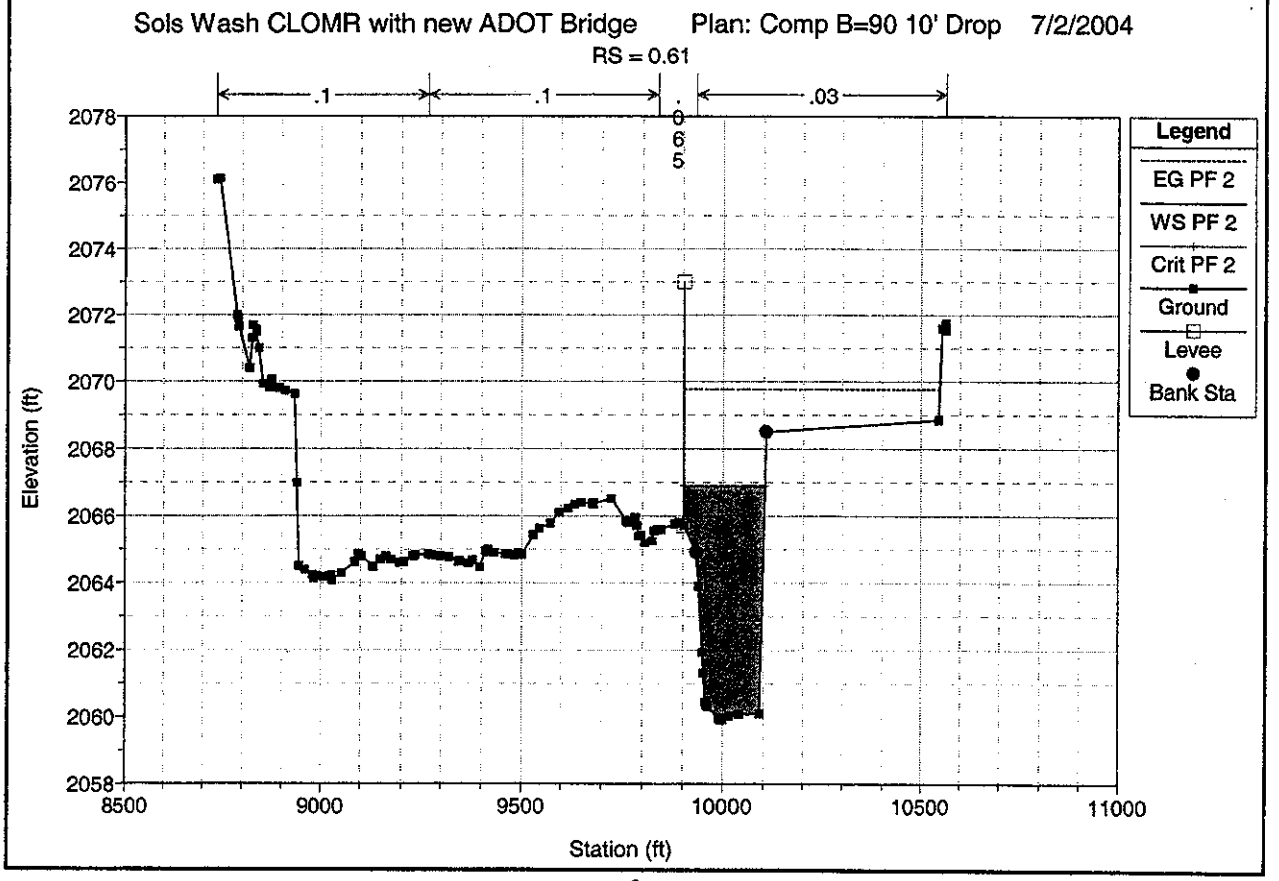

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.90 Cross Section 0.90 from CBA Study
1.
.065
.025
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2095
2090
2085
2080
2075
2070
8400
8600
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

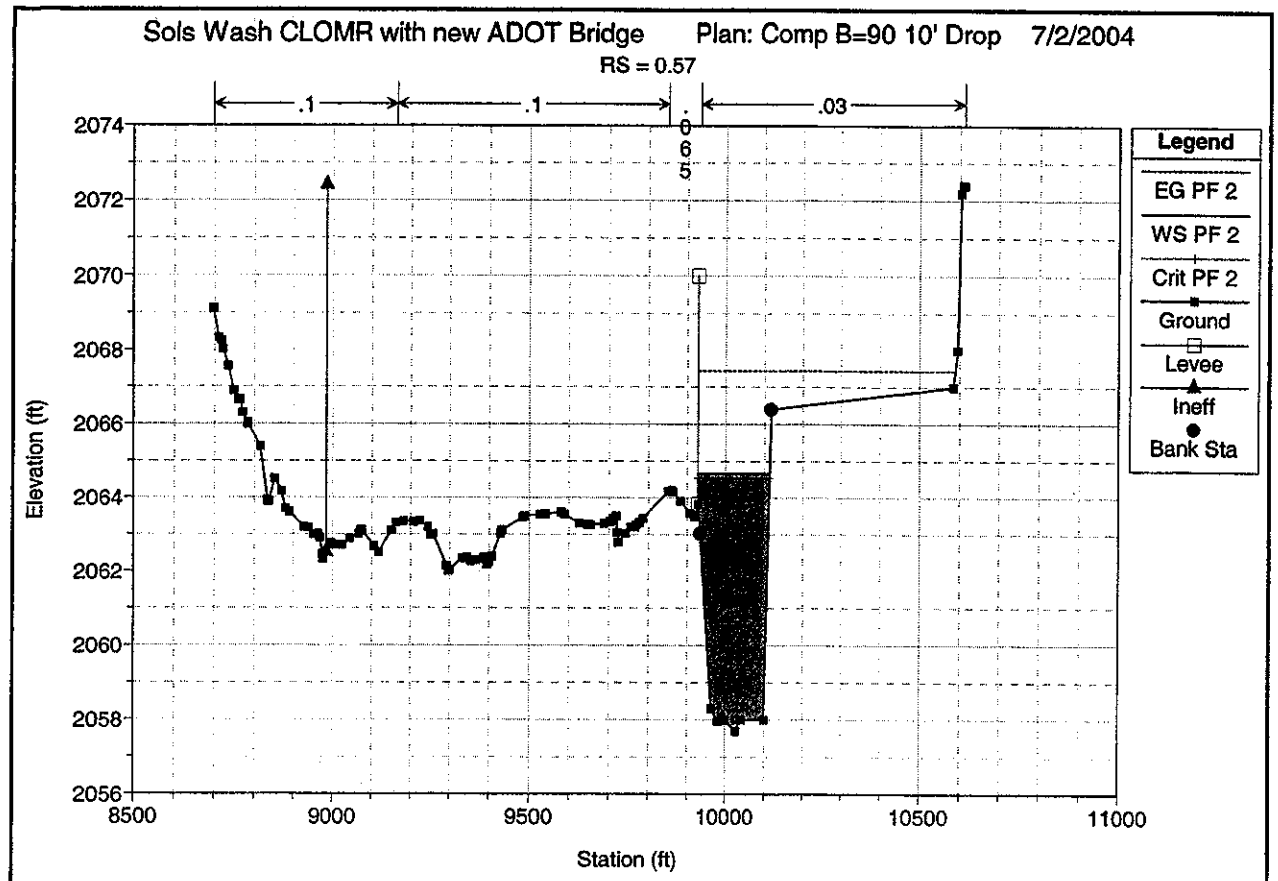

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.79 Begin new cross sections using 2002 mapping
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2084
2082
2080
2078
2076
2074
2072
2070
2068
2066
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

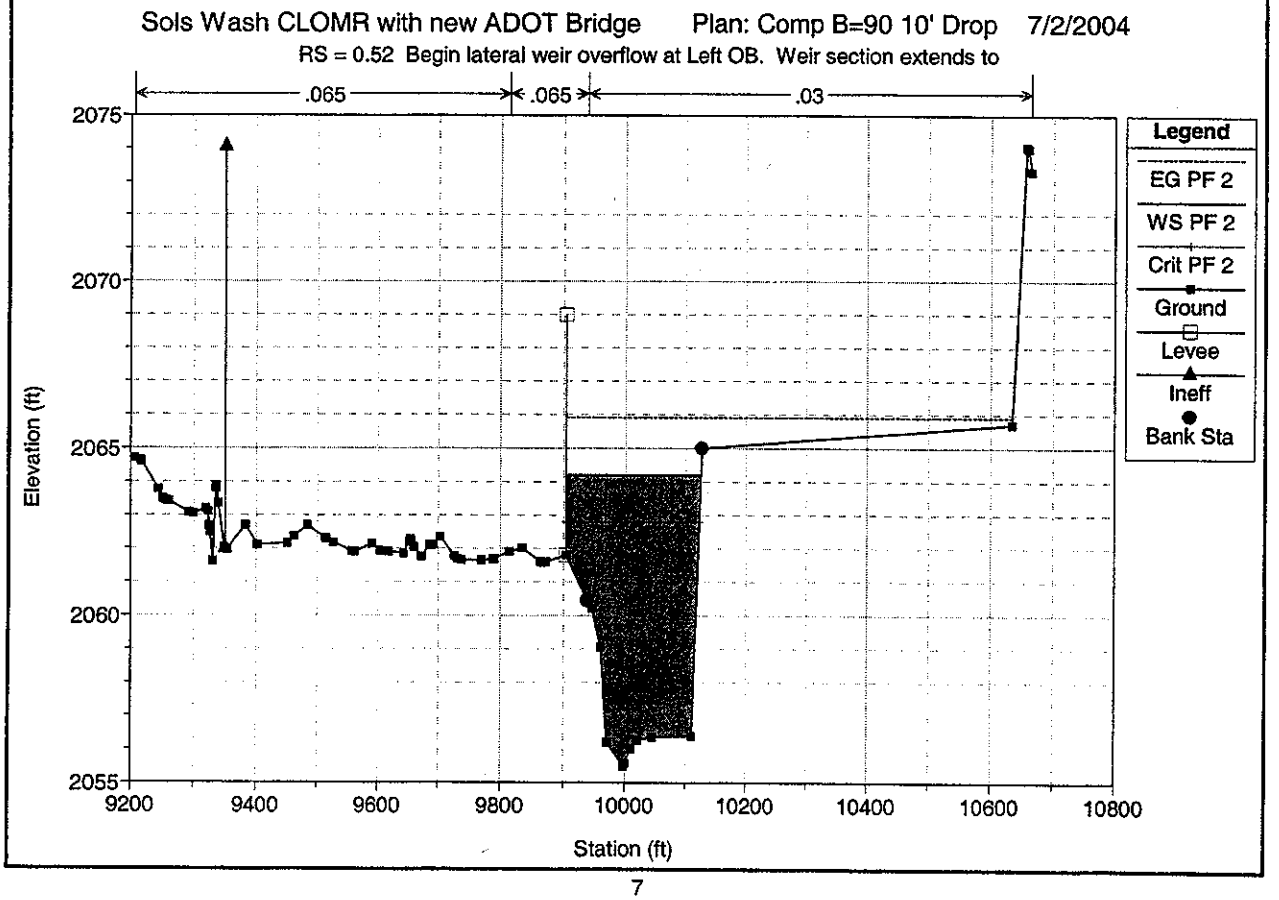

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.76
.065
.035
1.
.065
.035
.065
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
8800
9000
9200
9400
9600
9800
10000
10200
Station (ft)

