Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project:
Final Report

APPENDIX G

Appendix G.1: Comparative Thalweg Profile and Cross-section Plots for the Sediment Removal Alternatives

Appendix G.2: Mapping Showing Extents of the Sediment Removal Alternatives

October 20, 2015

Contract No. IBM09D0006
Order No. IBM14T0016

Appendix G.1

Comparative Profile and Cross-section Plots for the Sediment Removal Alternatives

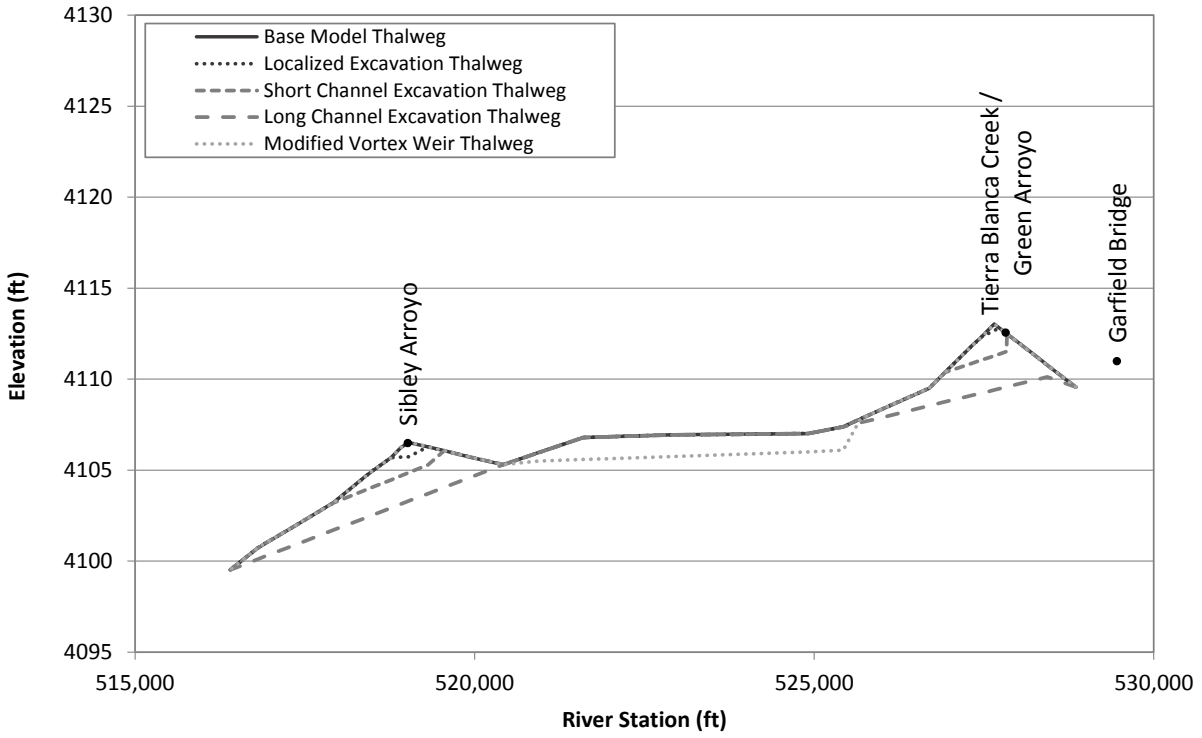


Figure G.1.1. Existing (Base Model) and excavation thalweg profiles at Problem Location 1.

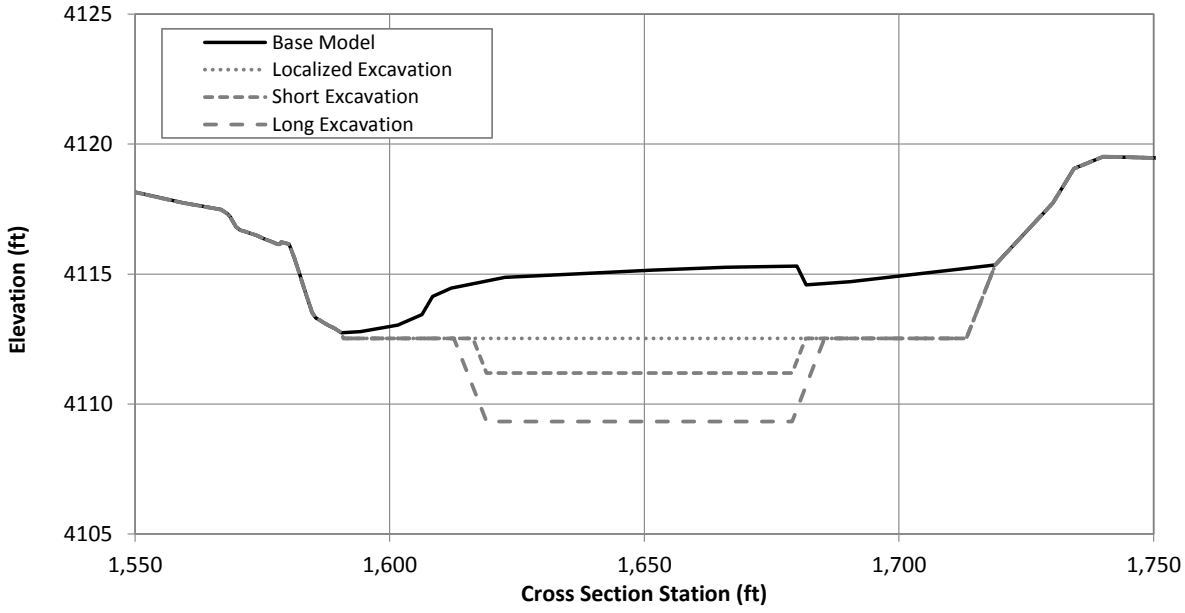


Figure G.1.2. Typical cross section at Problem Location 1 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 527574.7).

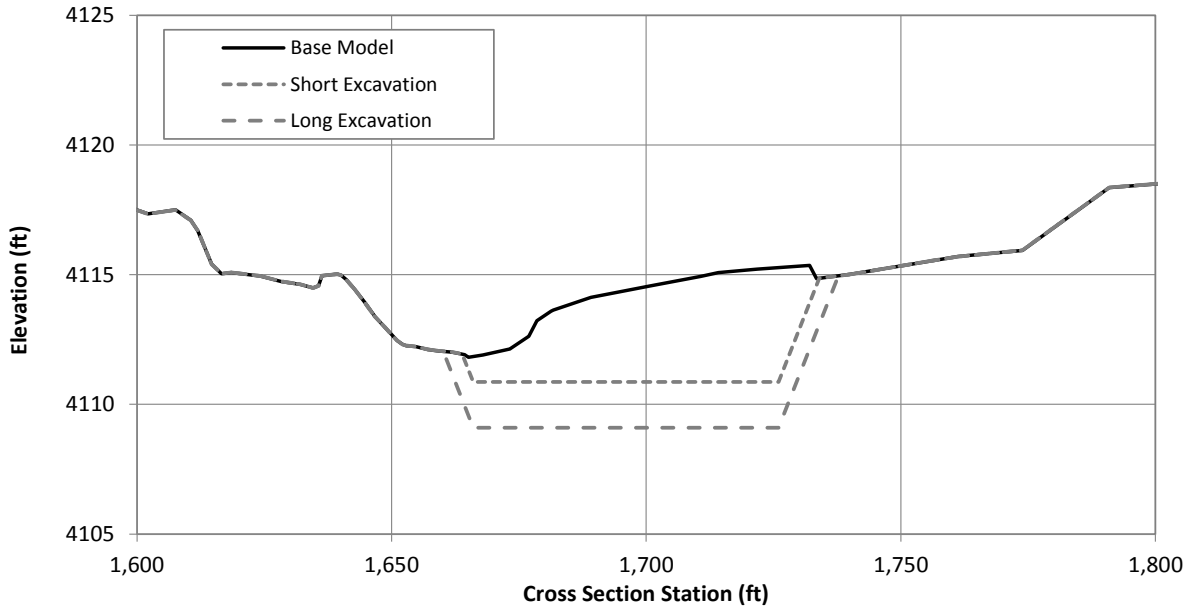


Figure G.1.3. Typical cross section at Problem Location 1 showing the existing (Base Model) channel geometry and excavated geometry under the short and long excavation scenarios (River Station 527320.4).

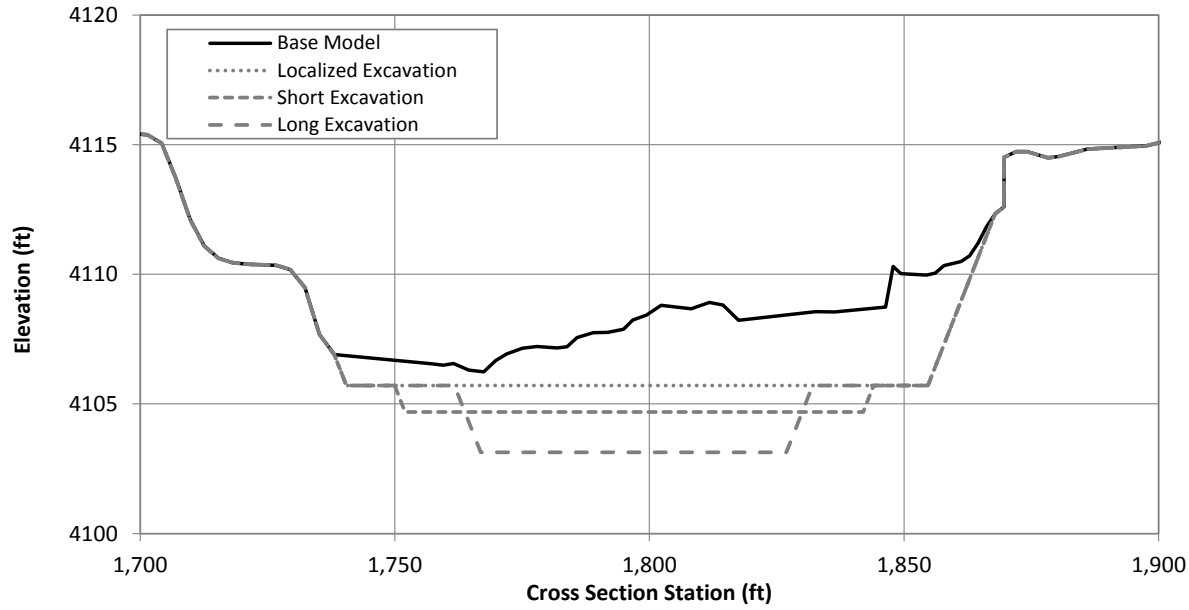


Figure G.1.4. Typical cross section at Problem Location 1 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 518915).

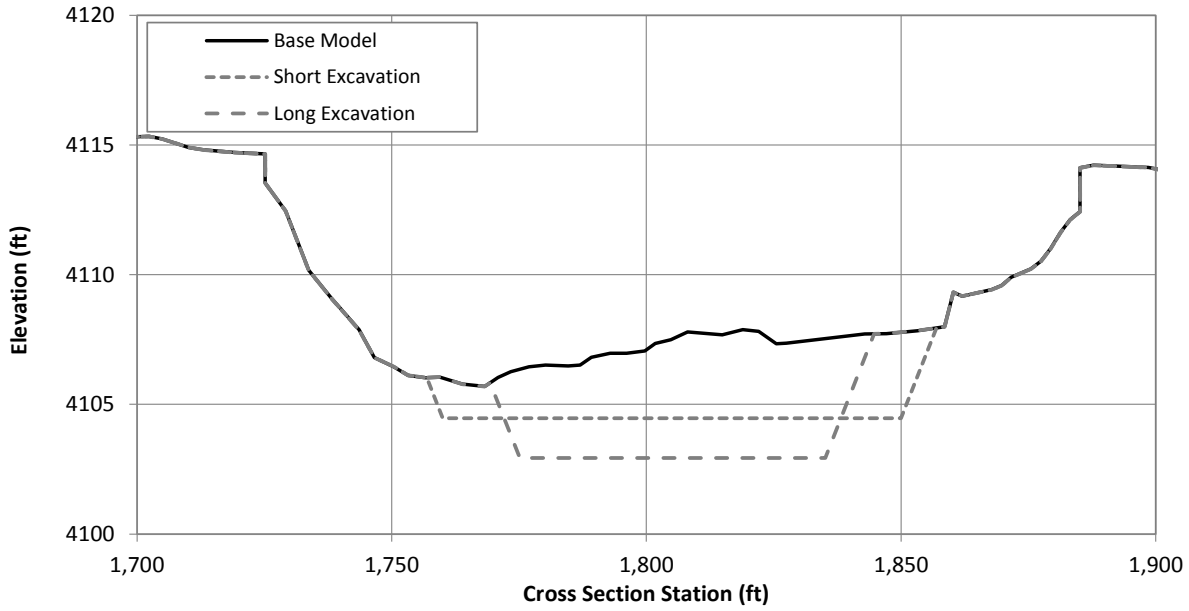


Figure G.1.5. Typical cross section at Problem Location 1 showing the existing (Base Model) channel geometry and excavated geometry under the short and long excavation scenarios (River Station 518772.4).

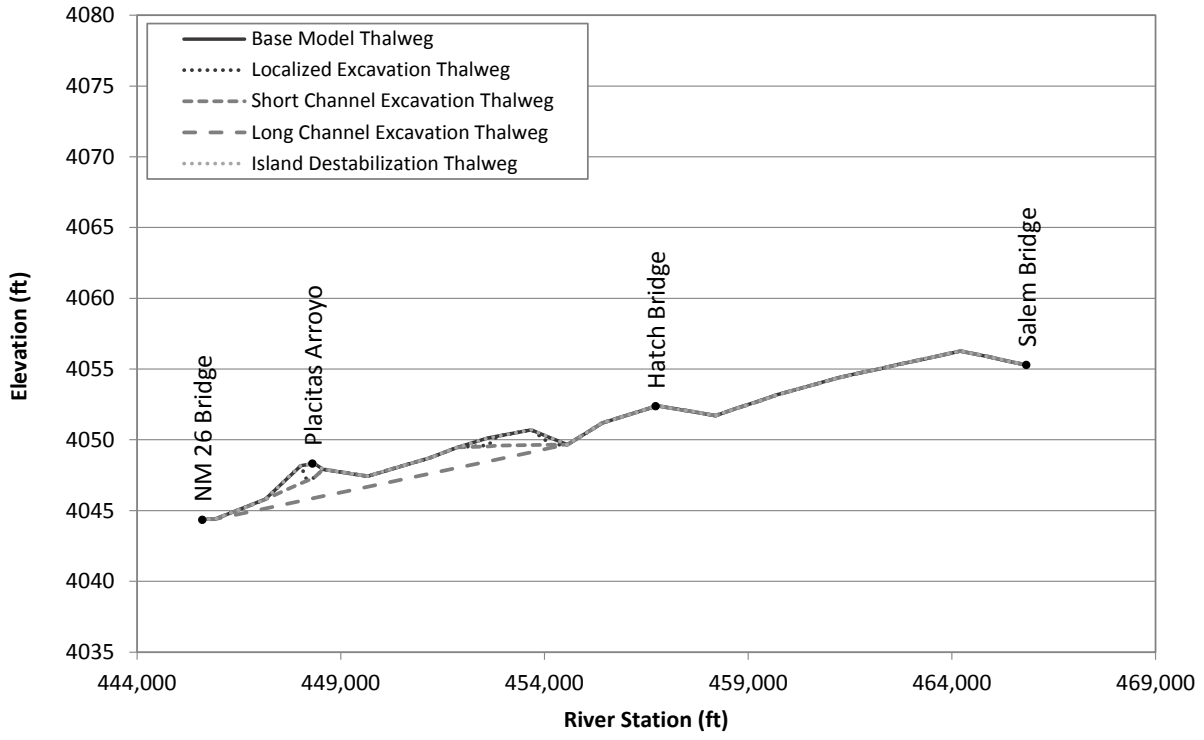


Figure G.1.6. Existing (Base Model) and excavation thalweg profiles at Problem Location 2.

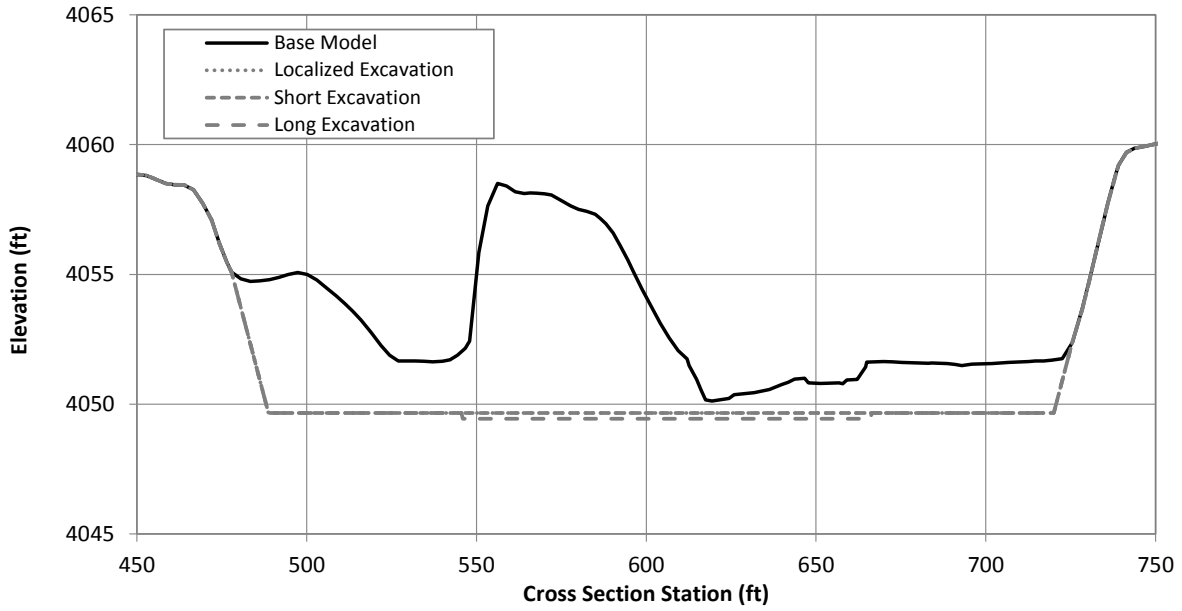


Figure G.1.7. Typical cross section at Problem Location 2 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 454174.4).