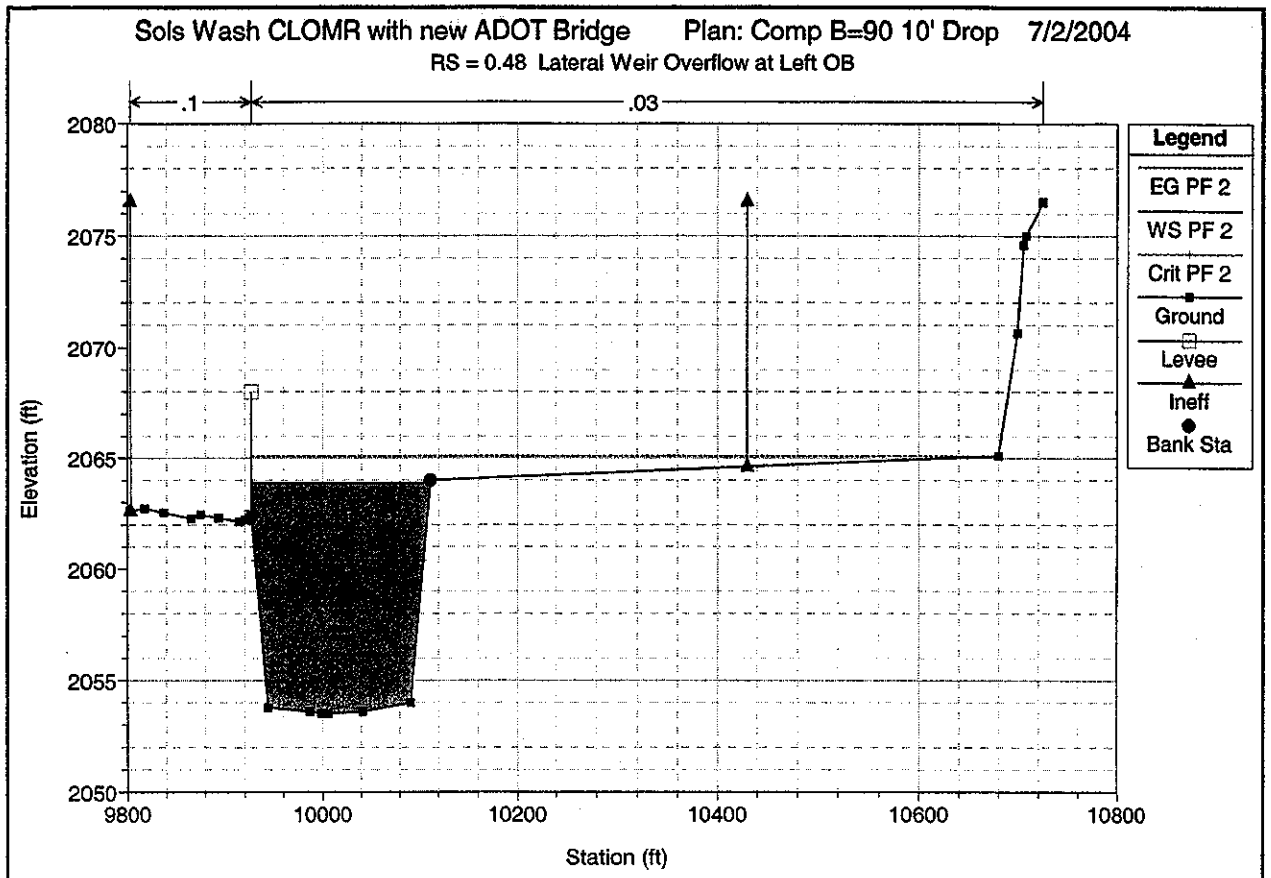

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.71
.065
1.
.035
.065
.035
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2085
2080
2075
2070
2065
2060
8800
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

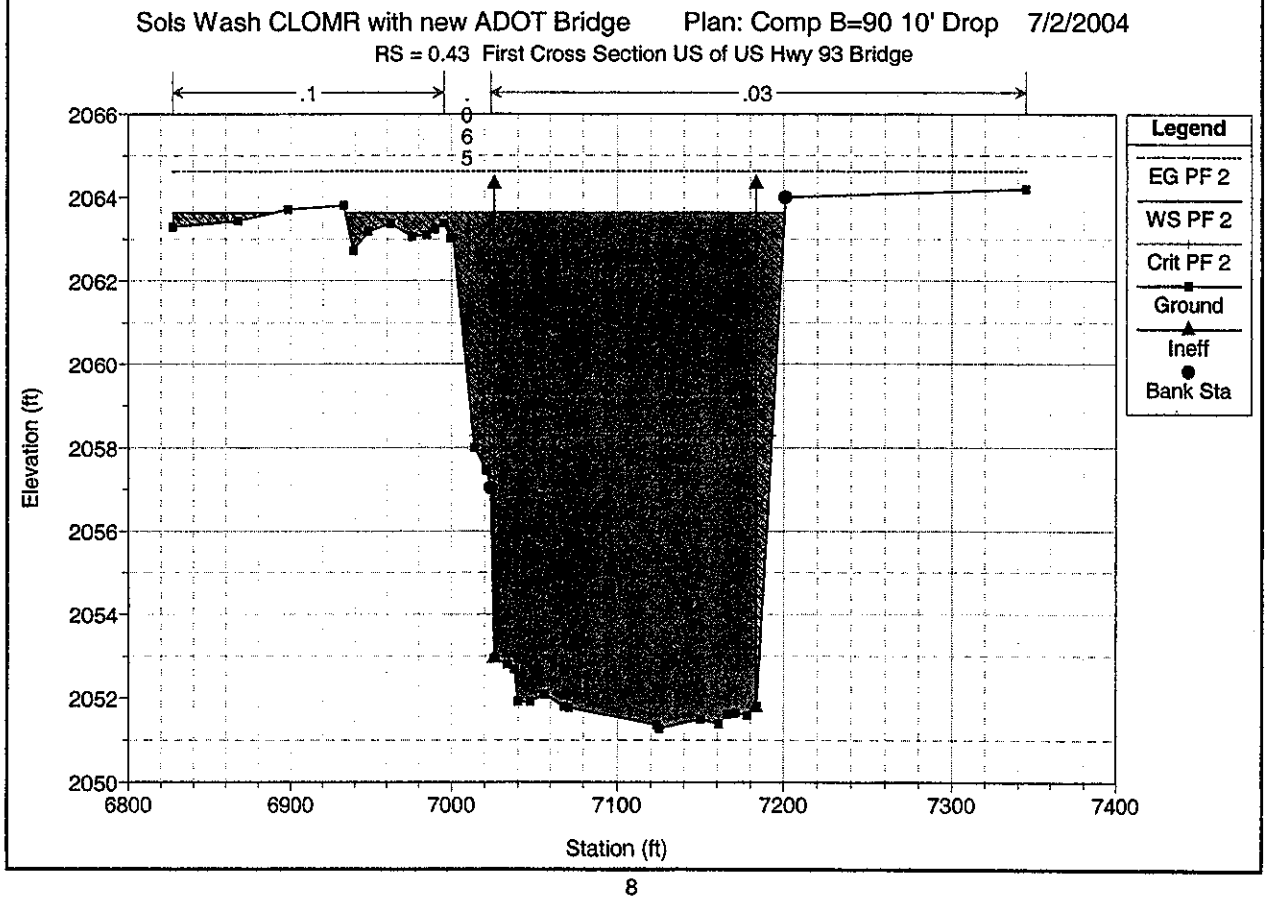

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.66
.065
.065
.03
.035
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

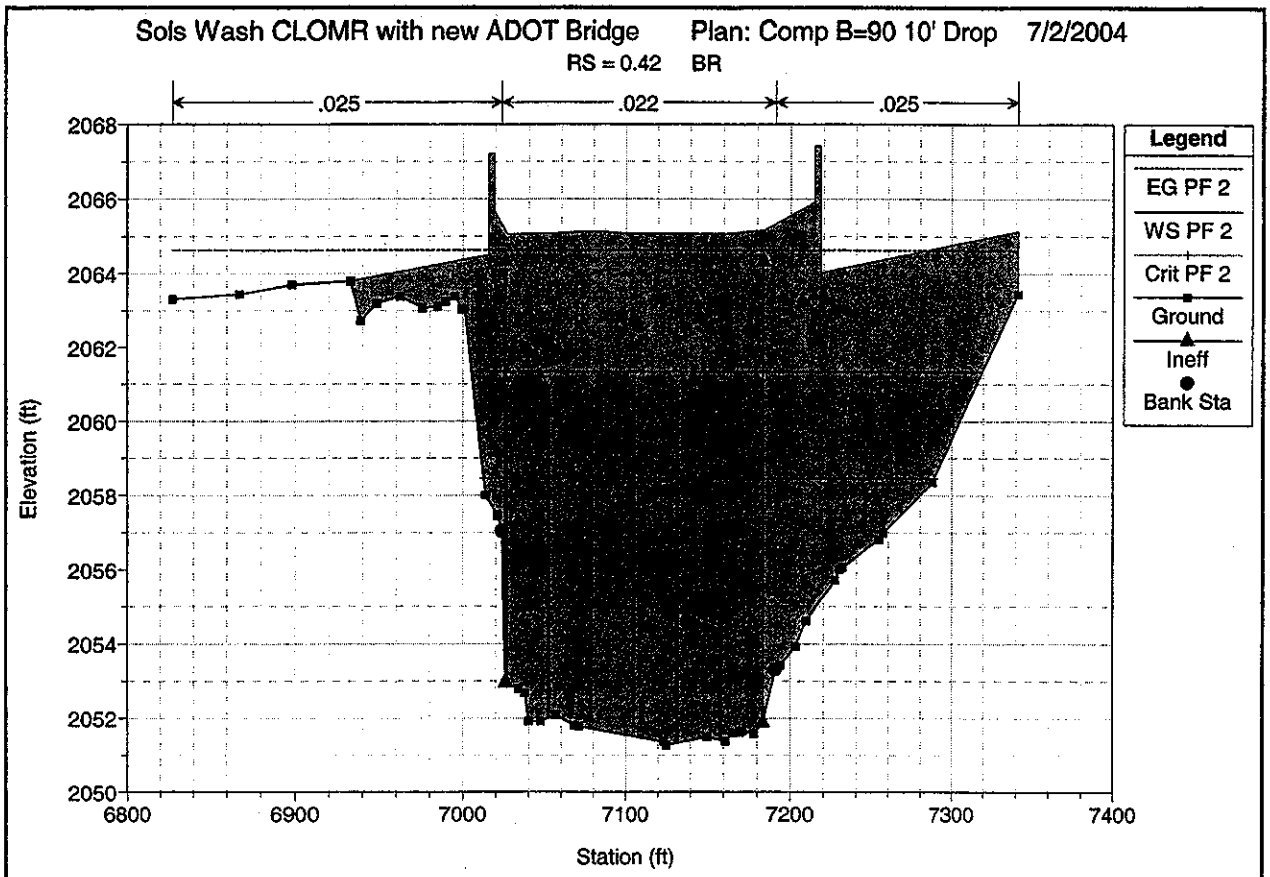

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.61
.1
.1
.03
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

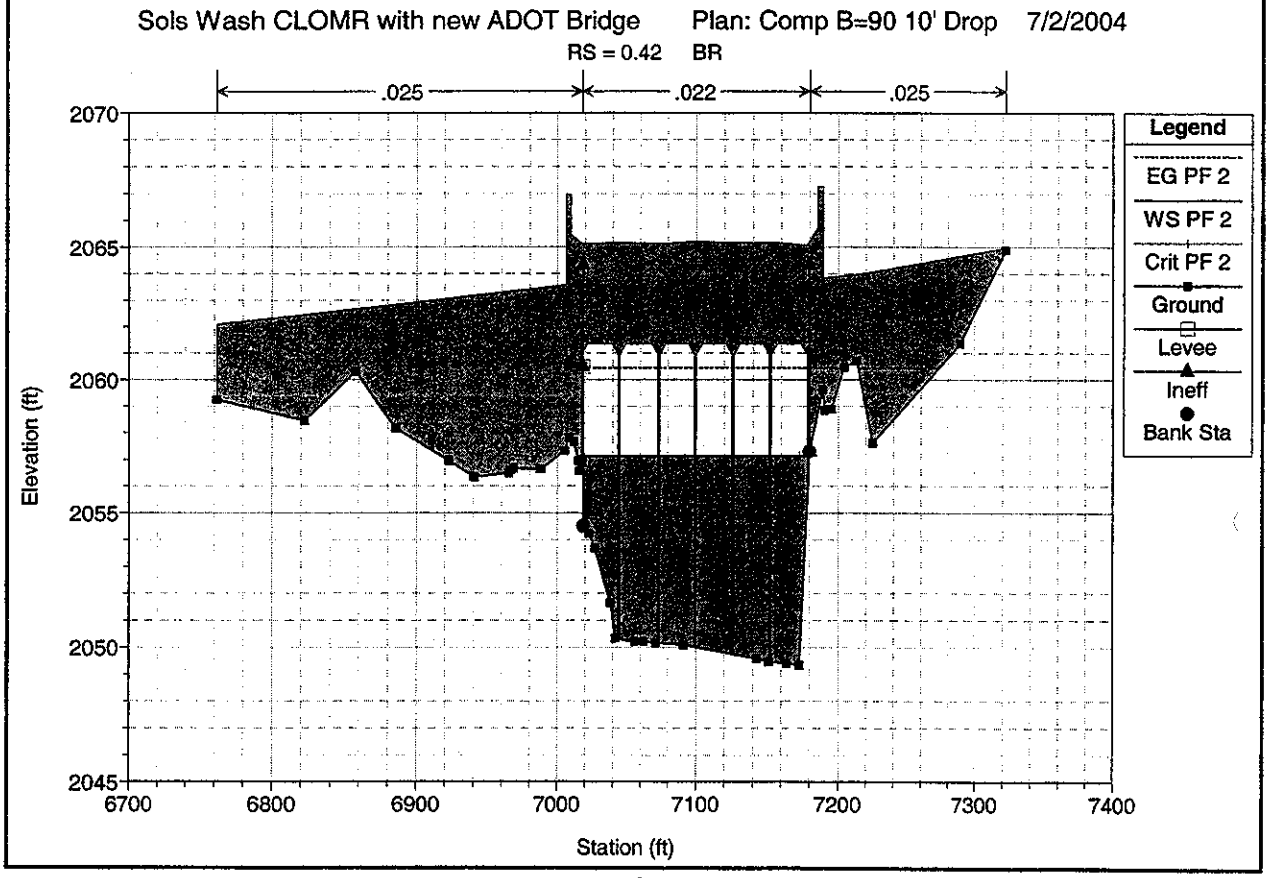

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.57
.1
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2074
2072
2070
2068
2066
2064
2062
2060
2058
2056
8500
9000
9500
10000
10500
11000

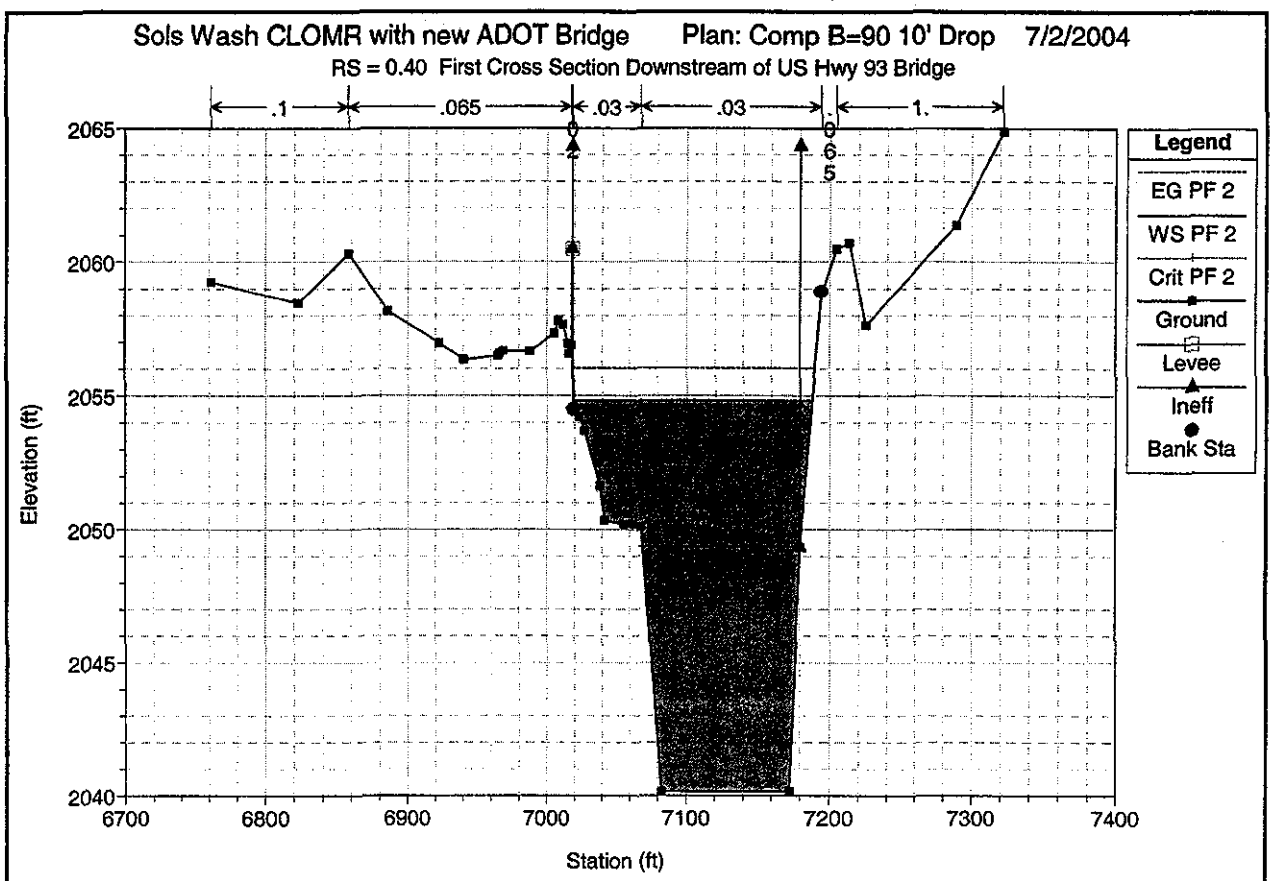

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.52 Begin lateral weir overflow at Left OB. Weir section extends to
.065
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
2075
2070
2065
2060
2055
9200
9400
9600
9800
10000
10200
10400
10600
10800