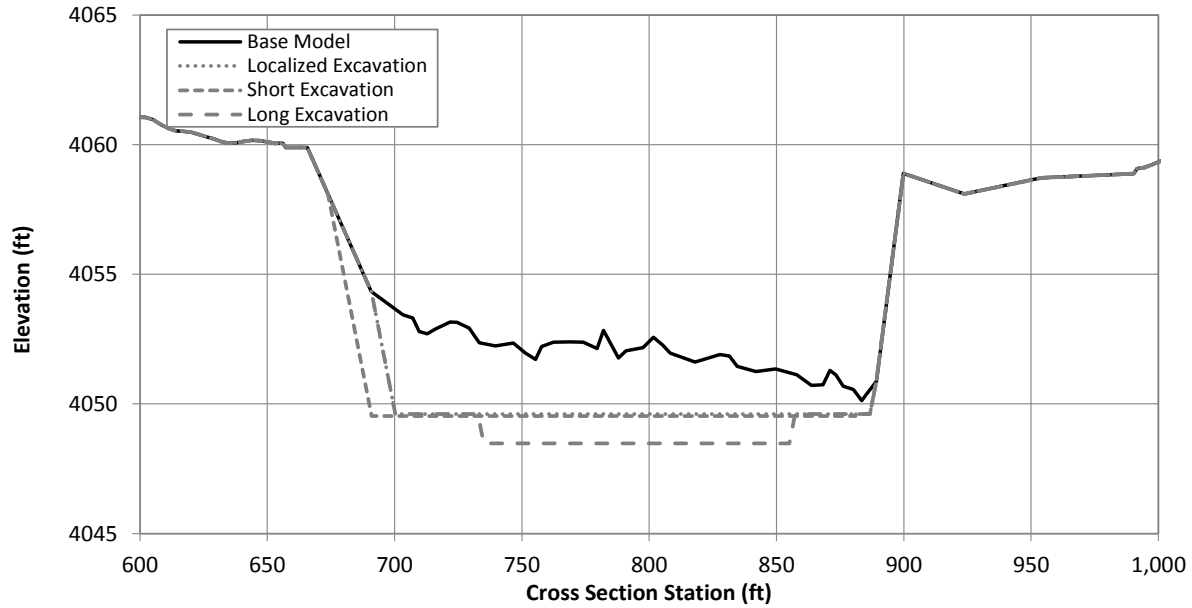


Figure G.1.8. Typical cross section at Problem Location 2 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 452614.1).

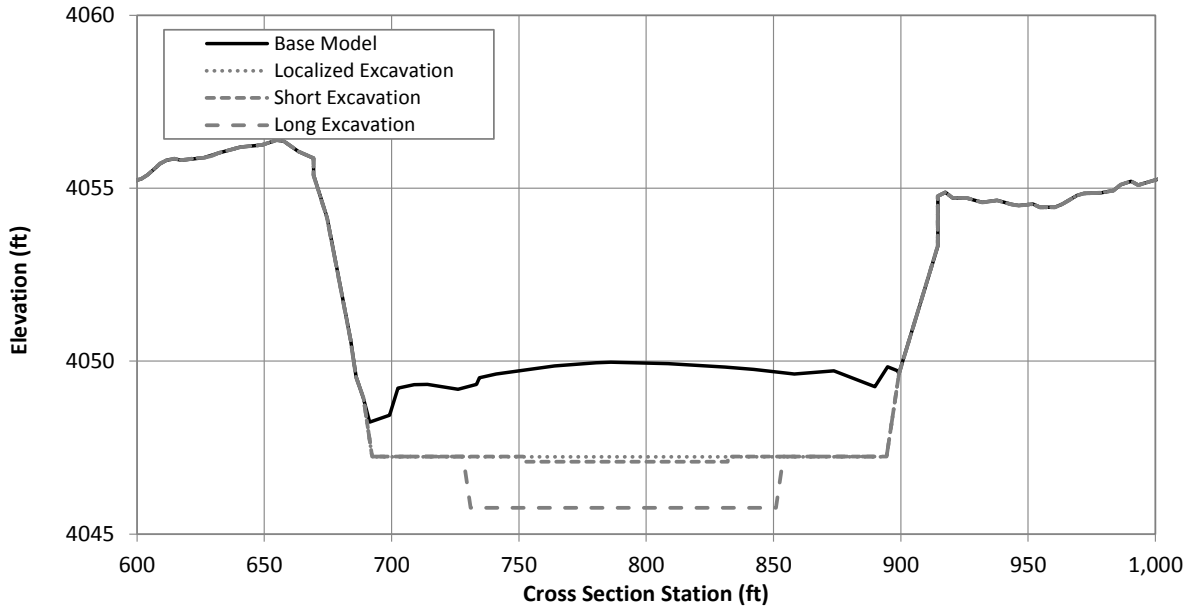


Figure G.1.9. Typical cross section at Problem Location 2 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 448155.2).

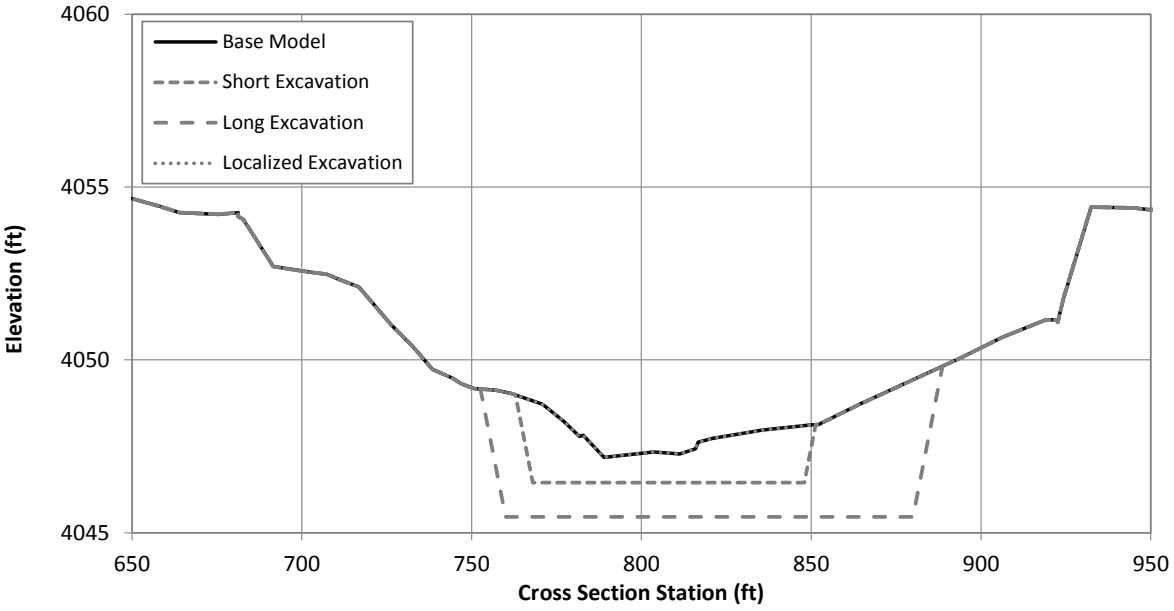


Figure G.1.10. Typical cross section at Problem Location 2 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 447654.5).

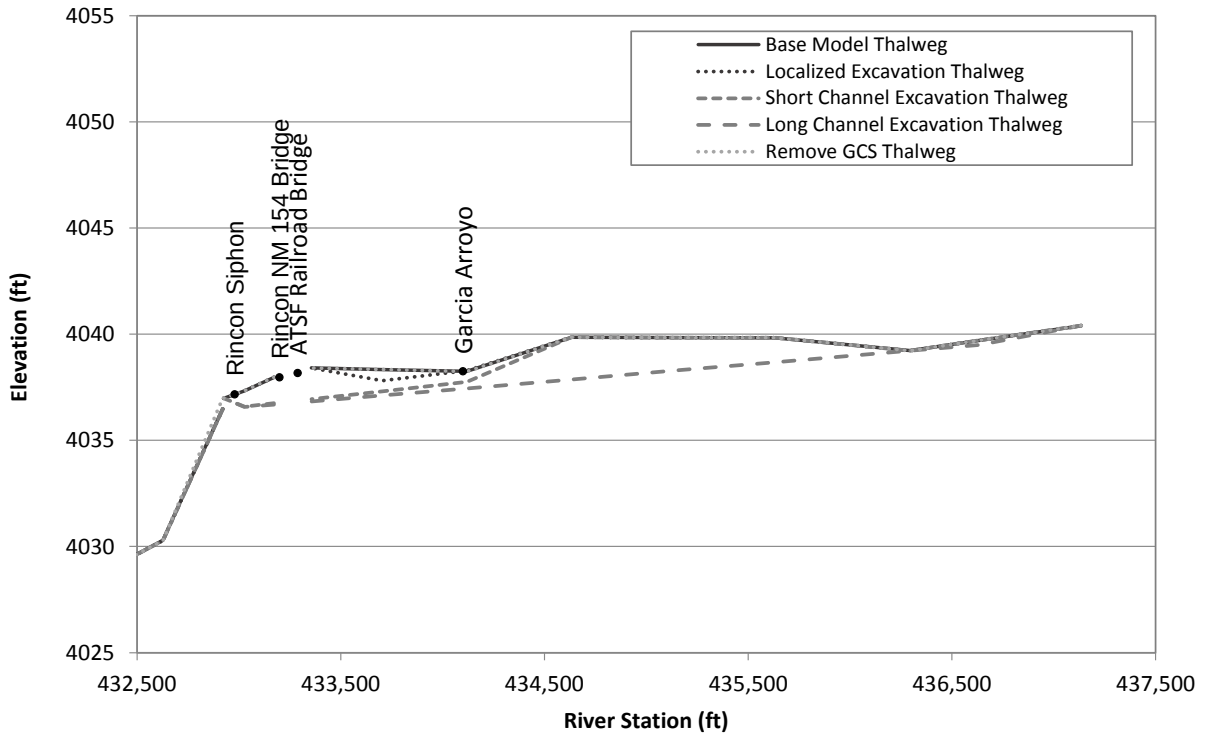


Figure G.1.11. Existing (Base Model) and excavation thalweg profiles at Problem Location 3.

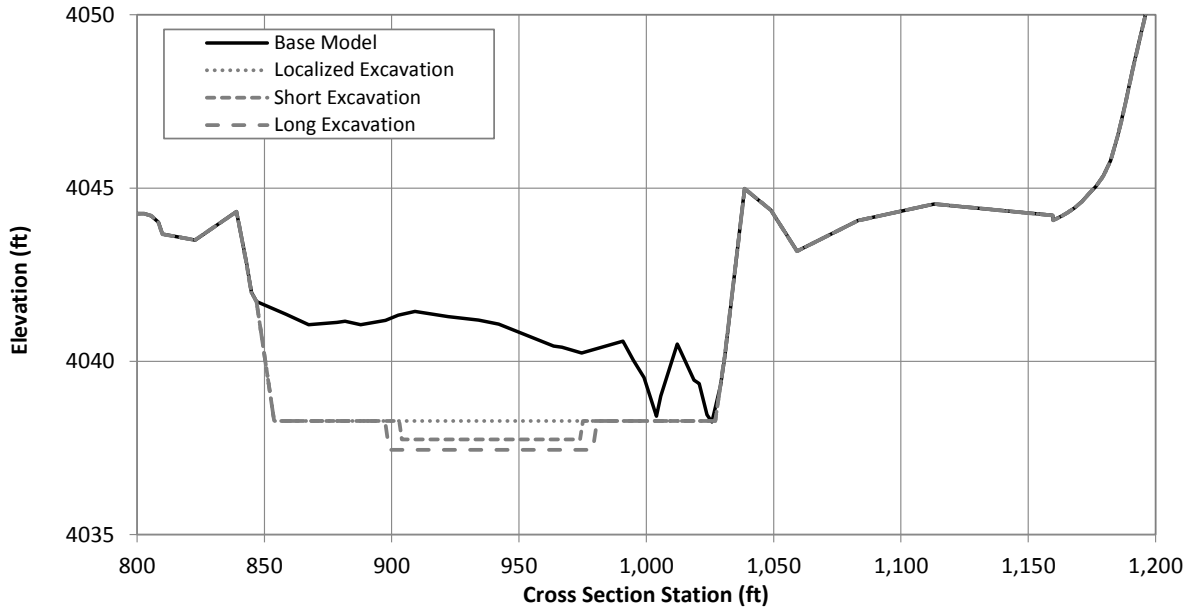


Figure G.1.12. Typical cross section at Problem Location 3 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 434118.9).

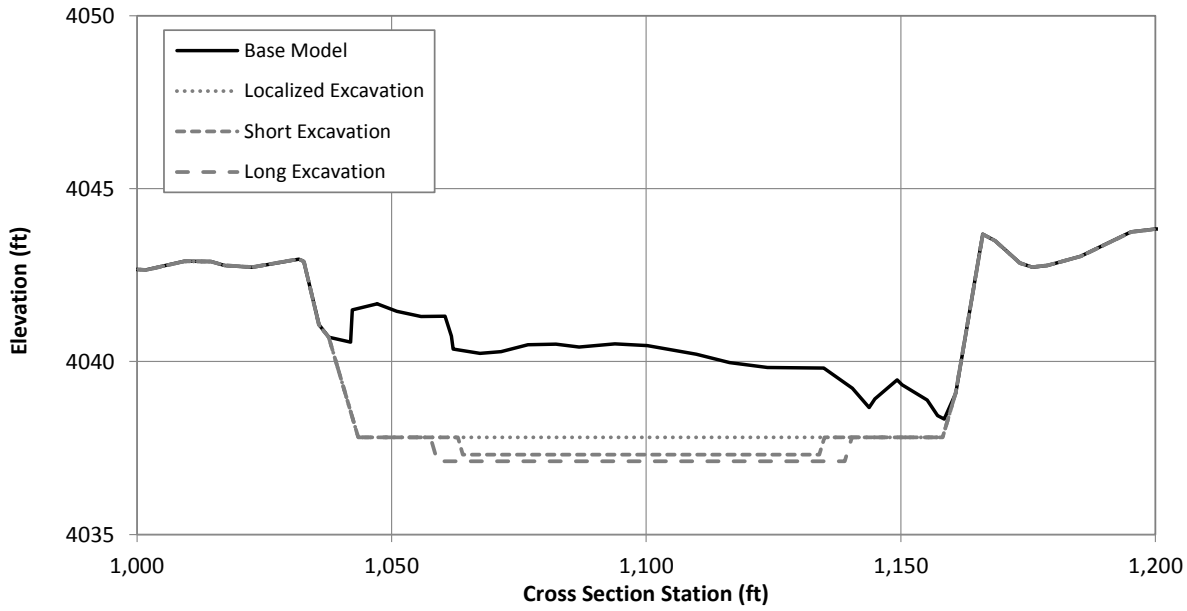


Figure G.1.13. Typical cross section at Problem Location 3 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 433704.5).

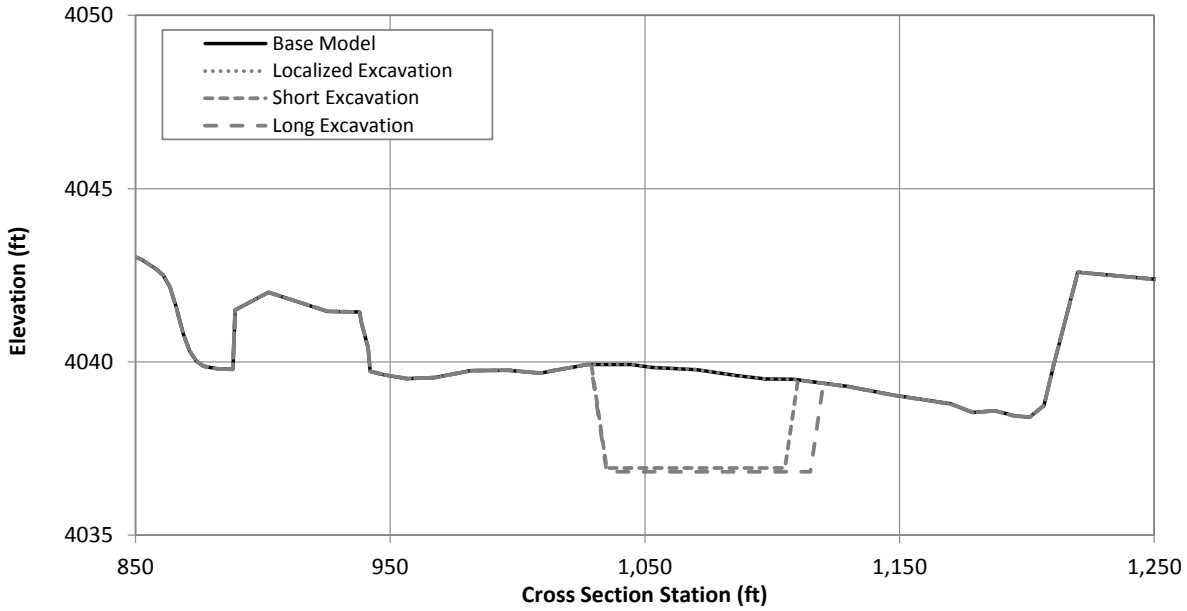


Figure G.1.14. Typical cross section at Problem Location 3 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 433356.2).