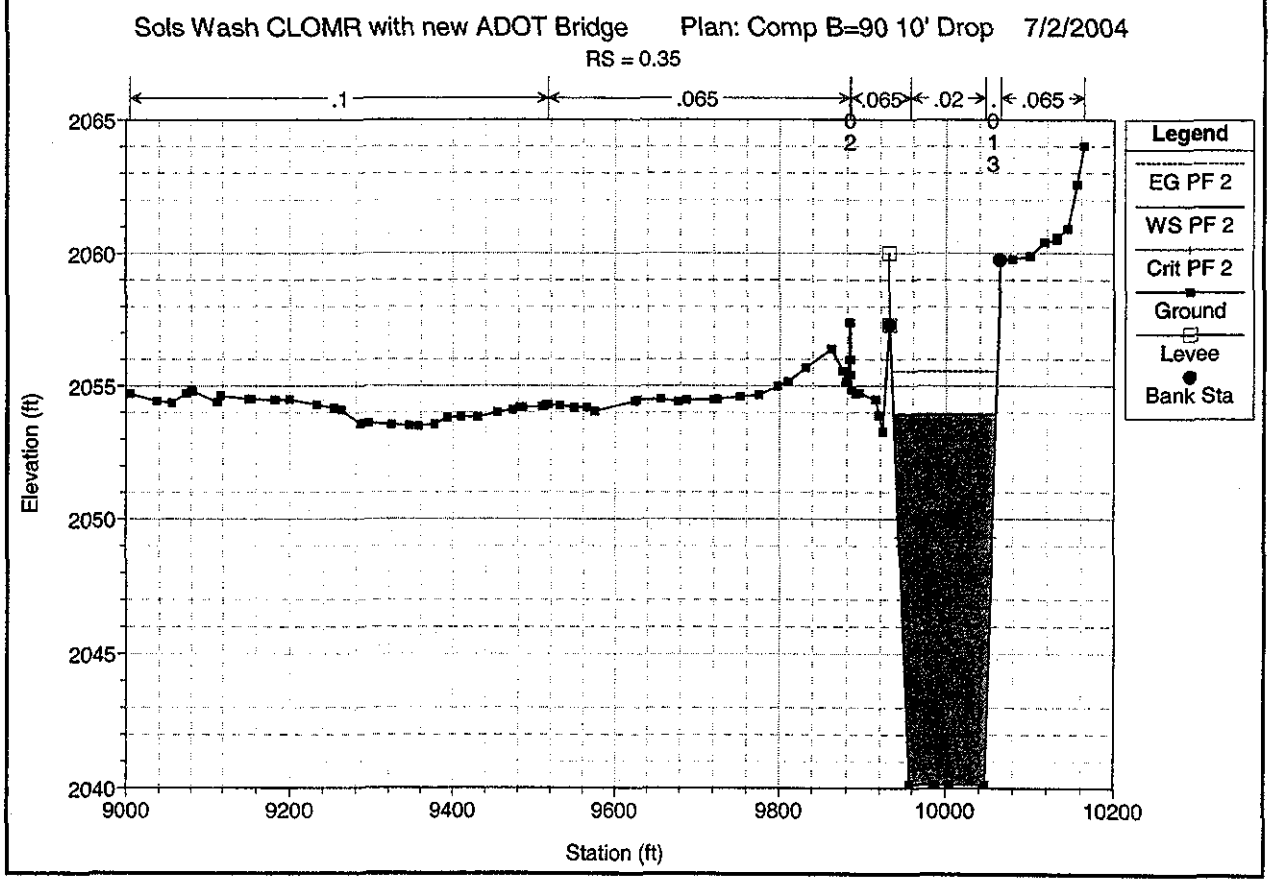

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.48 Lateral Weir Overflow at Left OB
.1
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2080
2075
2070
2065
2060
2055
2050
9800
10000
10200
10400
10600
10800
Station (ft)

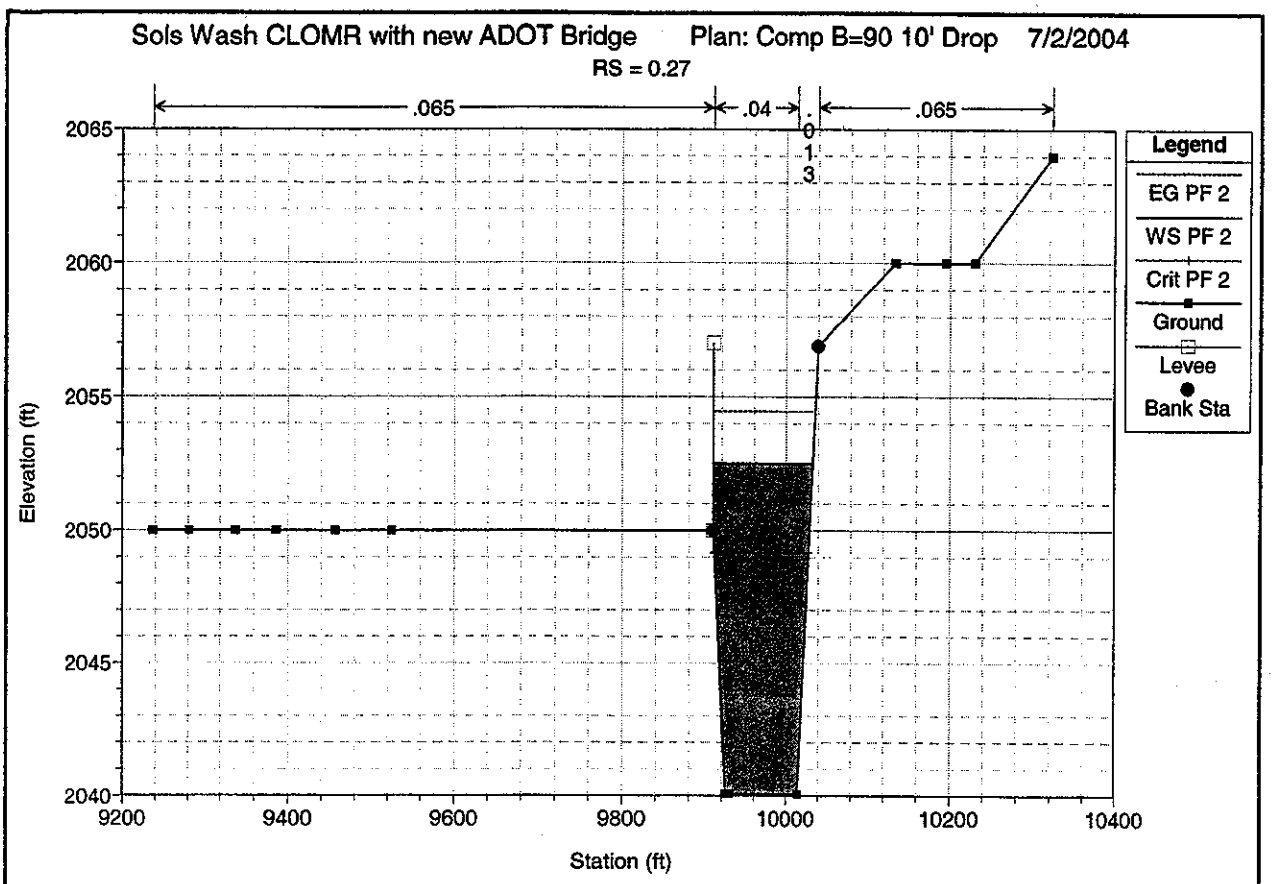

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.43 First Cross Section US of US Hwy 93 Bridge
.1
.065
.03
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Ineff
Bank Sta
Elevation (ft)
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

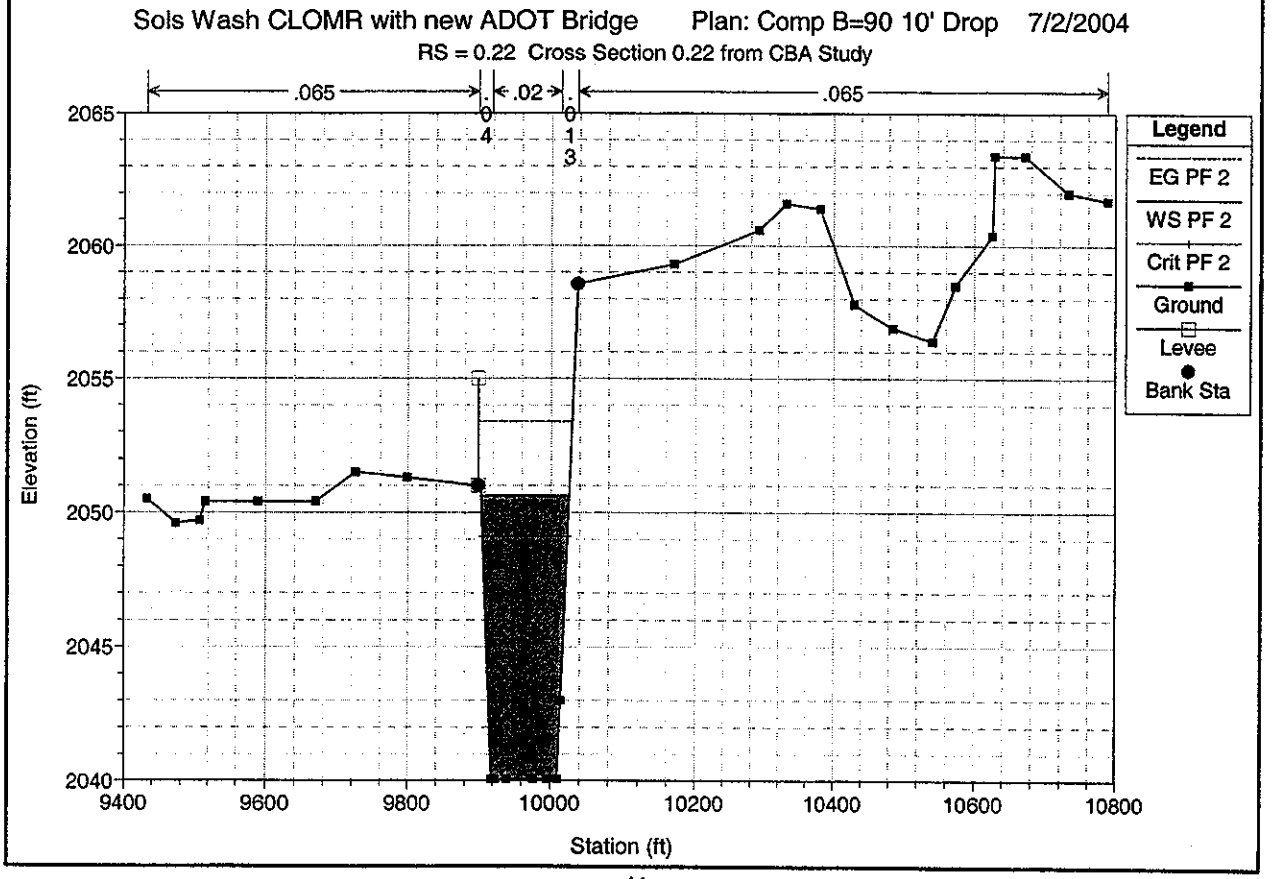

Sols Wash CLOMR with new ADOT Bridge
Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Ineff
Bank Sta
Elevation (ft)
2068
2066
2064
2062
2060
2058
2056
2054
2052
2050
6800
6900
7000
7100
7200
7300
7400
Station (ft)