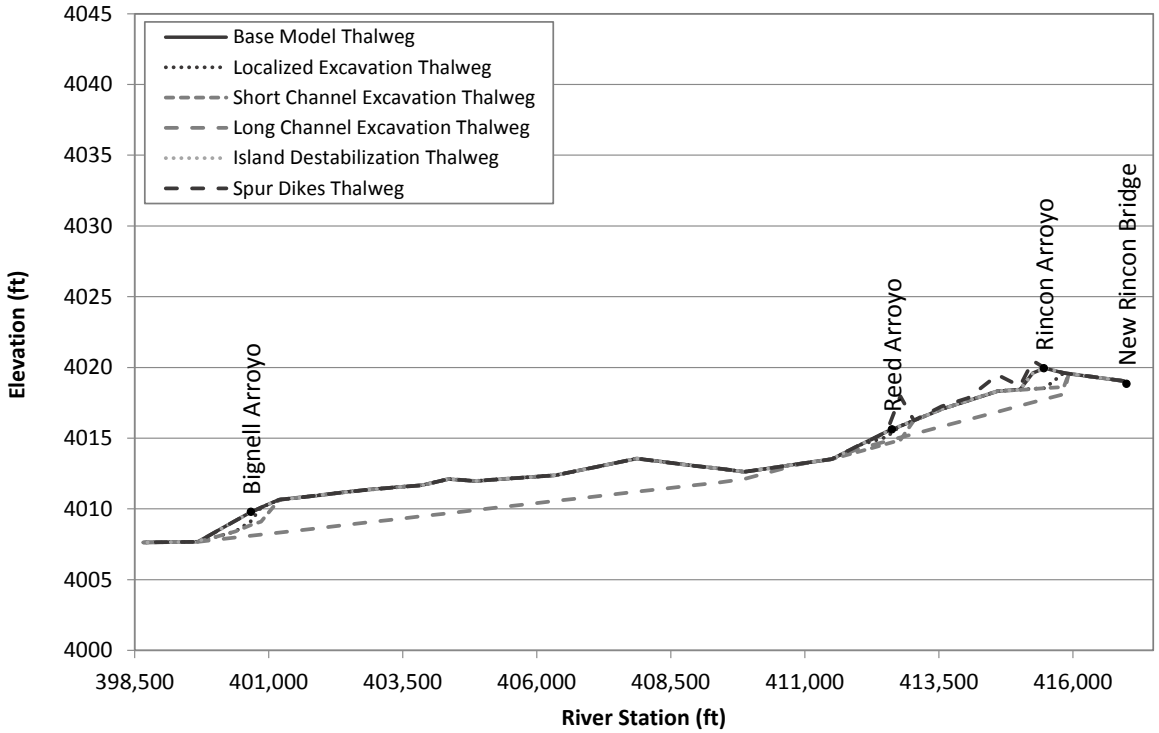


Figure G.1.15. Existing (Base Model) and excavation thalweg profiles at Problem Location 4.

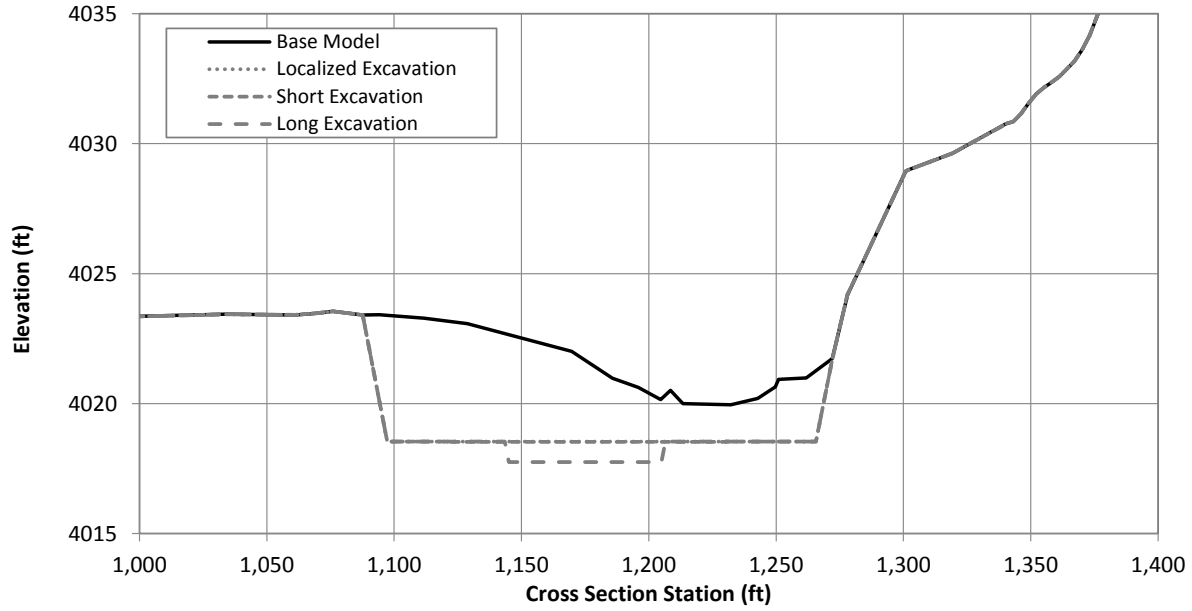


Figure G.1.16. Typical cross section at Problem Location 4 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 415476.8).

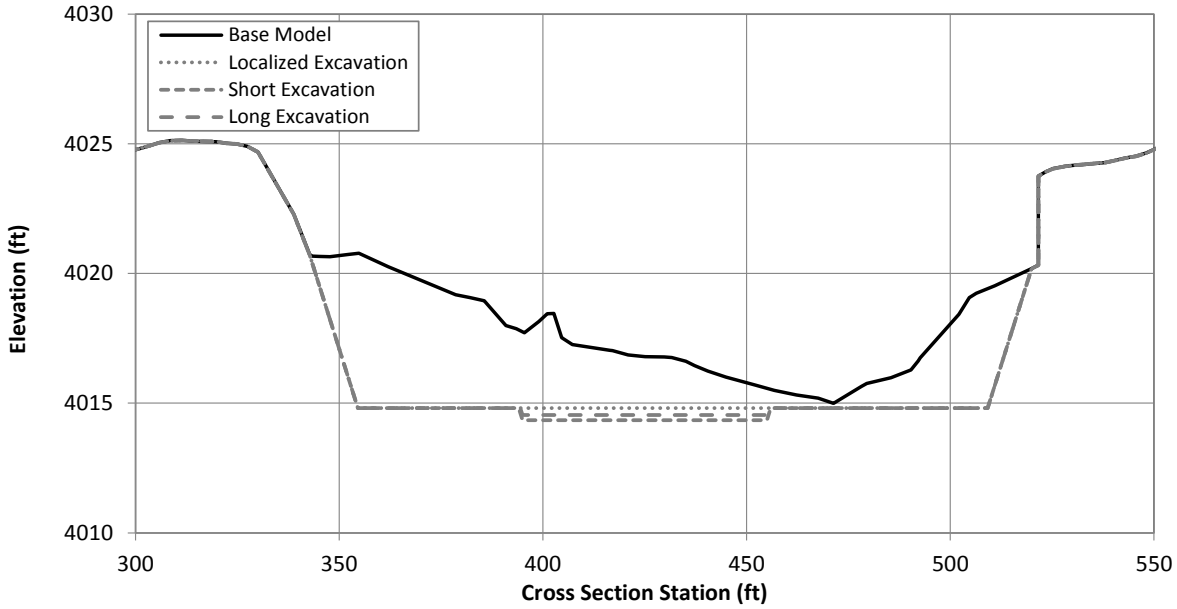


Figure G.1.17. Typical cross section at Problem Location 4 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 412284.1).

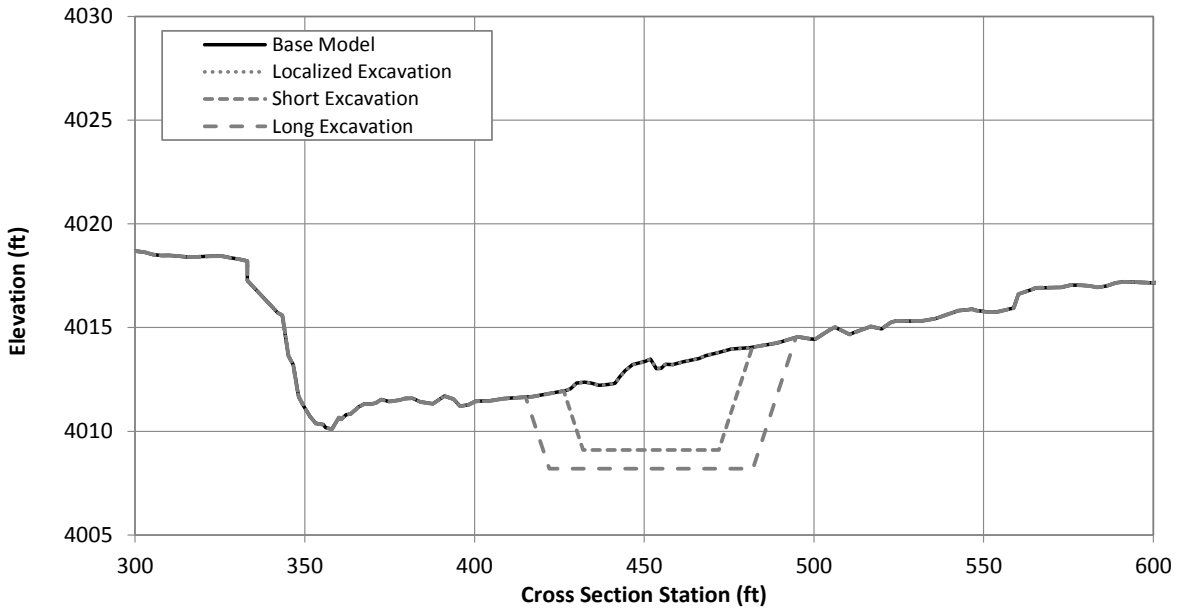


Figure G.1.18. Typical cross section at Problem Location 4 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 400857.9).

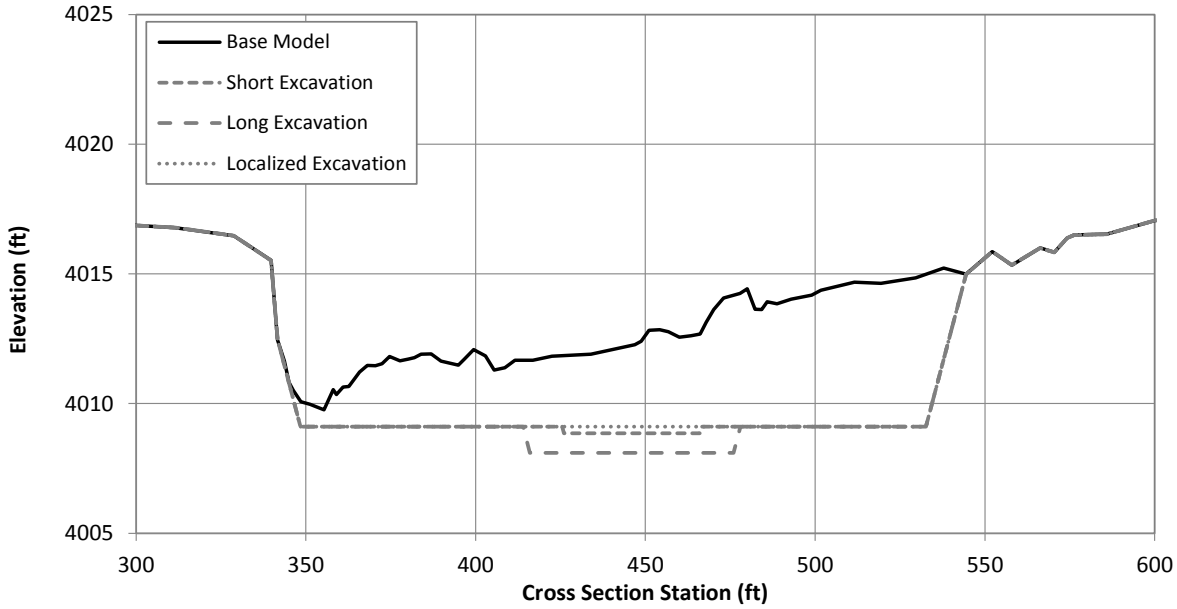


Figure G.1.19. Typical cross section at Problem Location 4 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 400659.3).

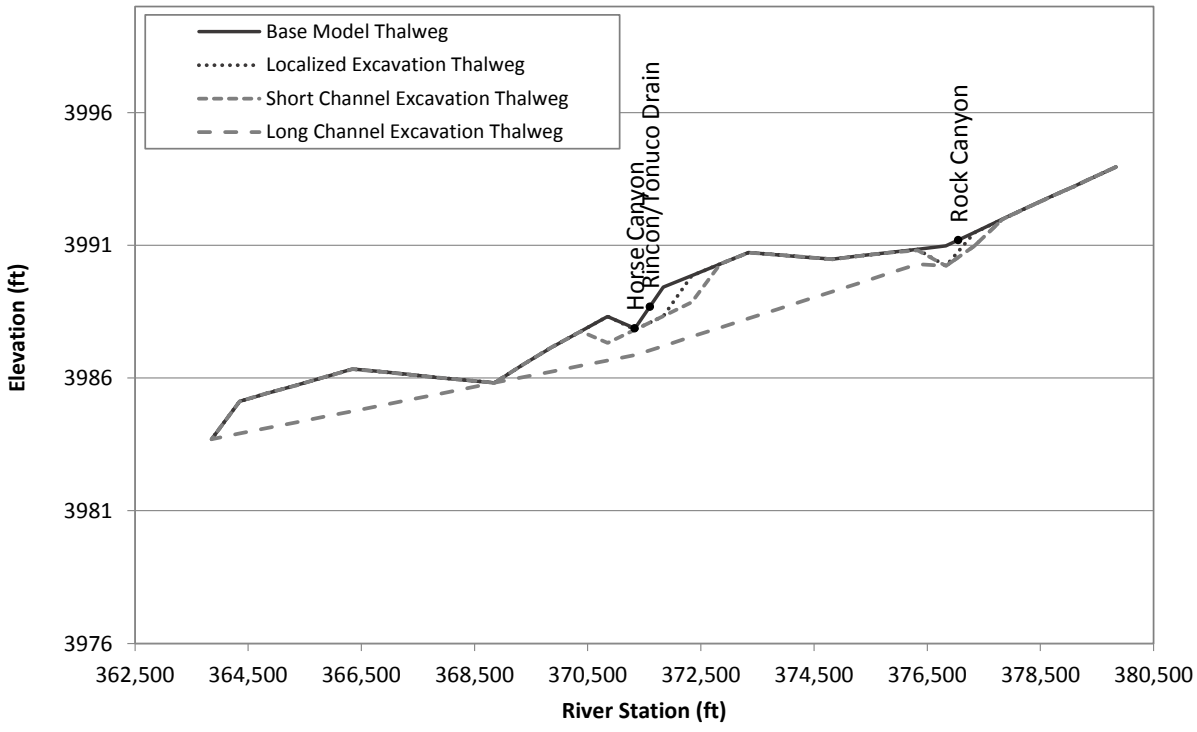


Figure G.1.20. Existing (Base Model) and excavation thalweg profiles at Problem Location 5.

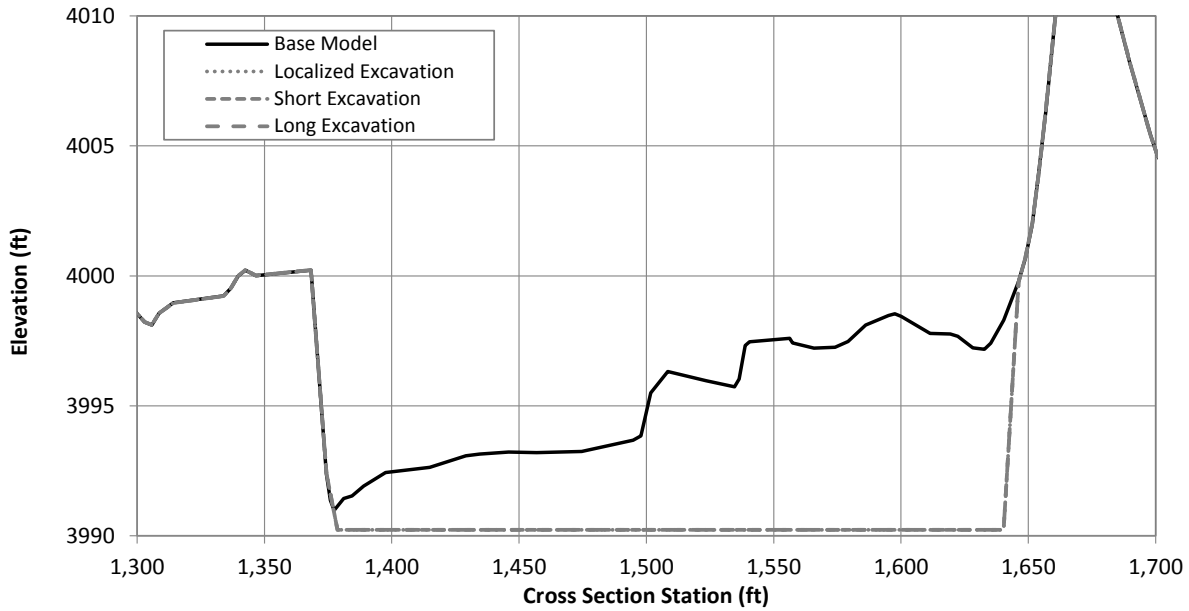


Figure G.1.21. Typical cross section at Problem Location 5 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 376830.4).