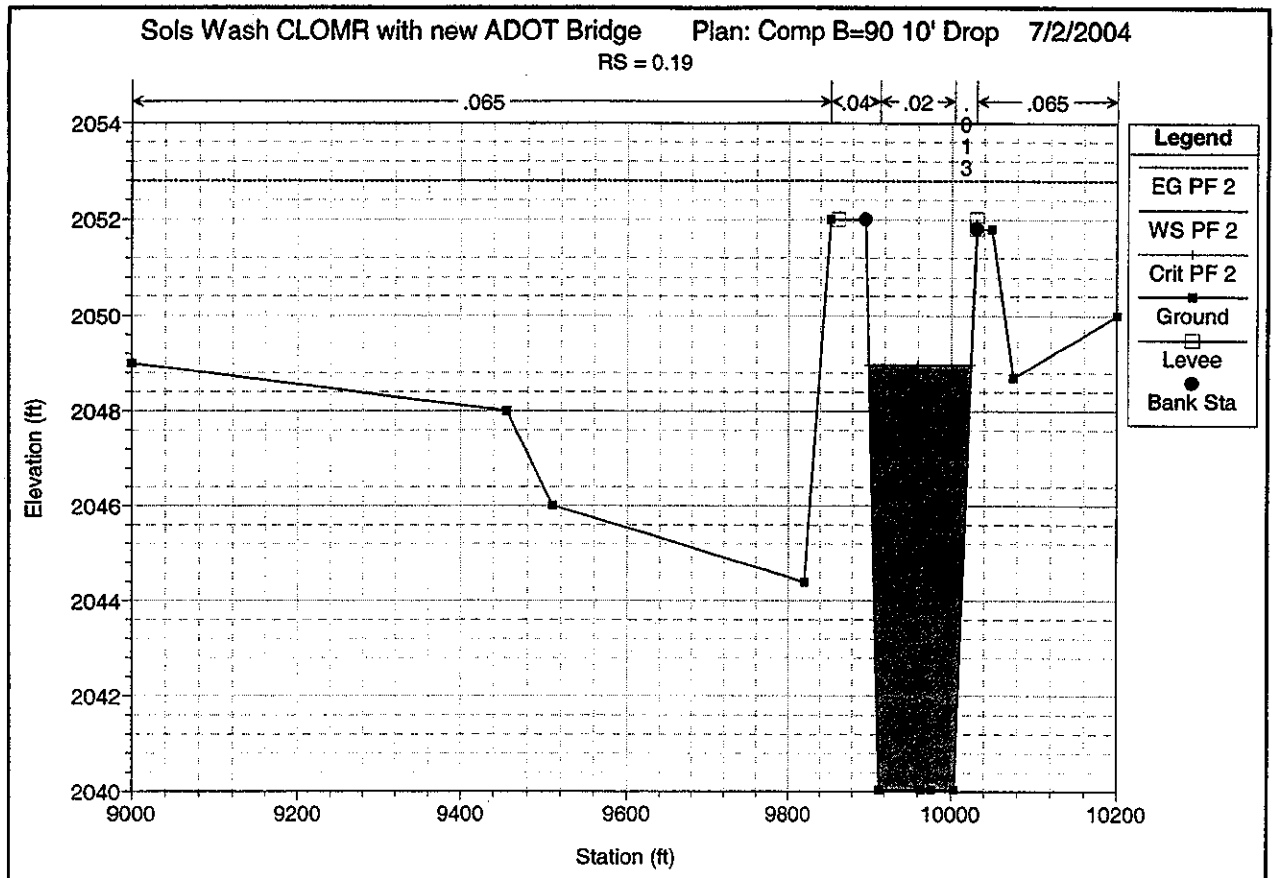

Sols Wash CLOMR with new ADOT Bridge
Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.42 BR
.025
.022
.025
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
2070
2065
2060
2055
2050
2045
6700
6800
6900
7000
7100
7200
7300
7400
Station (ft)

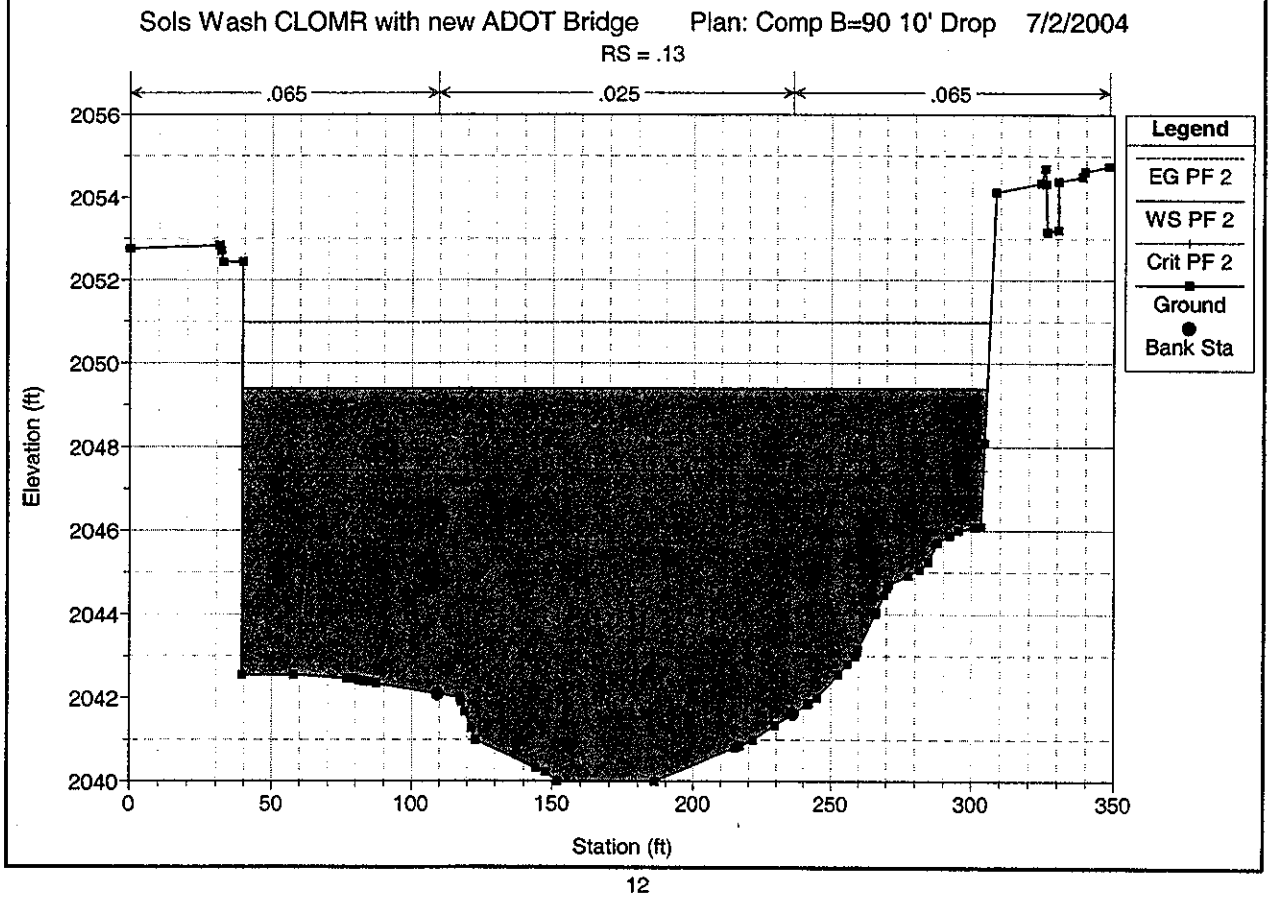

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.40 First Cross Section Downstream of US Hwy 93 Bridge
.1
.065
.03
.03
1.
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

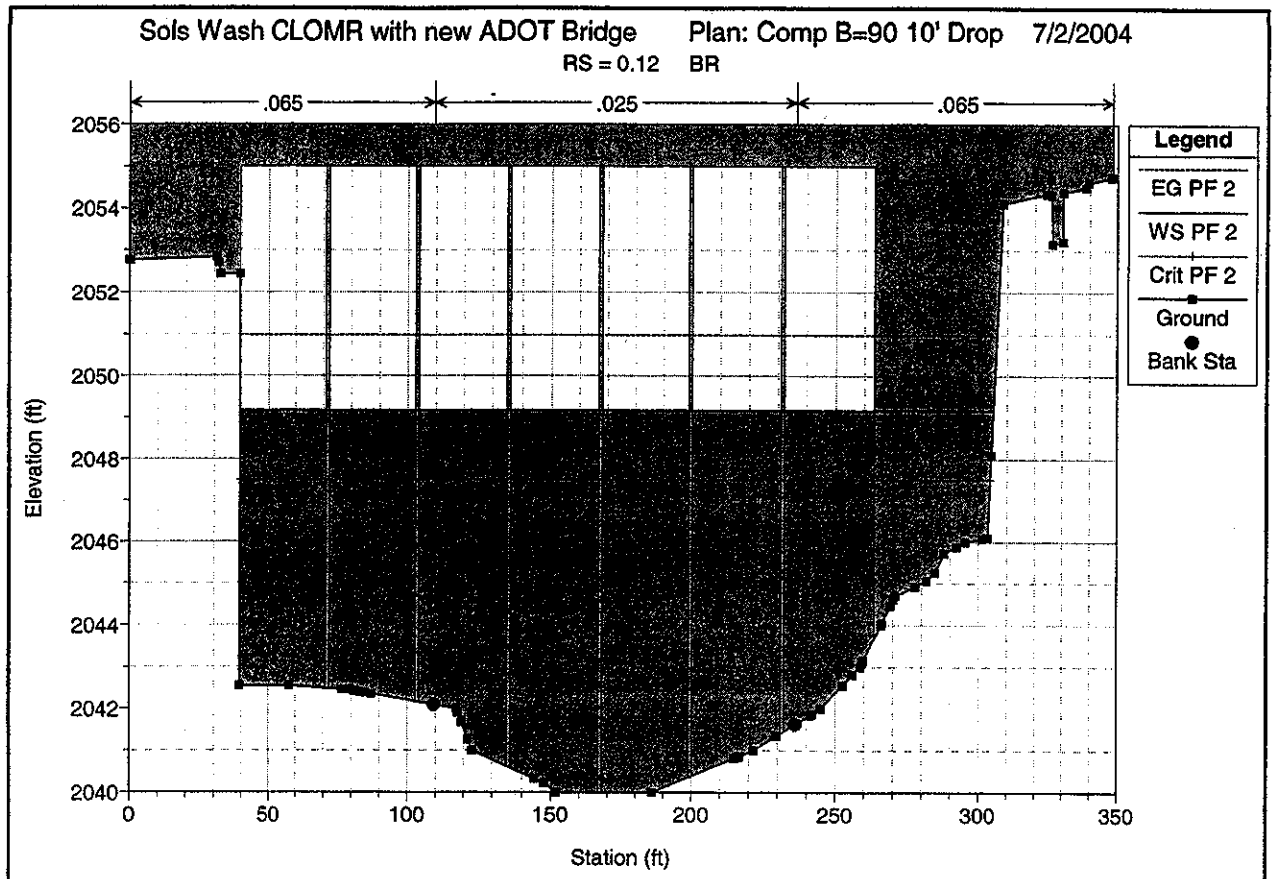

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.35
.1
.065
.065
.02
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