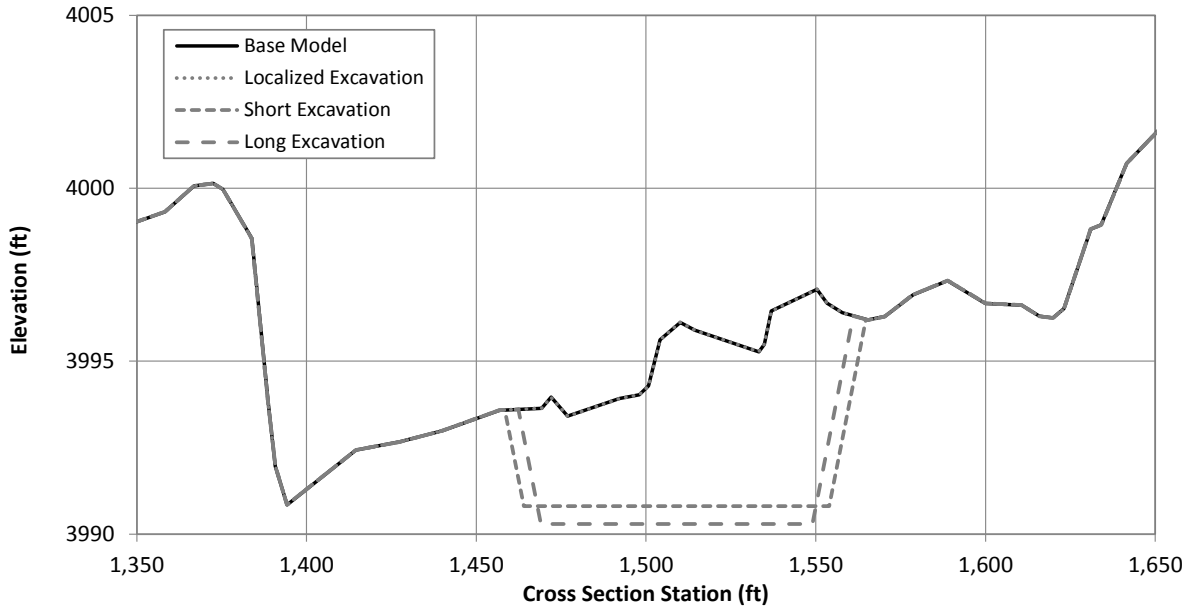


Figure G.1.22. Typical cross section at Problem Location 5 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 376330).

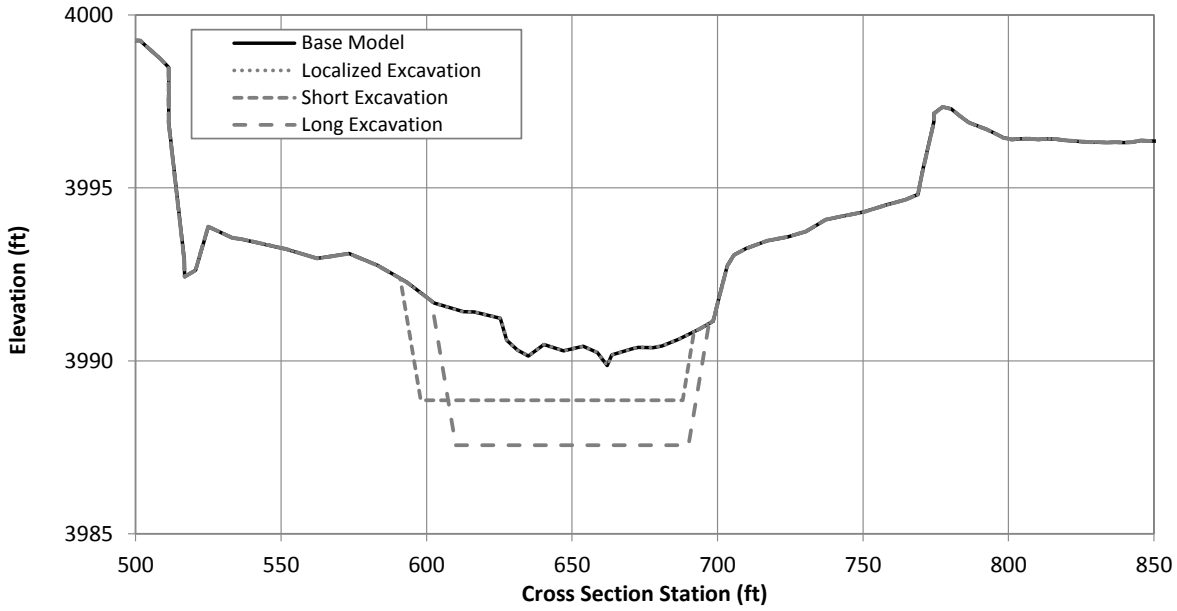


Figure G.1.23. Typical cross section at Problem Location 5 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 372339.6).

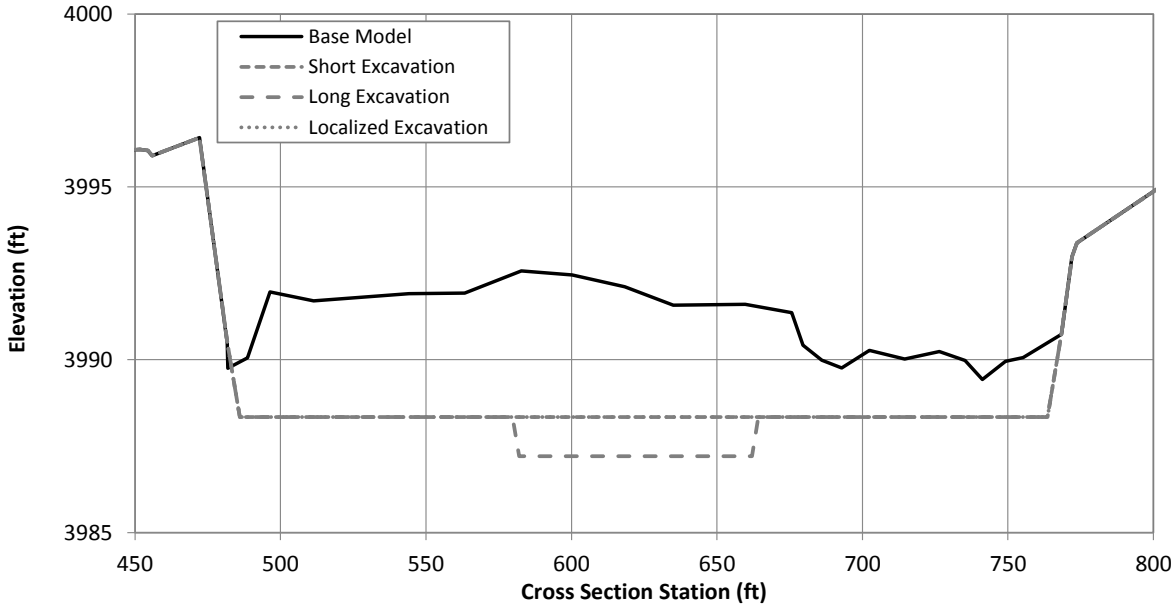


Figure G.1.24. Typical cross section at Problem Location 5 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 371836.6).

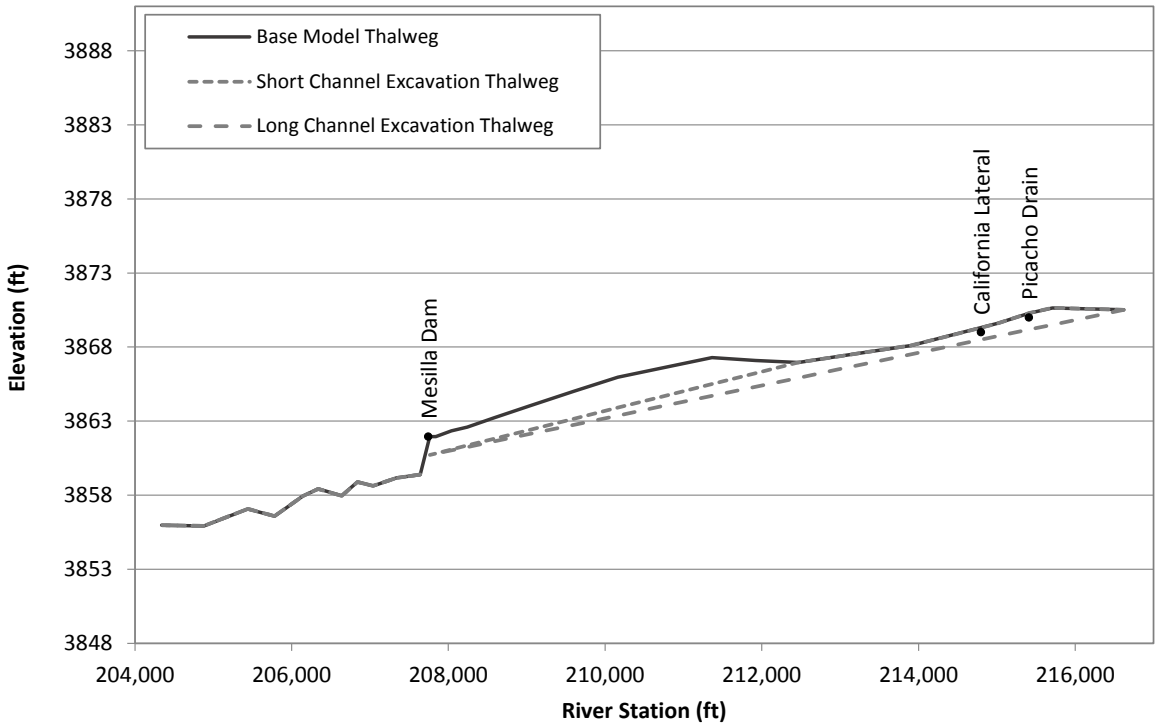


Figure G.1.25. Existing (Base Model) and excavation thalweg profiles at Problem Location 6.

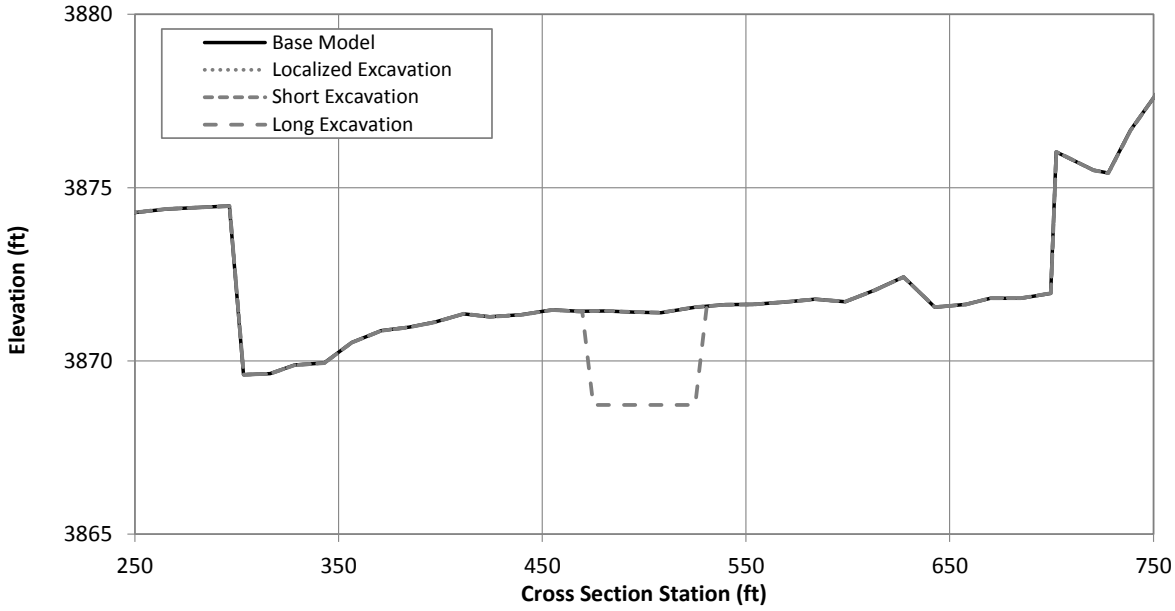


Figure G.1.26. Typical cross section at Problem Location 6 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 215011.7).

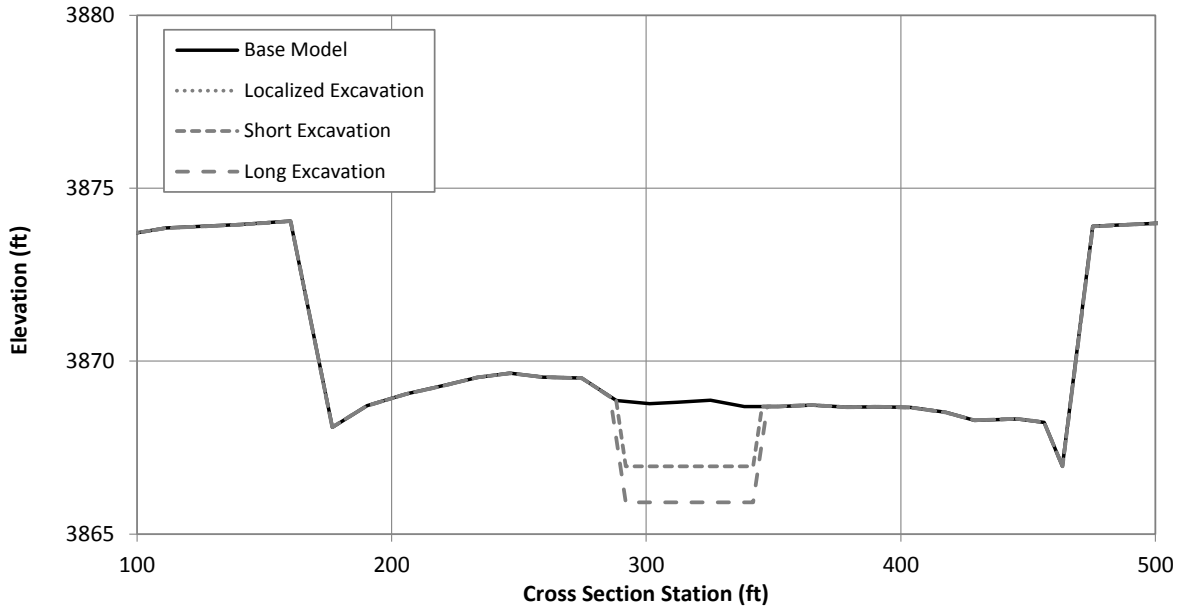


Figure G.1.27. Typical cross section at Problem Location 6 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 212468.2).

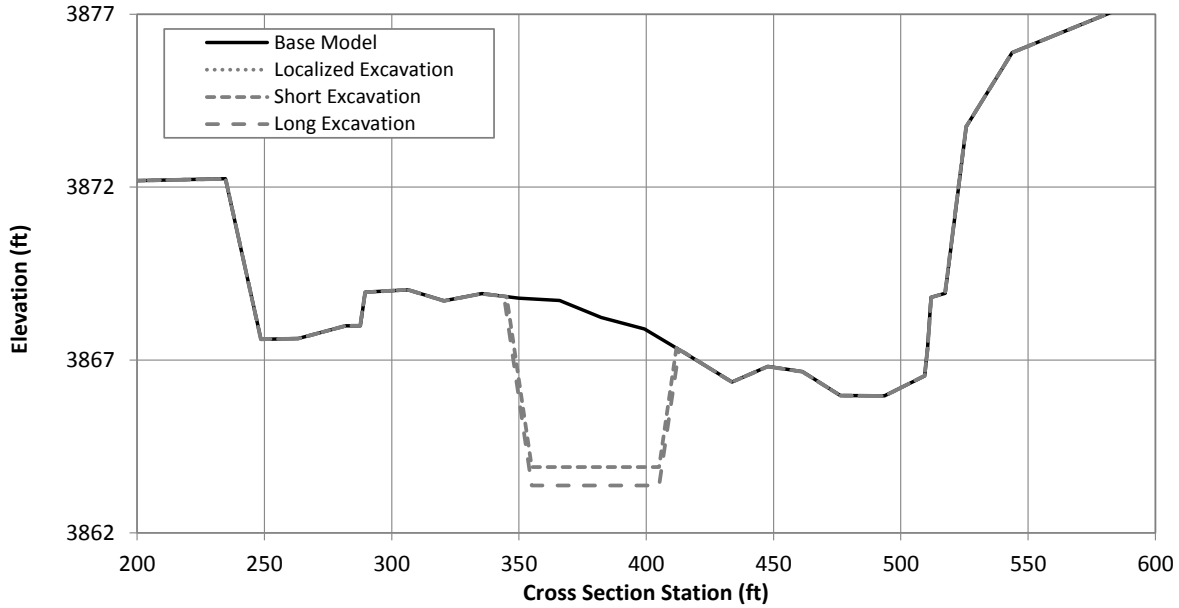


Figure G.1.28. Typical cross section at Problem Location 6 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 210162.5).

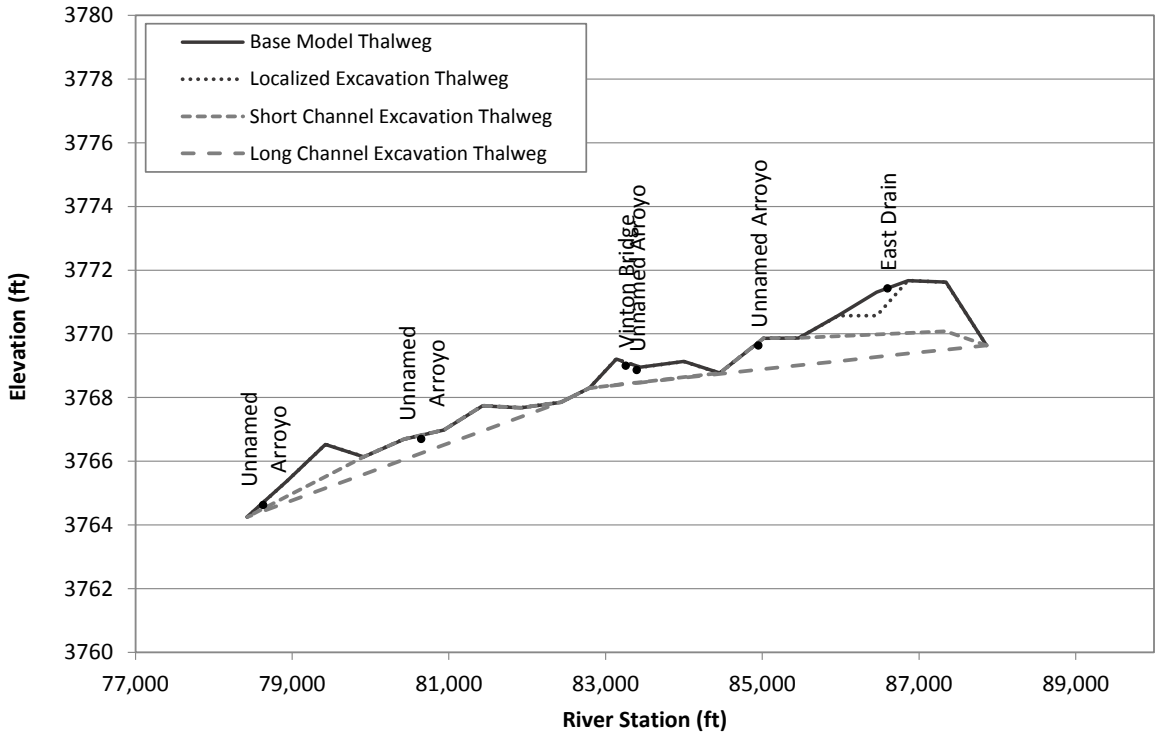


Figure G.1.29. Existing (Base Model) and excavation thalweg profiles at Problem Location 7.

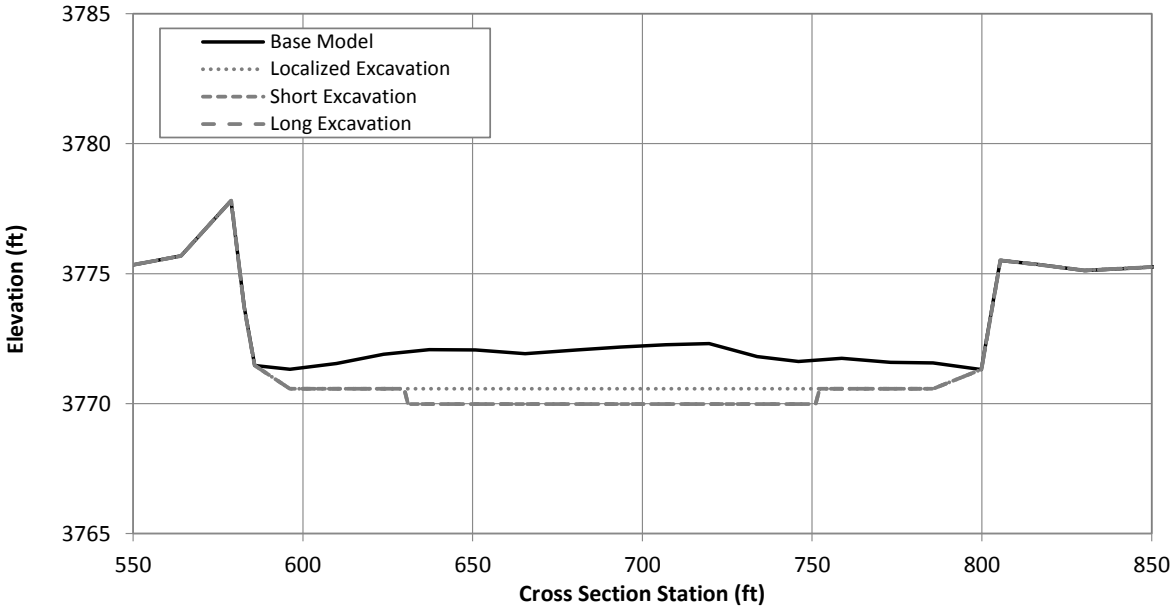


Figure G.1.30. Typical cross section at Problem Location 7 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 86460).

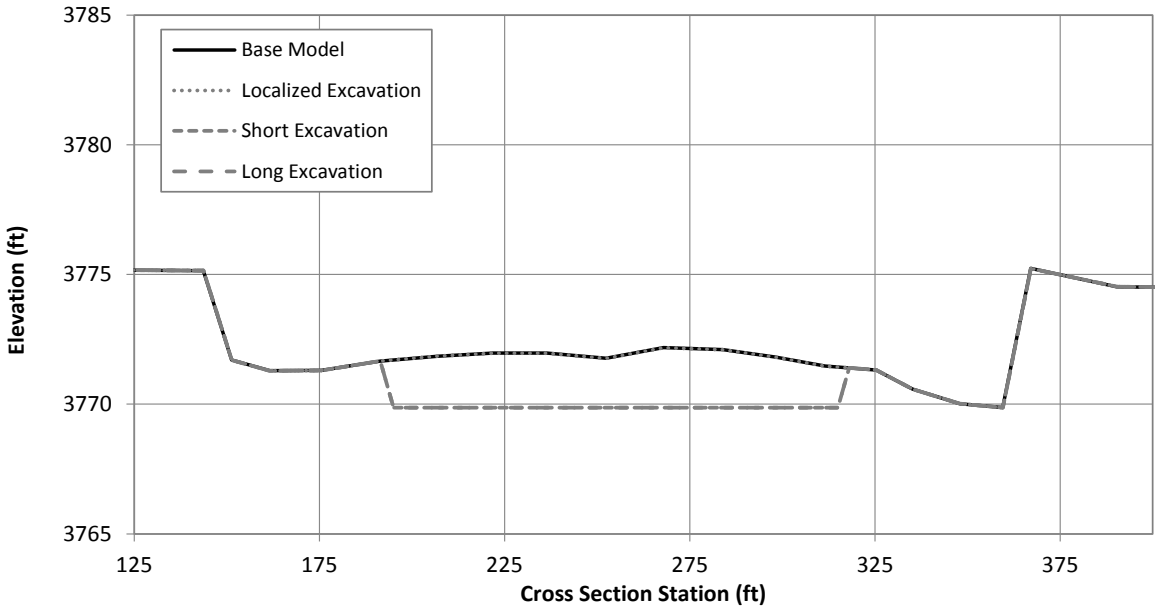


Figure G.1.31. Typical cross section at Problem Location 7 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 85464.6).

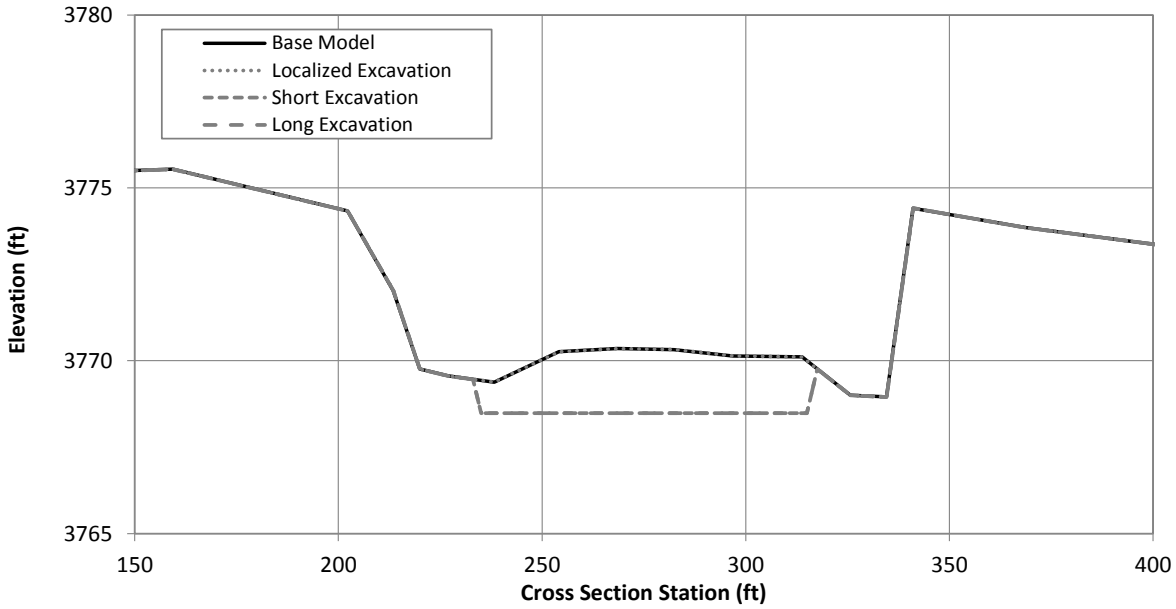


Figure G.1.32. Typical cross section at Problem Location 7 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 83444.4).

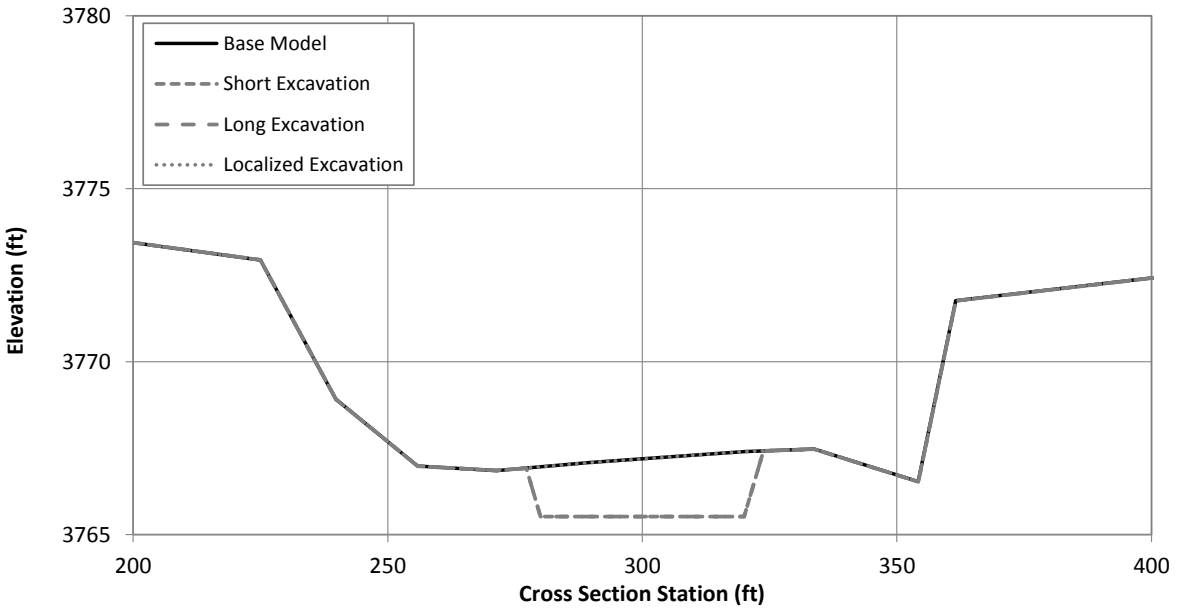


Figure G.1.32. Typical cross section at Problem Location 7 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 79425.6).

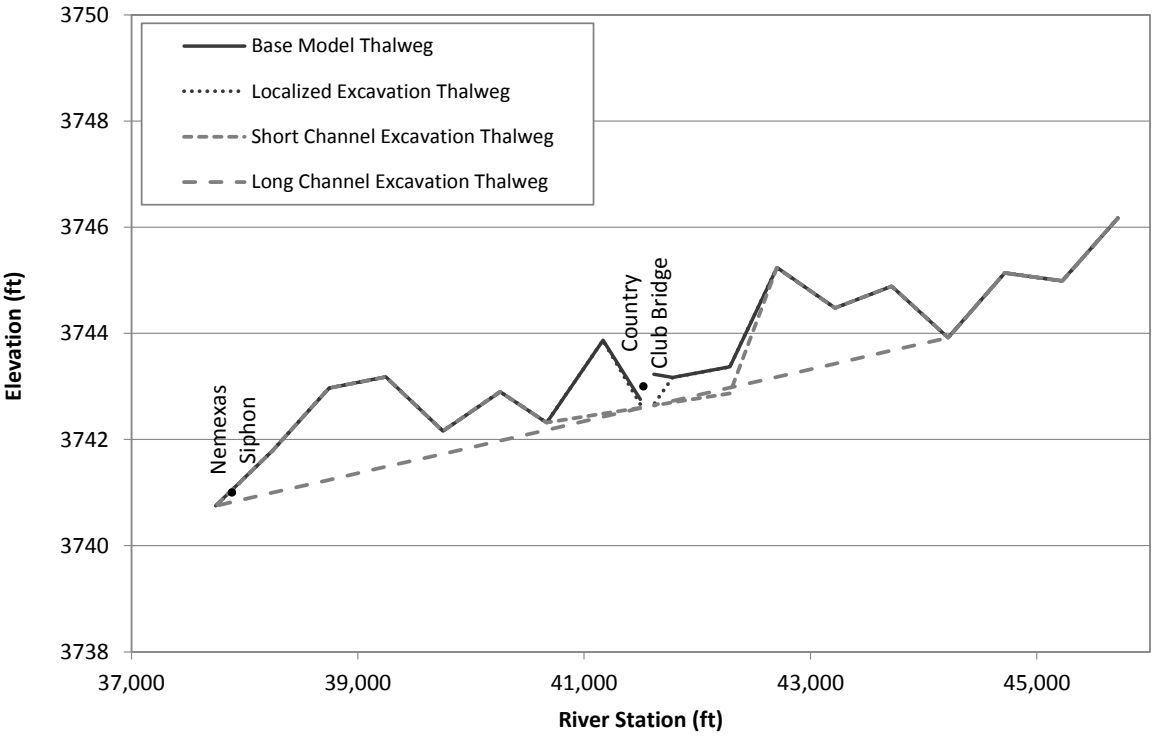


Figure G.1.33. Existing (Base Model) and excavation thalweg profiles at Problem Location 8.

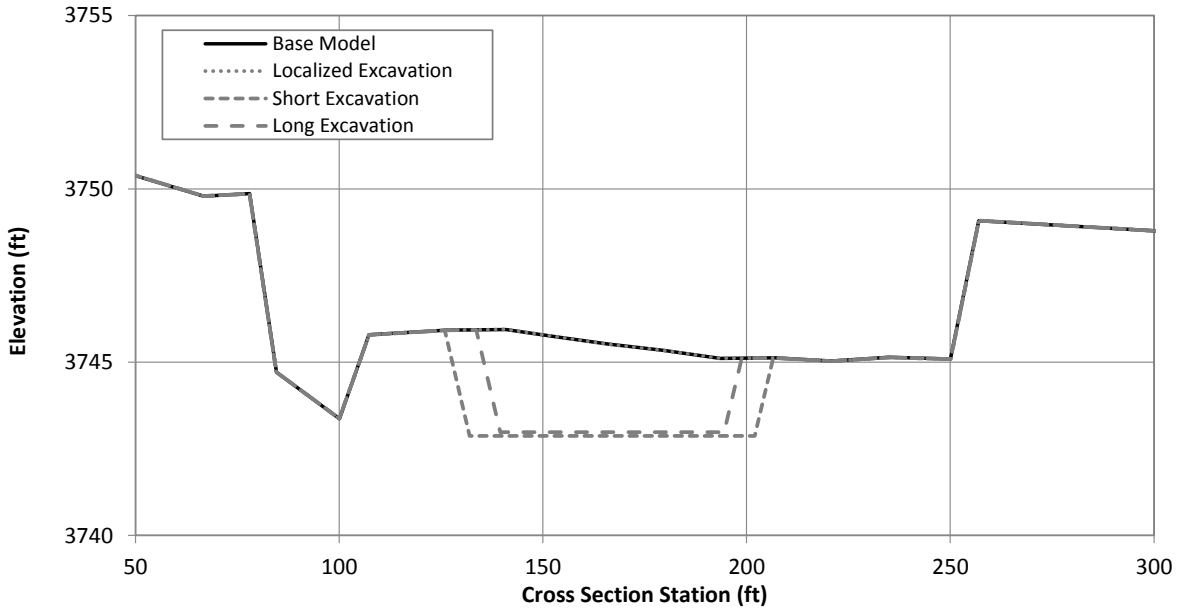


Figure G.1.34. Typical cross section at Problem Location 8 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 42287.4).

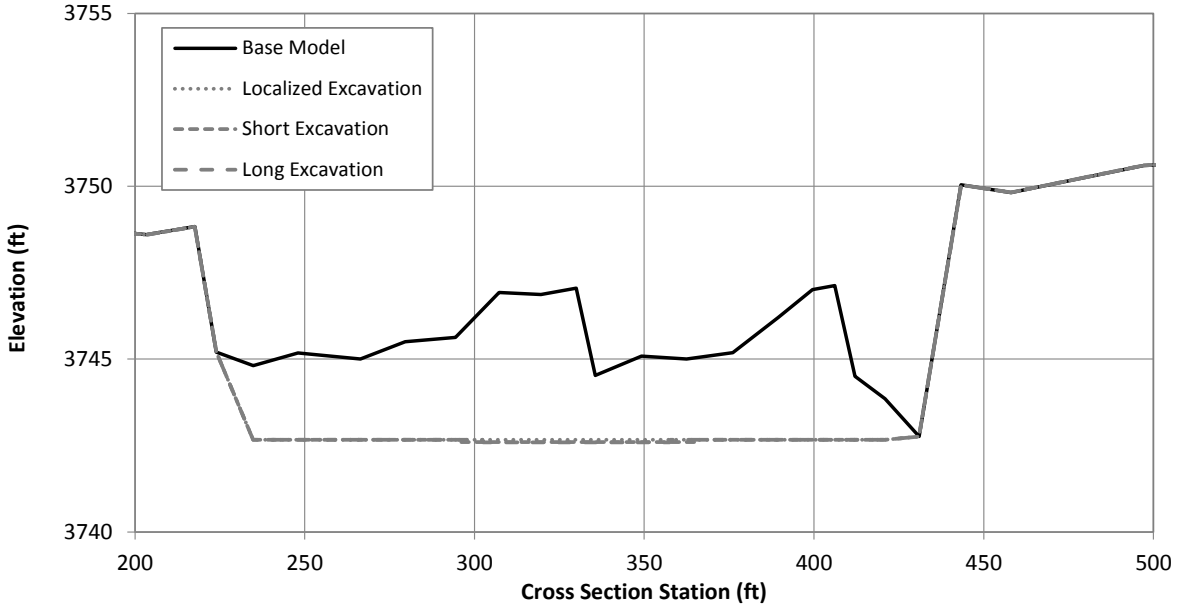


Figure G.1.35. Typical cross section at Problem Location 8 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 41495.8).