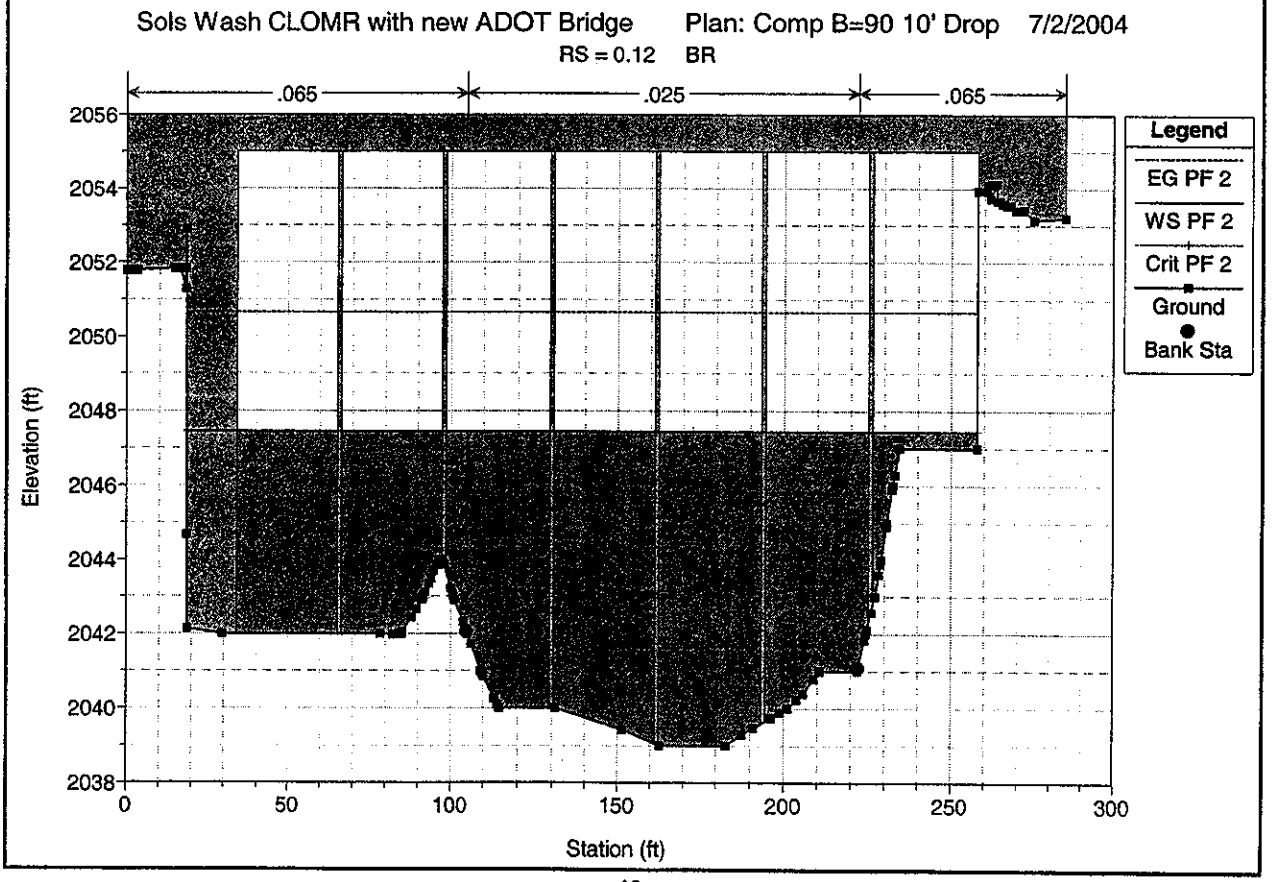

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.27
.065
.04
.065
0
1
3
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2065
2060
2055
2050
2045
2040
9200
9400
9600
9800
10000
10200
10400
Station (ft)

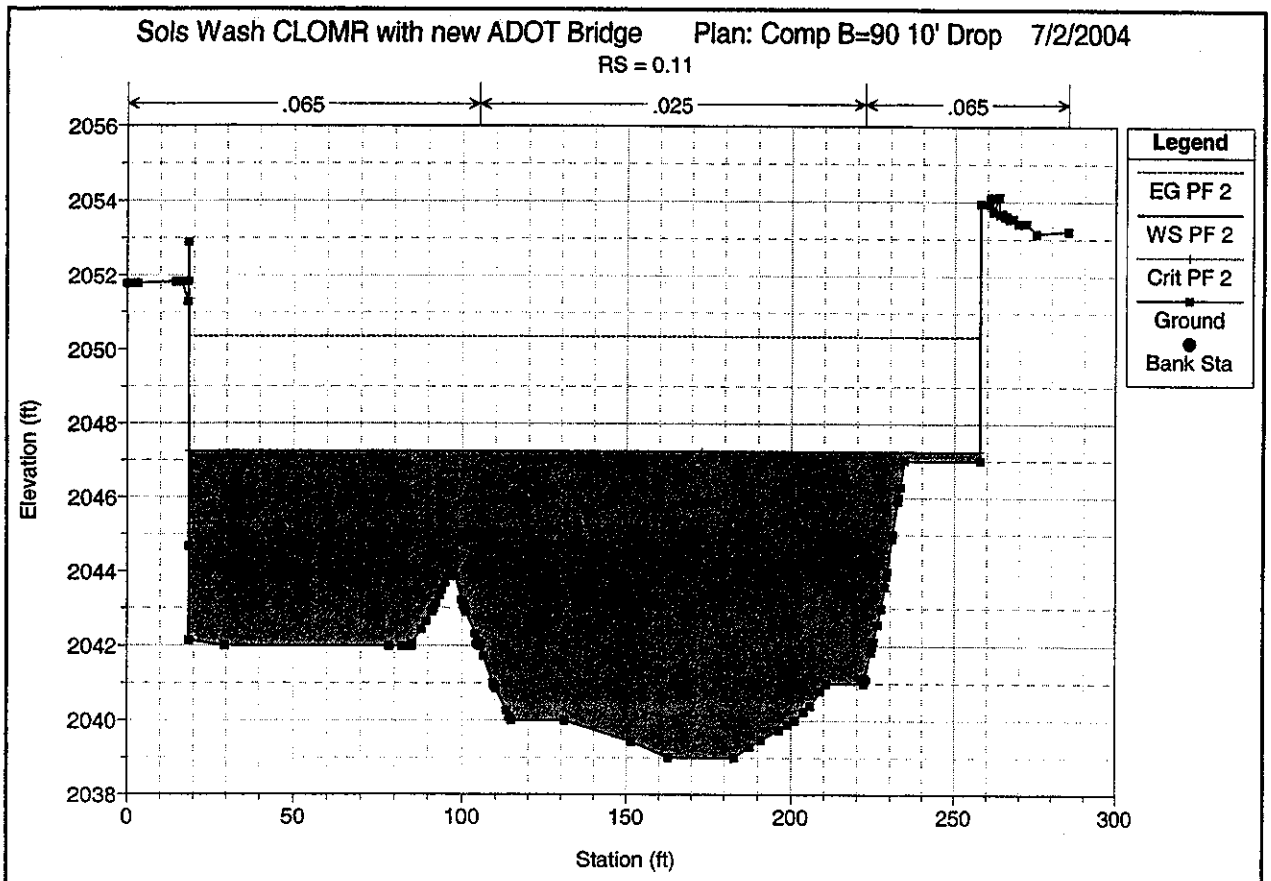

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.22 Cross Section 0.22 from CBA Study
.065
.02
.065
0
4
0
1
3
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
2065
2060
2055
2050
2045
2040
9400
9600
9800
10000
10200
10400
10600
10800
Station (ft)

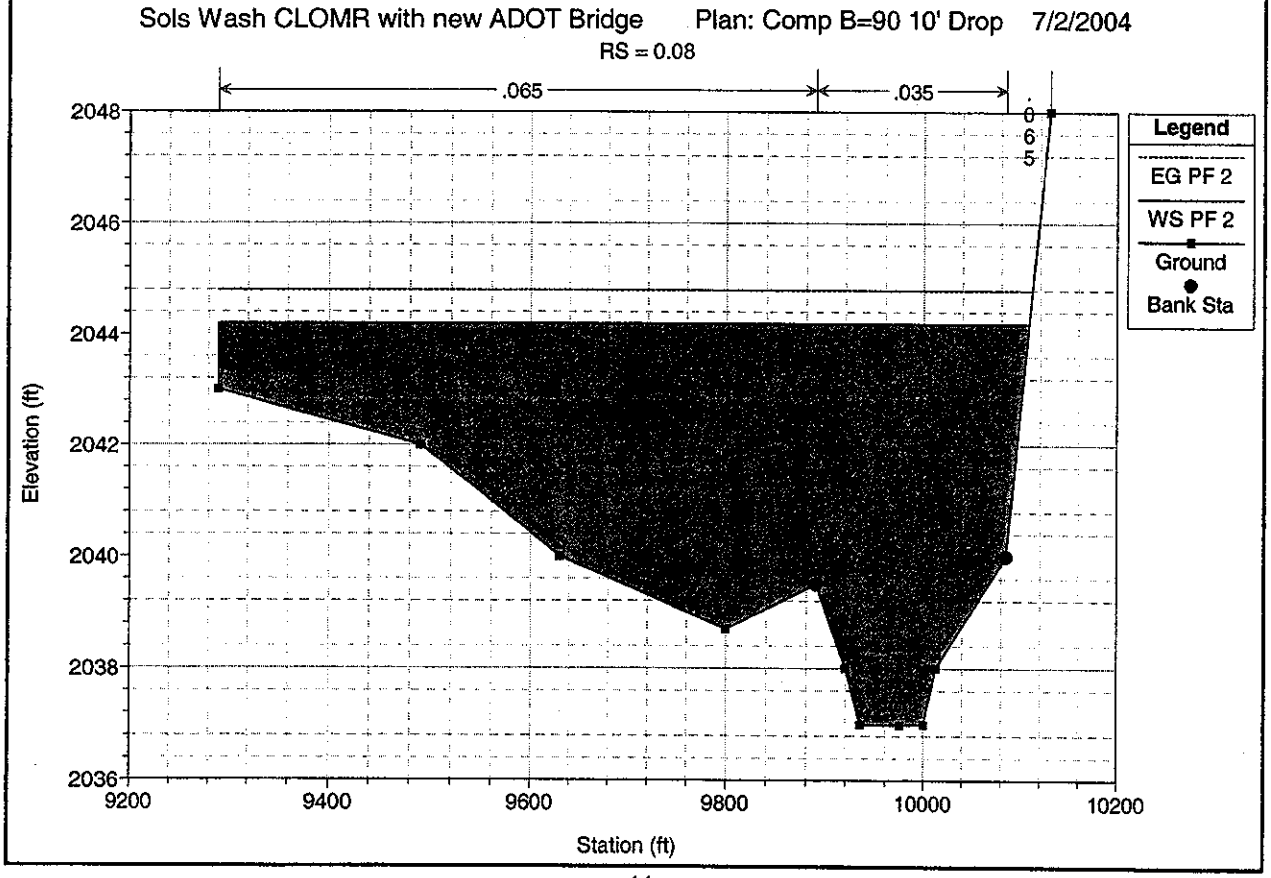

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.19
.065
.04
.02
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