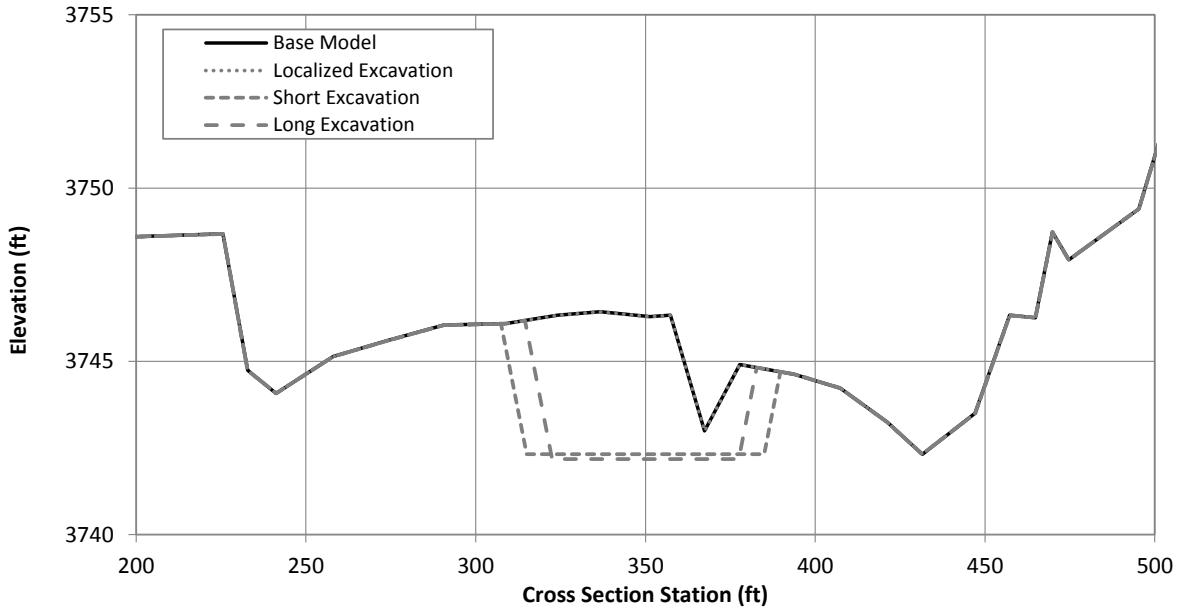


Figure G.1.36. Typical cross section at Problem Location 8 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 40669.1).

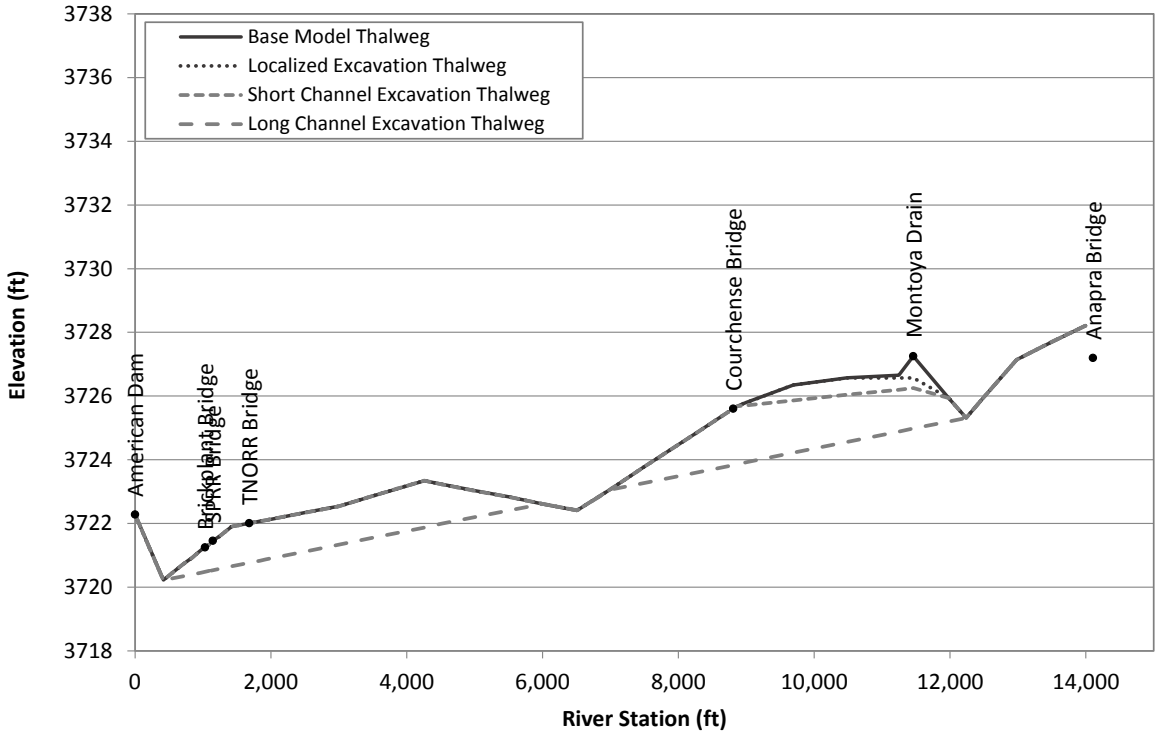


Figure G.1.37. Existing (Base Model) and excavation thalweg profiles at Problem Location 9.

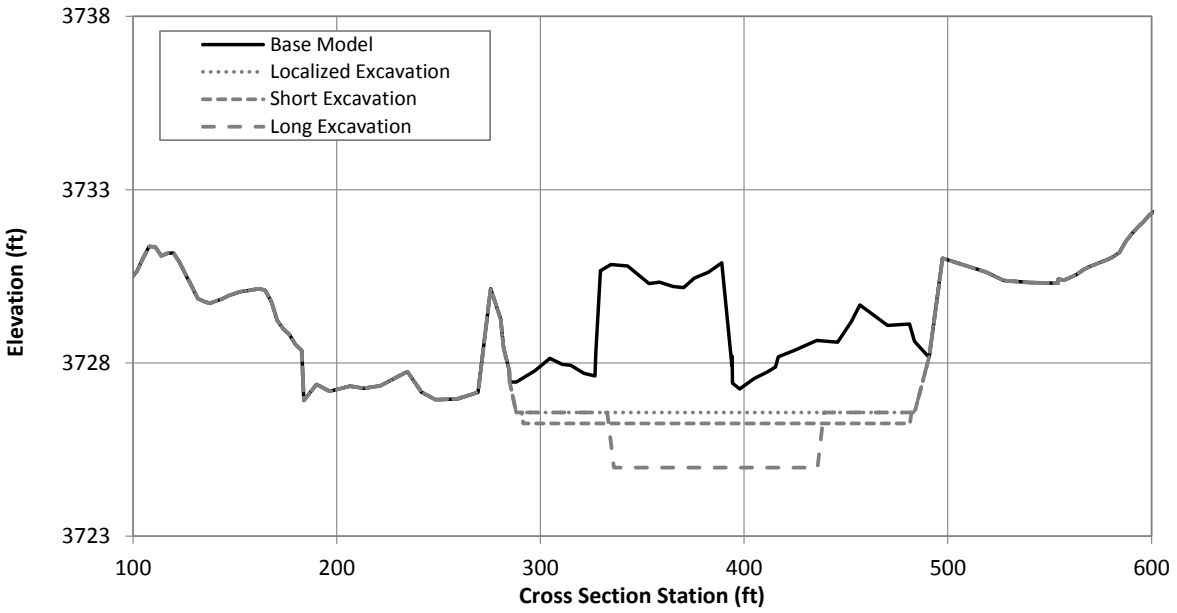


Figure G.1.38. Typical cross section at Problem Location 9 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 11460.1).

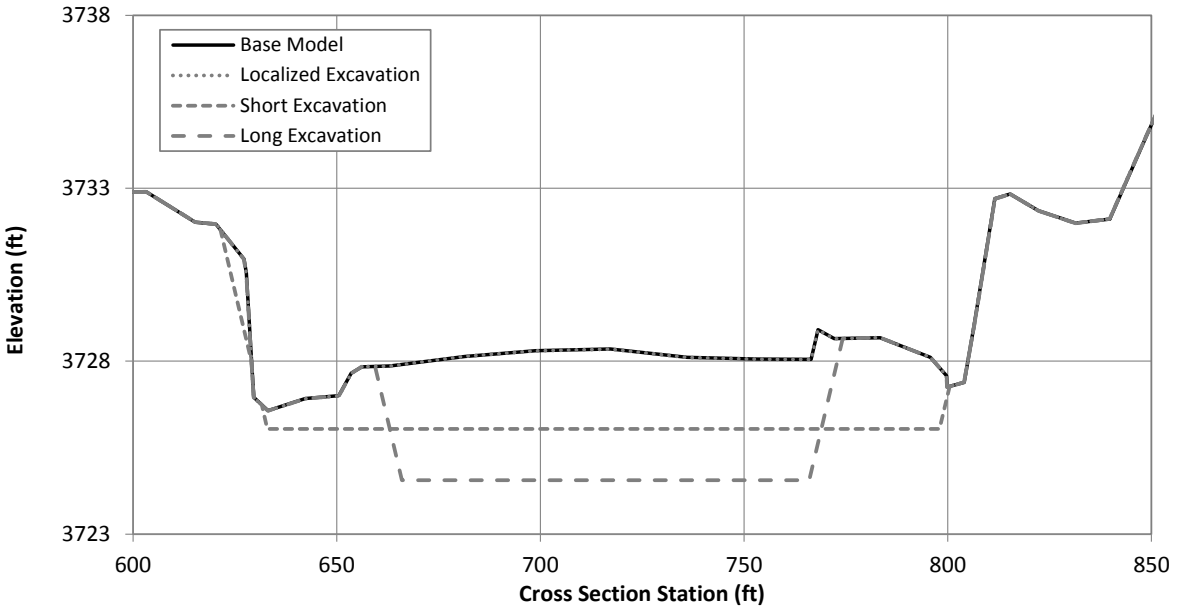


Figure G.1.39. Typical cross section at Problem Location 9 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 10483.52).

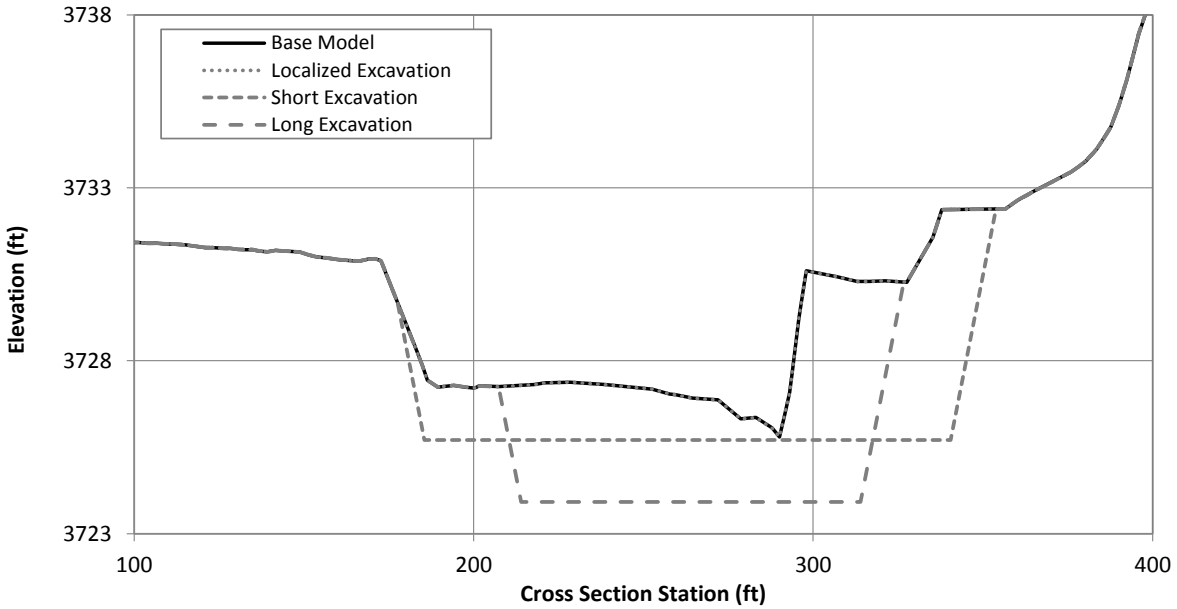


Figure G.1.40. Typical cross section at Problem Location 9 showing the existing (Base Model) channel geometry and excavated geometry under the localized, short and long excavation scenarios (River Station 9006.36).

Appendix G.2

Mapping Showing Extents of the Sediment Removal Alternatives

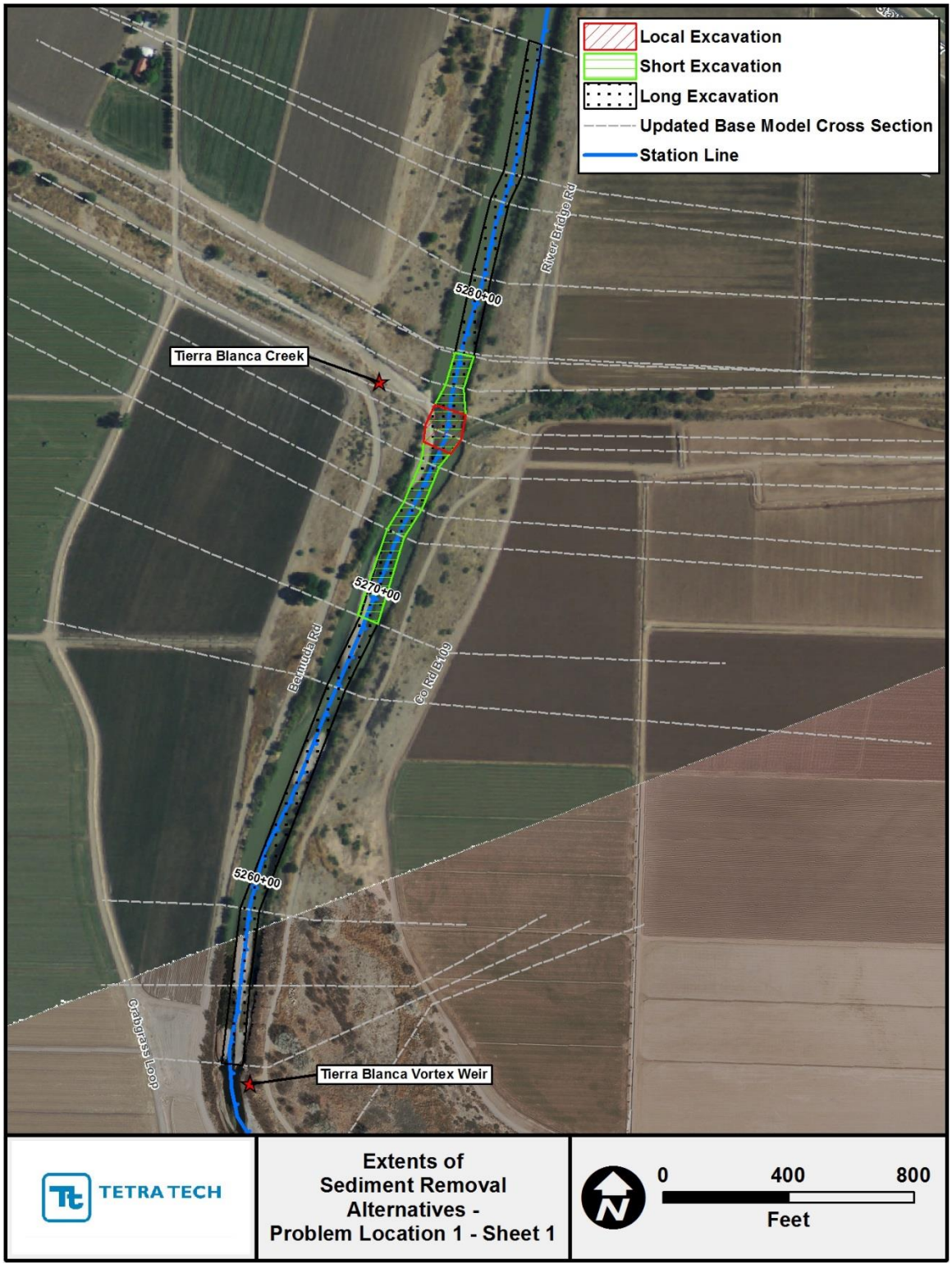


Figure G.2.1. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 1 (Sheet 1).

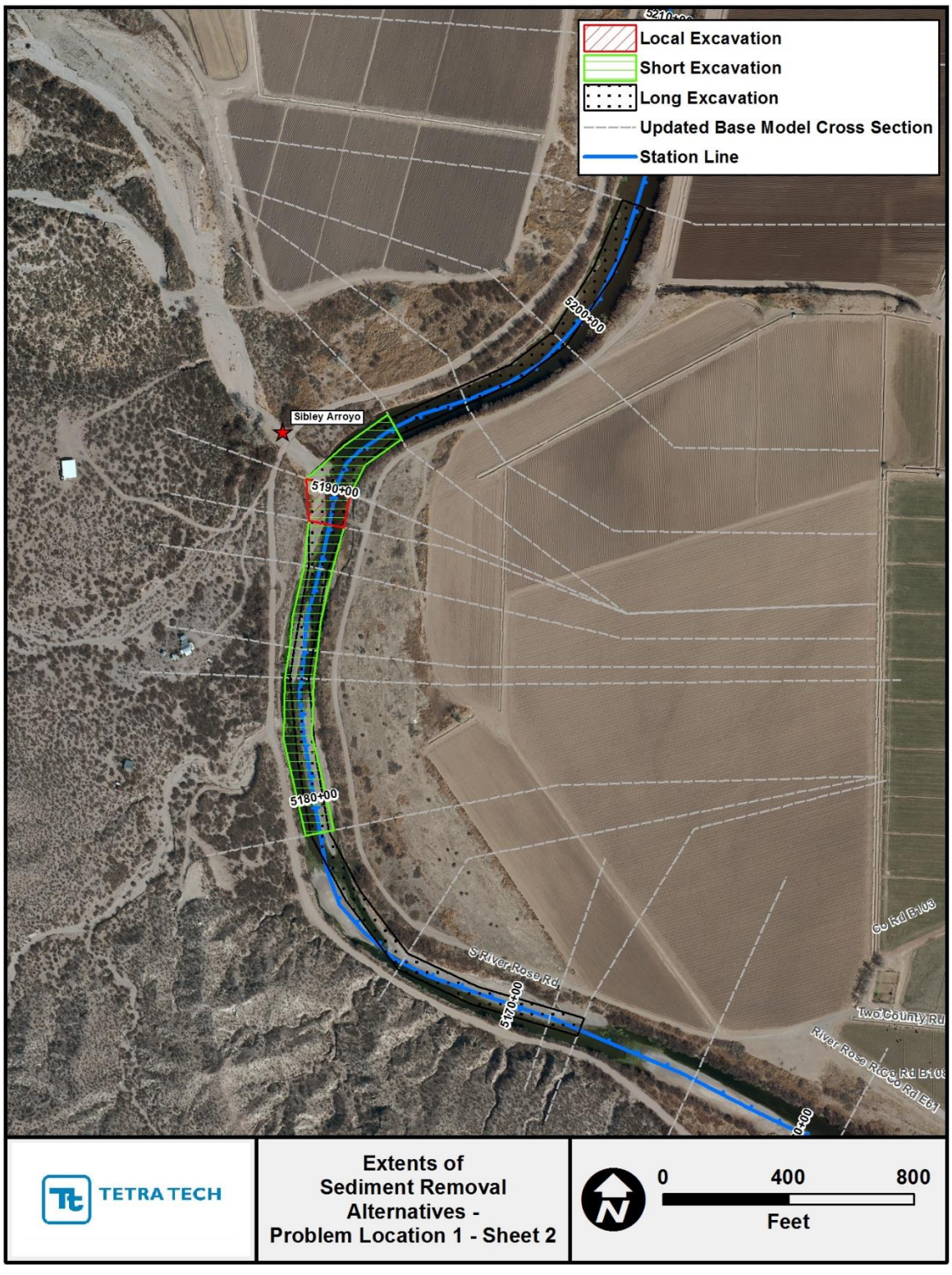


Figure G.2.2. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 1 (Sheet 2).

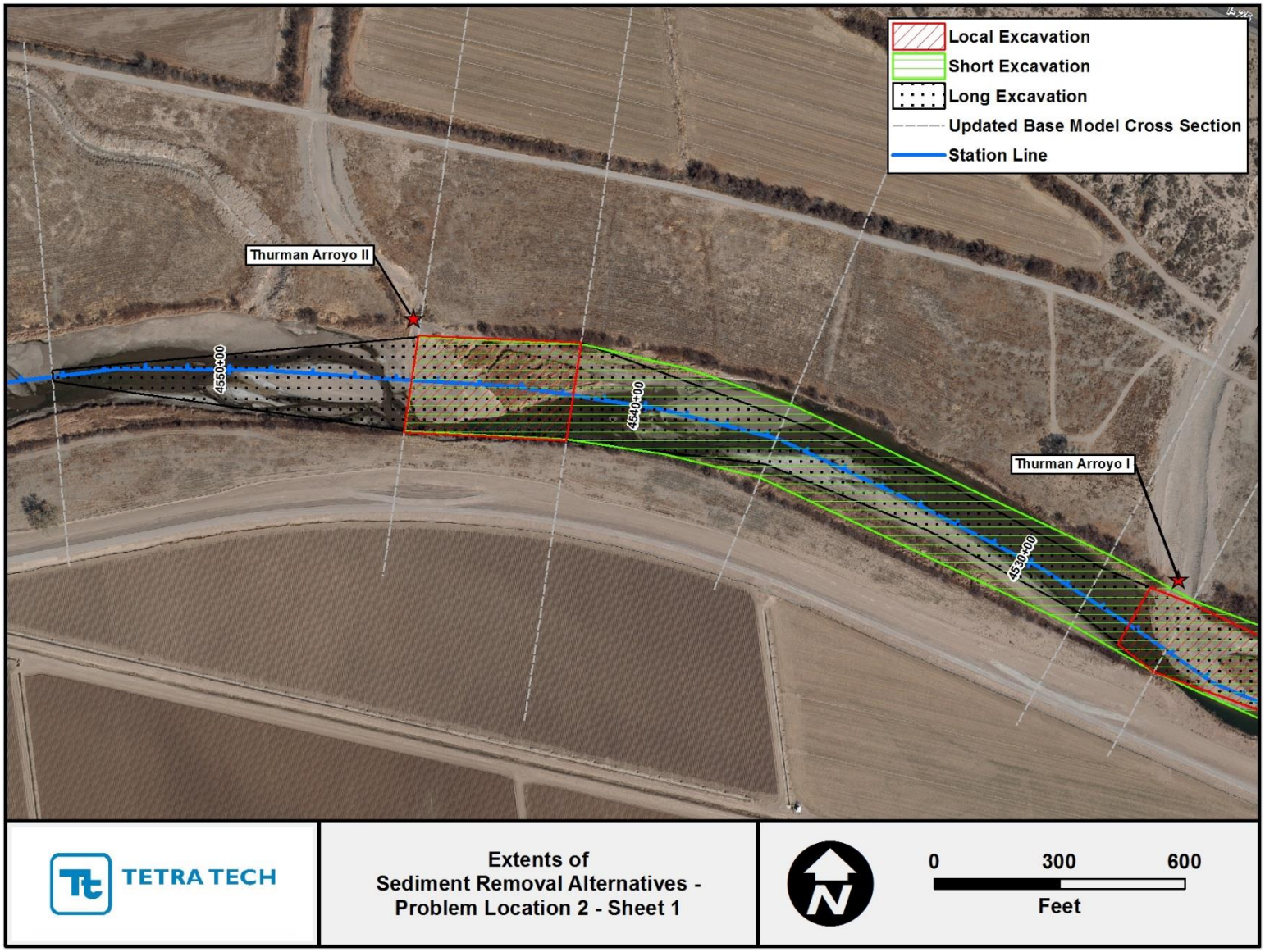


Figure G.2.3. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 2 (Sheet 1).

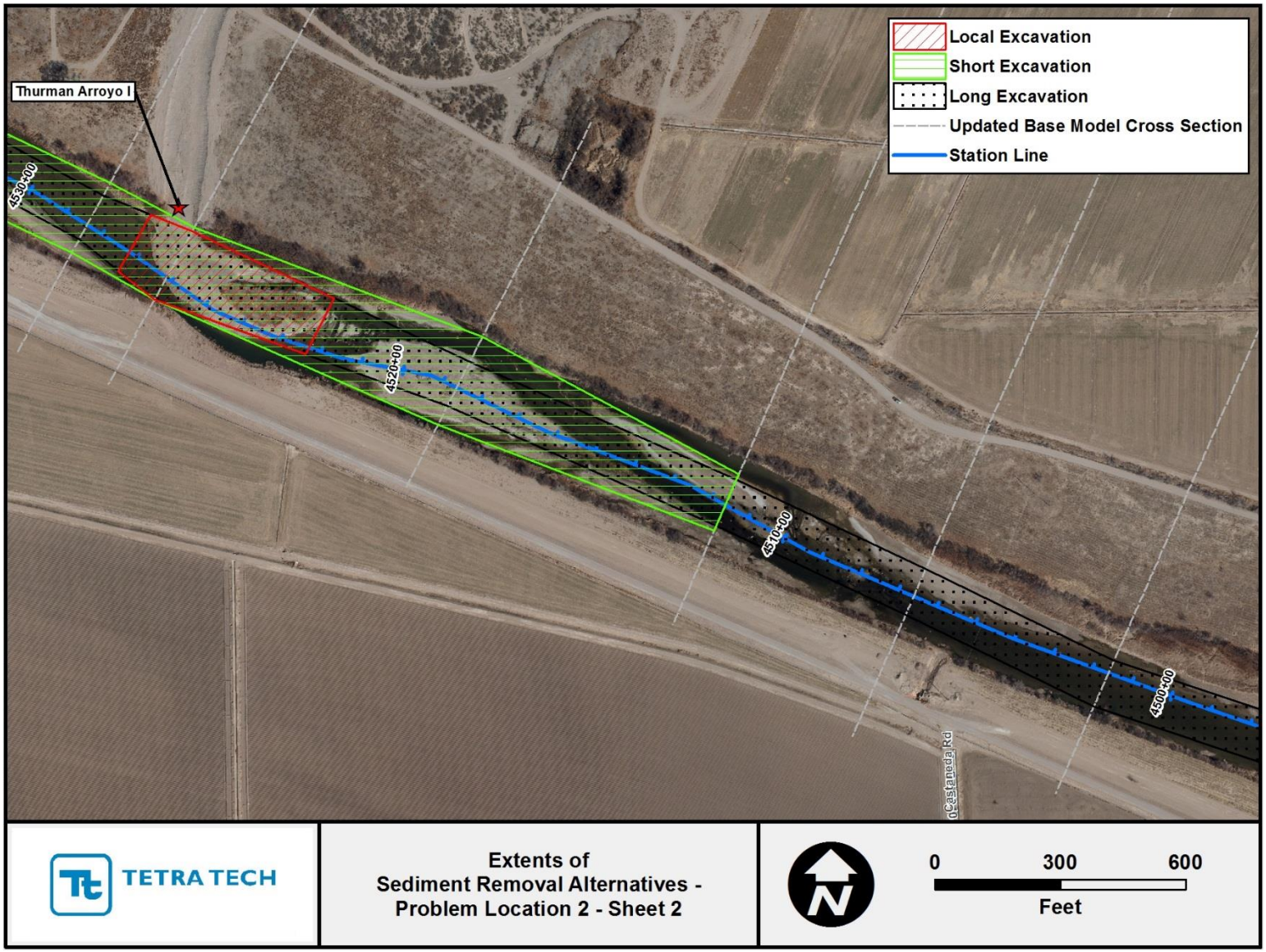


Figure G.2.4. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 2 (Sheet 2).

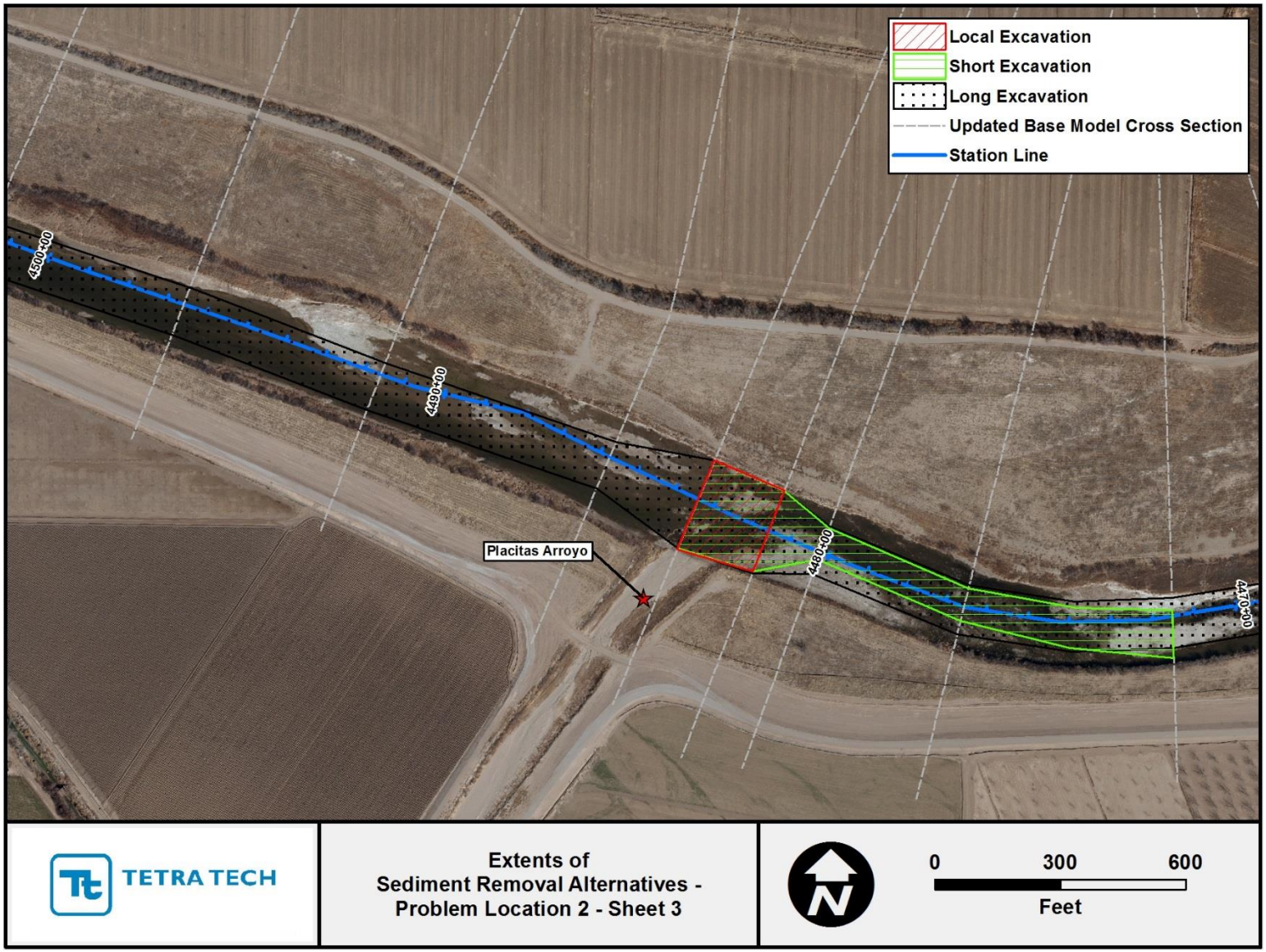


Figure G.2.5. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 2 (Sheet 3).

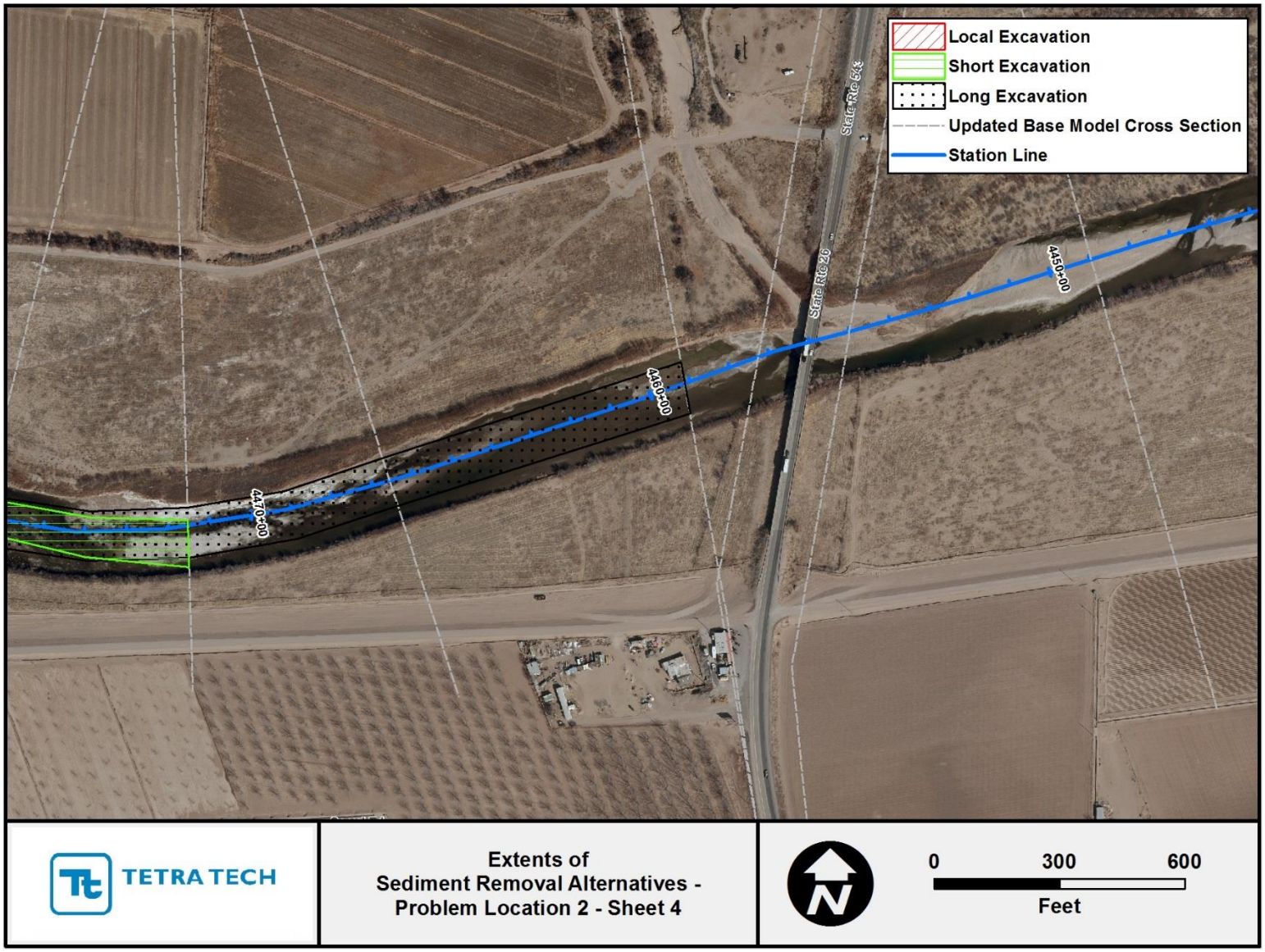


Figure G.2.6. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 2 (Sheet 4).