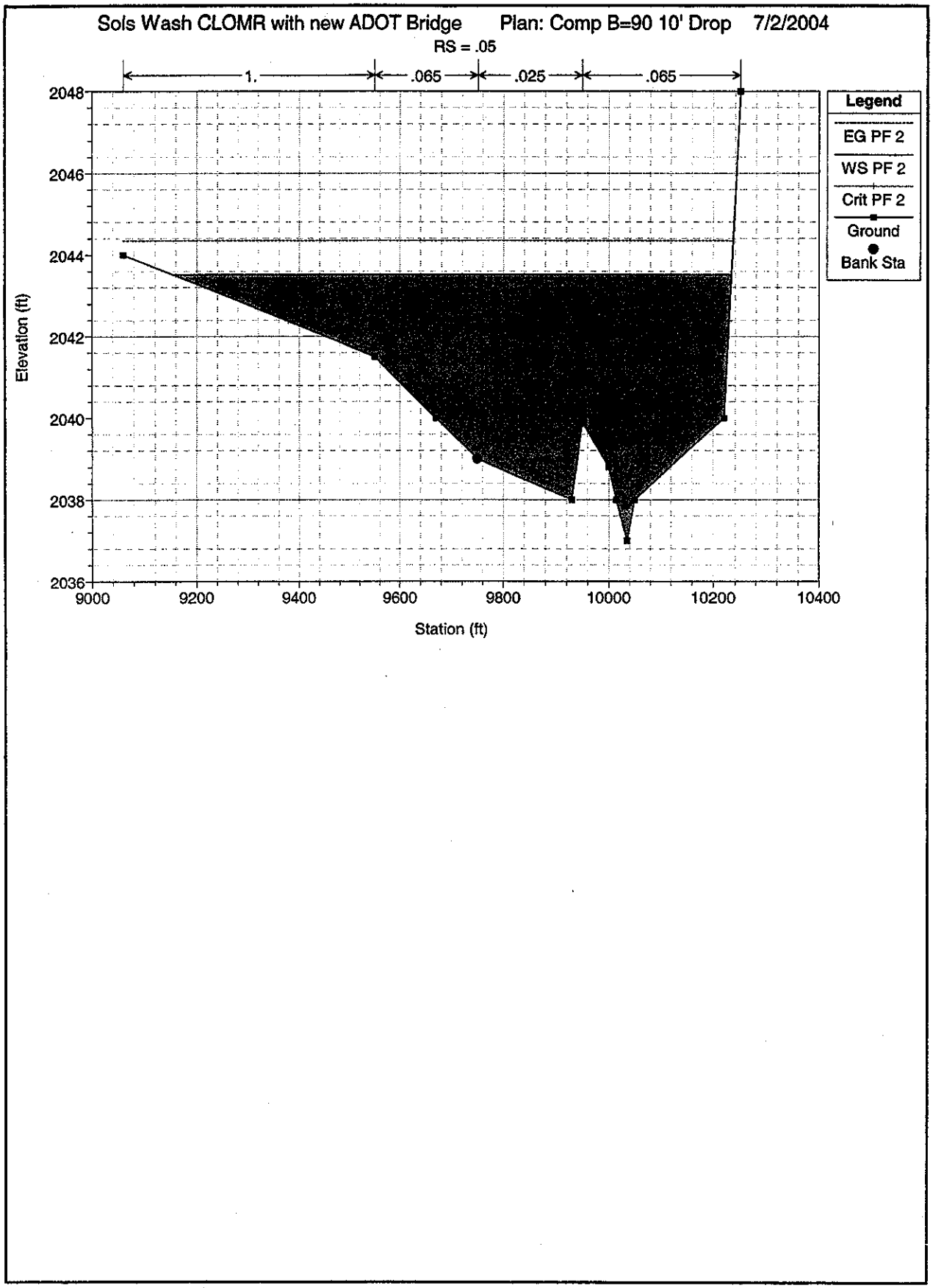

Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = .13
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge
Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.12 BR
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.11
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2056
2054
2052
2050
2048
2046
2044
2042
2040
2038
0
50
100
150
200
250
300
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = 0.08
.065
.035
.065
Legend
EG PF 2
WS PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9200
9400
9600
9800
10000
10200
Station (ft)


Sols Wash CLOMR with new ADOT Bridge Plan: Comp B=90 10' Drop 7/2/2004
RS = .05
1.
.065
.025
.065
Legend
EG PF 2
WS PF 2
Crit PF 2
Ground
Bank Sta
Elevation (ft)
2048
2046
2044
2042
2040
2038
2036
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)

HASSAYAMPA RIVER

(EXISTING US 93)

PROPOSED US 93

HOSPITAL WASH

PROPOSED LEVEE

SOLS WASH

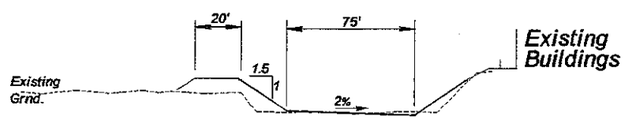
EXISTING RIP RAP BANK PROTECTION

GOLDMINE VILLAGE

TEGNER STREET

PROPOSED LEVEE

Scale in Feet



Concrete Channel

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

SOLS WASH C.A.R.
CONCRETE ALTERNATIVE
75' WIDE CHANNEL

PRELIMINARY NOT FOR CONSTRUCTION		BY	DATE
	DESIGNED	LFS	4/04
	DRAWN	KRL	4/04
	CHECKED	RJZ	4/04

DRAWING NO. FIGURE 2 SHEET OF

Plotted By: kleahy at 10:09:46 AM 4/2/2004 R:\PhoenixGrove\Projects\AZ03152\Cadd\Presentation\3152fig02.dgn

HASSAYAMPA RIVER

(EXISTING US 93)

PROPOSED US 93

HOSPITAL WASH

PROPOSED LEVEE

SOLS WASH

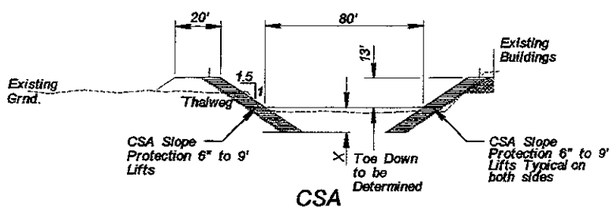
EXISTING RIP RAP BANK PROTECTION

GOLDMINE VILLAGE

TEGNER STREET

PROPOSED LEVEE

Scale in Feet



CSA

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

SOLS WASH C.A.R.
CSA BANK STABILIZATION
80' WIDE CHANNEL

PRELIMINARY NOT FOR CONSTRUCTION

	BY	DATE
DESIGNED	LFS	4/04
DRAWN	KRL	4/04
CHECKED	RJZ	4/04

DRAWING NO. FIGURE 3 SHEET OF

Plotted By: kleahy at 10:15:56 AM 4/2/2004 R:\PhoenixGrove\Projects\AZ03152\Cadd\Presentation\3152fig03.dgn

HASSAYAMPA RIVER

PROPOSED US 93

(EXISTING US 93)

HOSPITAL WASH

PROPOSED LEVEE

SOLS WASH

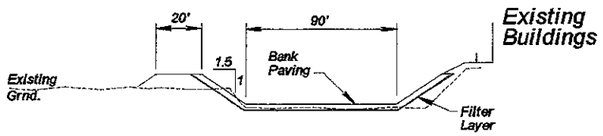
EXISTING RIP RAP BANK PROTECTION

GOLDMINE VILLAGE

TEGNER STREET

PROPOSED LEVEE

Scale in Feet



RENO MATTRESS CHANNEL PROTECTION

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ENGINEERING DIVISION

SOLS WASH C.A.R.
RENO MATTRESS CHANNEL PROTECTION
90' WIDE CHANNEL

PRELIMINARY NOT FOR CONSTRUCTION		BY	DATE
	DESIGNED	LFS	4/04
	DRAWN	KRL	4/04
	CHECKED	RJZ	4/04

DRAWING NO. FIGURE 4 SHEET OF

Plotted By: kleahy at 10:17:15 AM 4/2/2004 R:\PhoenixGrove\Projects\AZ03152\Cadd\Presentation\3152fig04.dgn

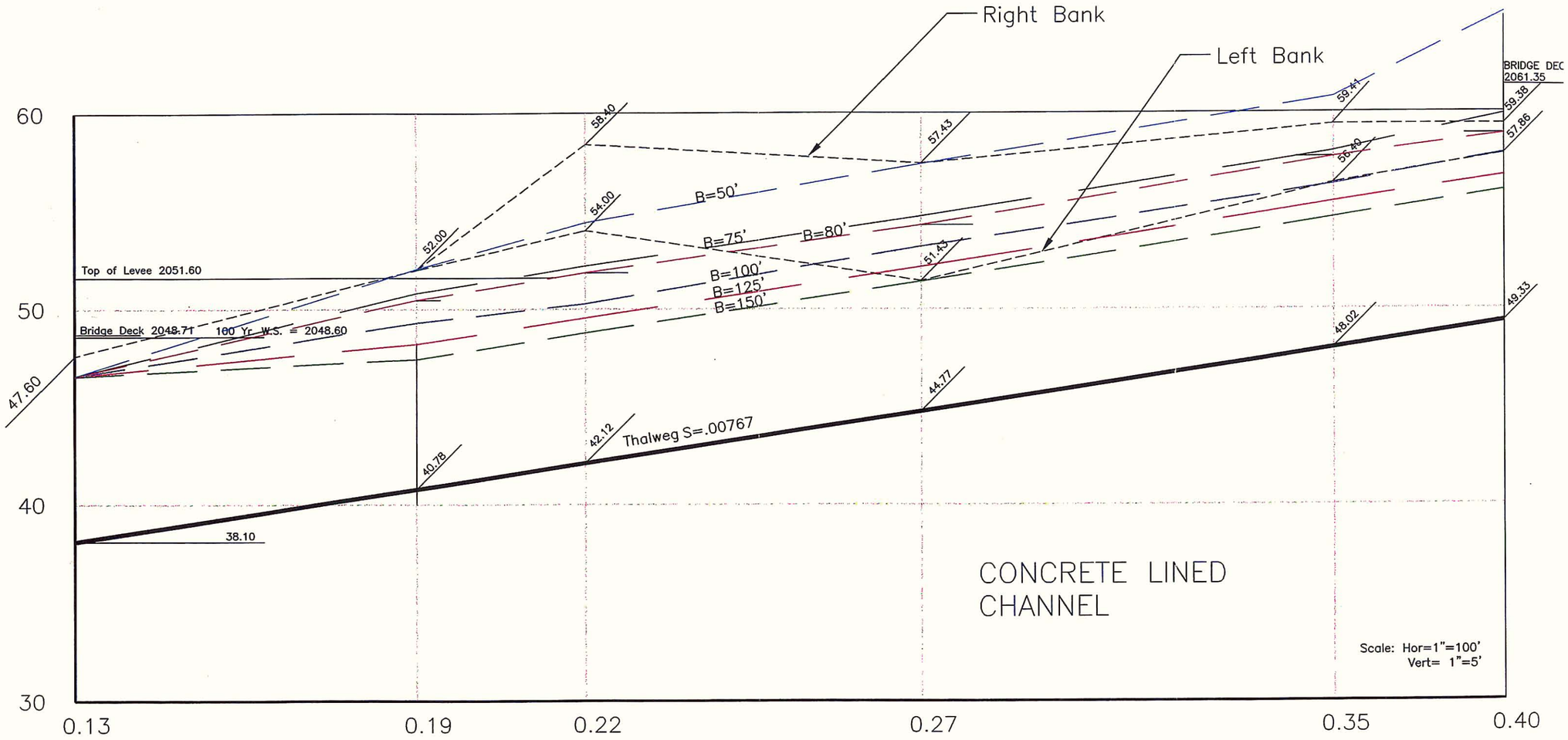

Right Bank
Left Bank
BRIDGE DEC
2061.35
59.38
57.86
49.33
59.44
56.40
48.02
58.40
57.43
54.00
52.00
51.43
44.77
42.12
40.78
47.60
38.10
B=50'
B=75'
B=80'
B=100'
B=125'
B=150'
Top of Levee 2051.60
Bridge Deck 2048.71
100 Yr W.S. = 2048.60
Thalweg S=.00767
CONCRETE LINED
CHANNEL
Scale: Hor=1"=100'
Vert= 1"=5'
60
50
40
30
0.13
0.19
0.22
0.27
0.35
0.40

FIGURE 5

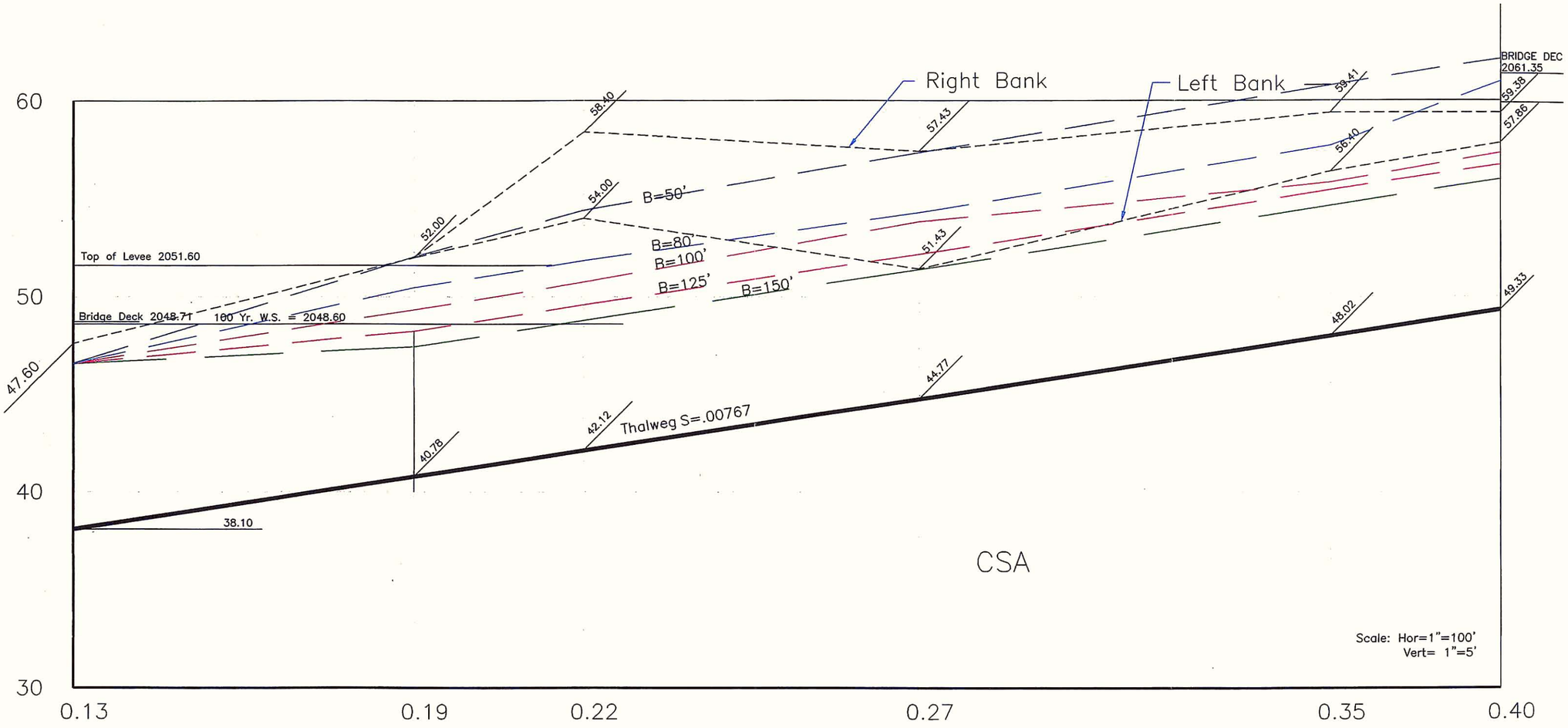

Right Bank
Left Bank
BRIDGE DEC
2061.35
59.41
59.38
57.86
58.40
57.43
56.40
54.00
52.00
51.43
49.33
48.02
47.60
44.77
42.12
40.78
38.10
B=50'
B=80'
B=100'
B=125'
B=150'
Top of Levee 2051.60
Bridge Deck 2048.71
100 Yr. W.S. = 2048.60
Thalweg S=.00767
CSA
Scale: Hor=1"=100'
Vert= 1"=5'
60
50
40
30
0.13
0.19
0.22
0.27
0.35
0.40

FIGURE 6

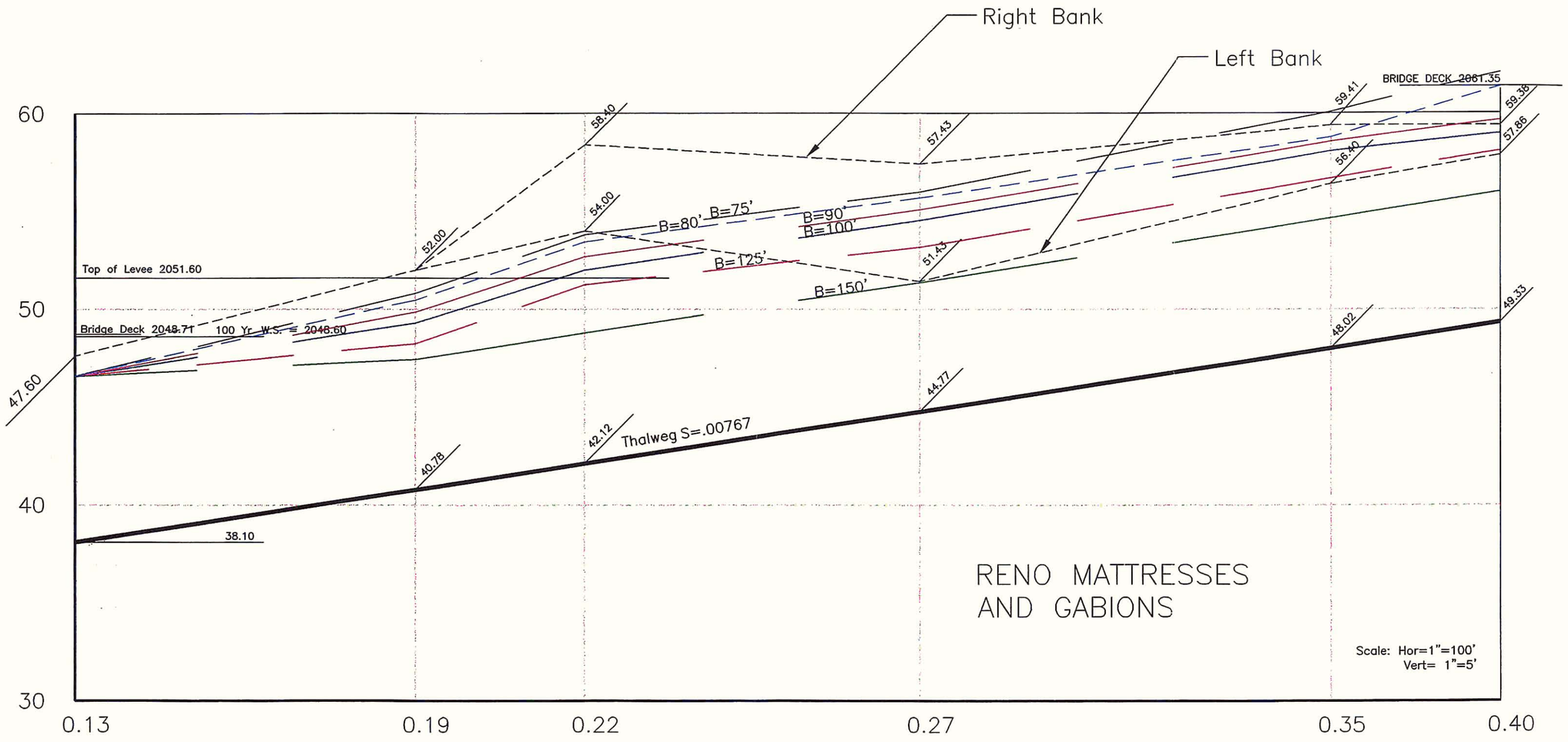

Right Bank
Left Bank
BRIDGE DECK 2061.35
Top of Levee 2051.60
Bridge Deck 2048.71
100 Yr W.S. = 2046.60
B=80'
B=75'
B=90'
B=100'
B=125'
B=150'
Thalweg S=.00767
58.40
57.43
59.41
59.38
57.86
56.40
54.00
52.00
51.43
49.33
48.02
47.60
44.77
42.12
40.78
38.10
RENO MATTRESSES
AND GABIONS
Scale: Hor=1"=100'
Vert= 1"=5'
60
50
40
30
0.13
0.19
0.22
0.27
0.35
0.40

FIGURE 7

	AESTHETICS	COST	EXISTING SHORELINE IMPACTS	HYDRAULICS	MAINTENANCE	TOTAL SCORE
DO NOTHING (NATURAL)	7	2	1	8	1	19
CONCRETE LINED CHANNEL	1	1	9	4	6	21
CSA BANK PROTECTION	4	5	7	4	6	26
RENO MATTRESS CHANNEL PROTECTION	7	2	6	8	7	30

FLOOD CONTROL DISTRICT of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009-6399
(602) 506-1501
FAX: (602) 506-4601
TT: (602) 506-5897

LETTER OF TRANSMITTAL

TO: Mona Merkevicius
Flood Control District
2801 W. Durango Street
Phoenix, Arizona 85009-6399

September 20, 2004

SUBJECT: Wickenburg Sols Wash Final Candidate Assessment Report (CAR)

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