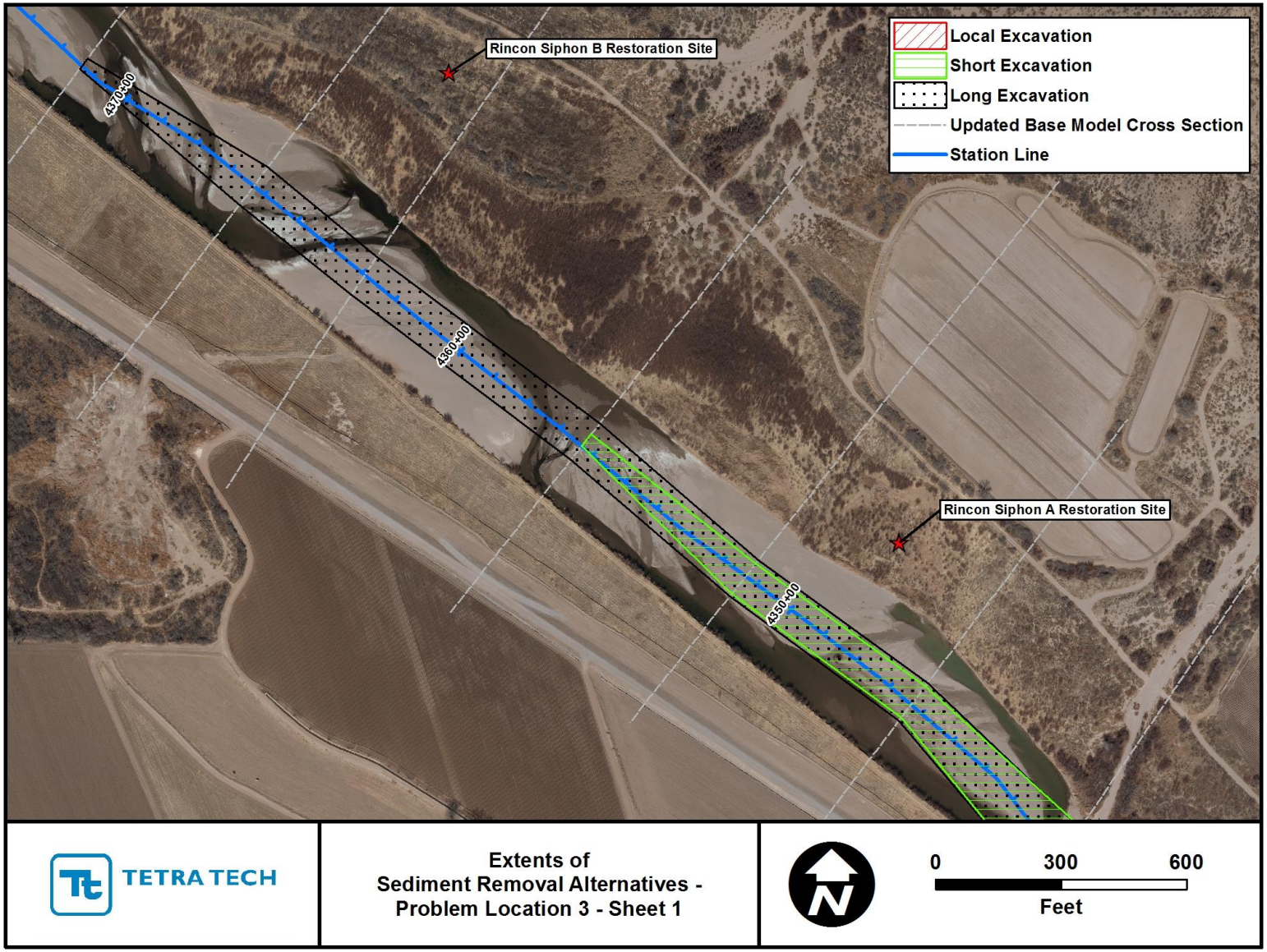


Figure G.2.7. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 3 (Sheet 1).

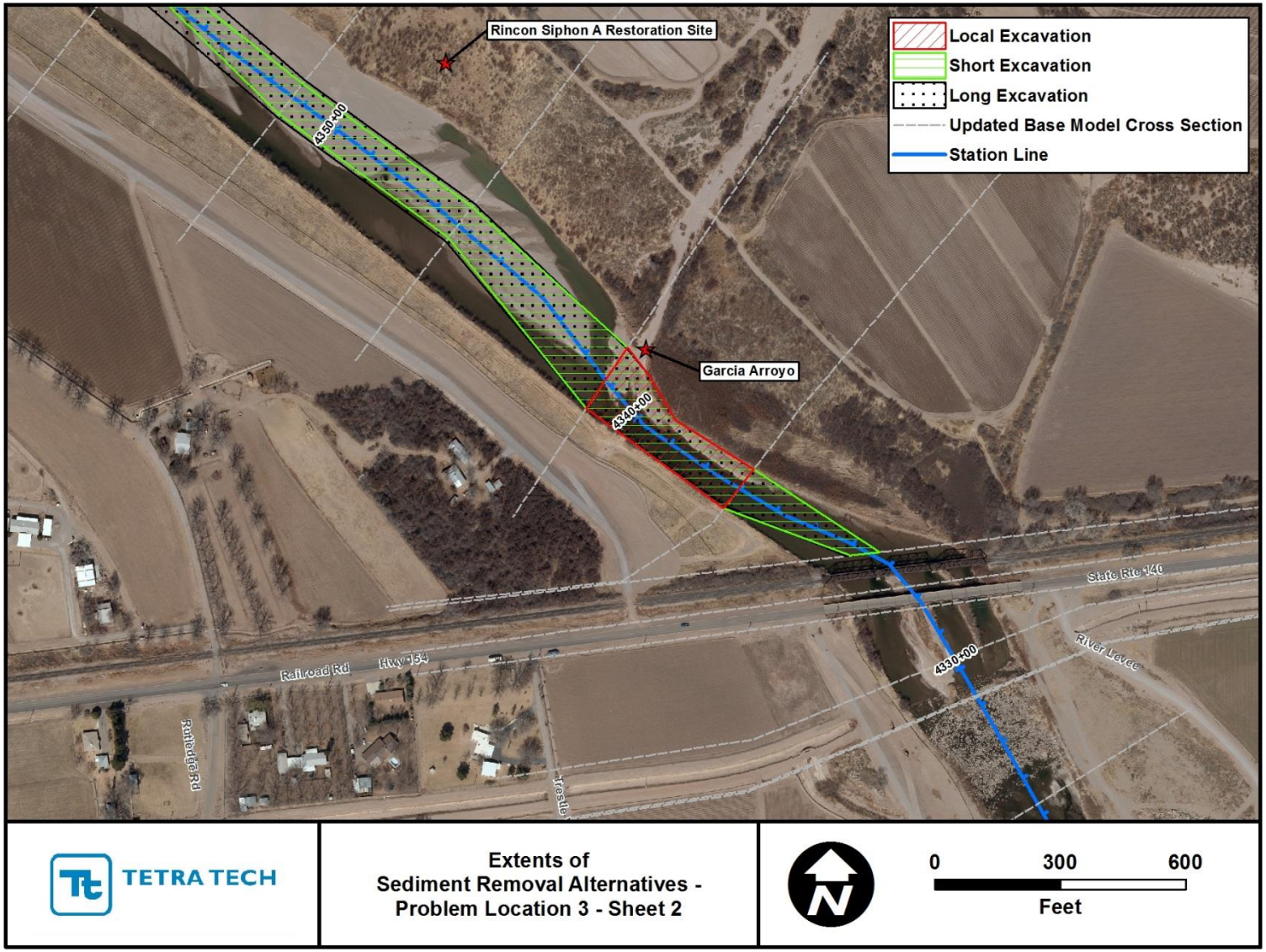


Figure G.2.8. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 3 (Sheet 2).

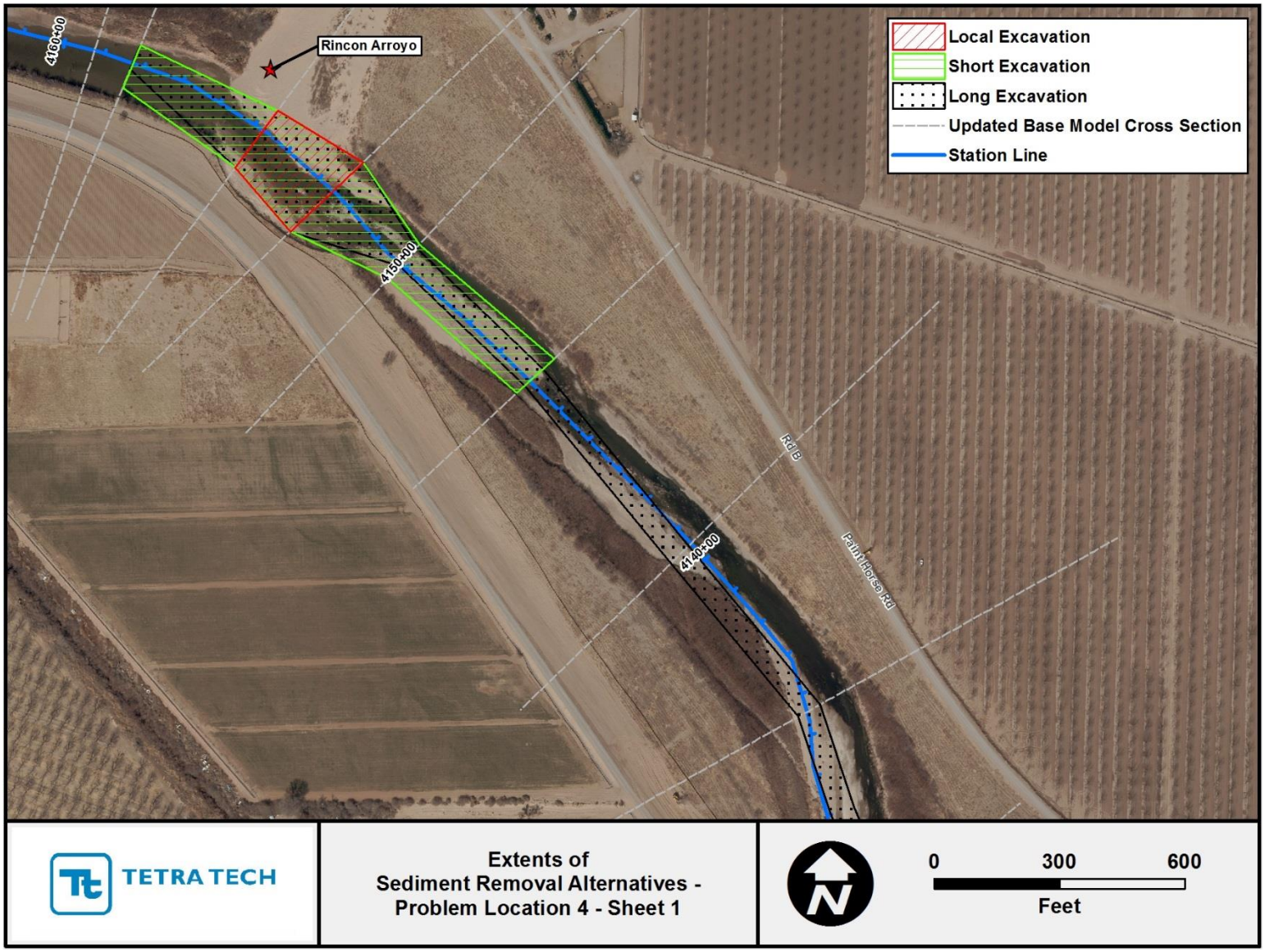


Figure G.2.9. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 4 (Sheet 1).

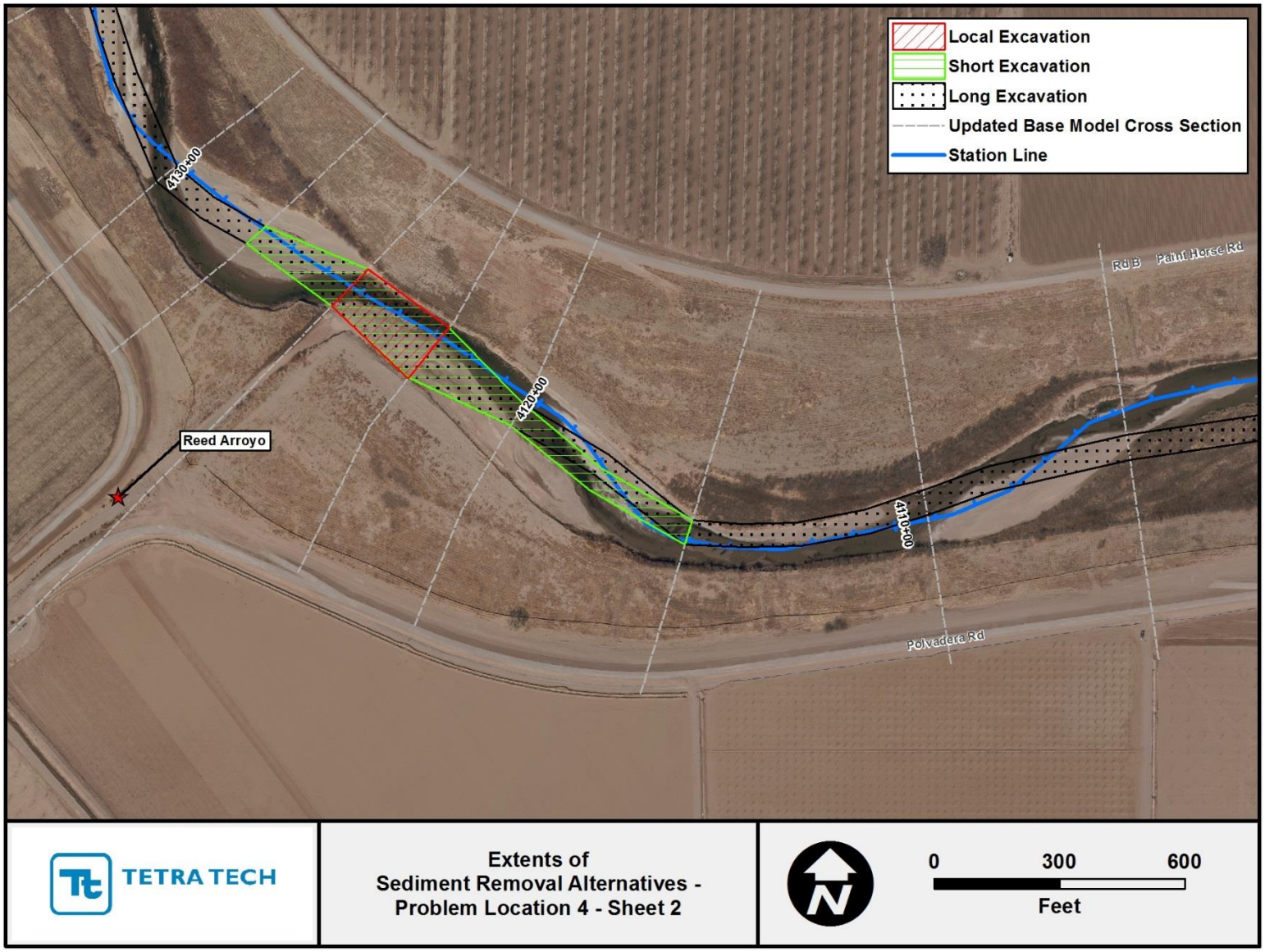


Figure G.2.10. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 4 (Sheet 2).

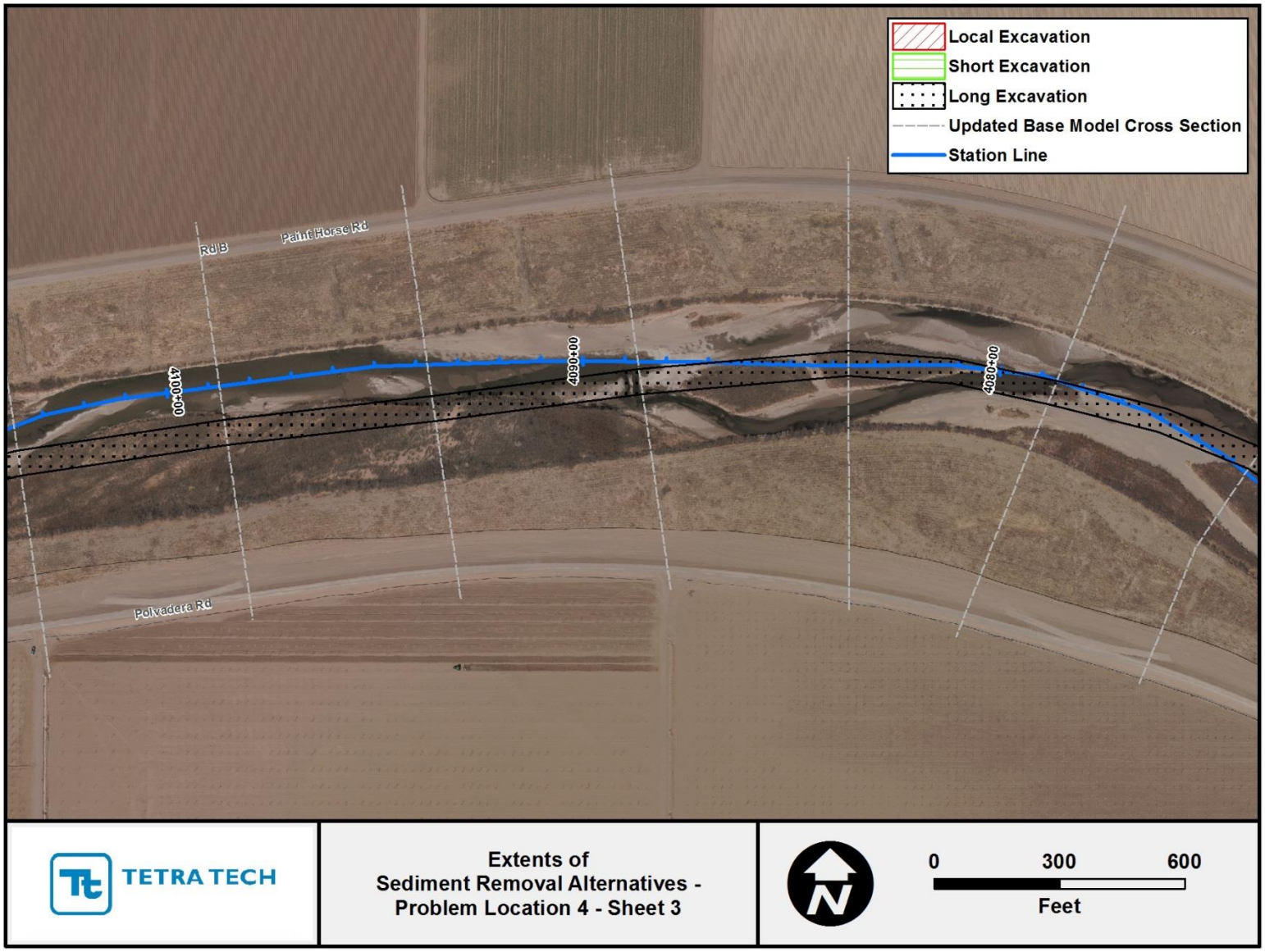


Figure G.2.11. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 4 (Sheet 3).

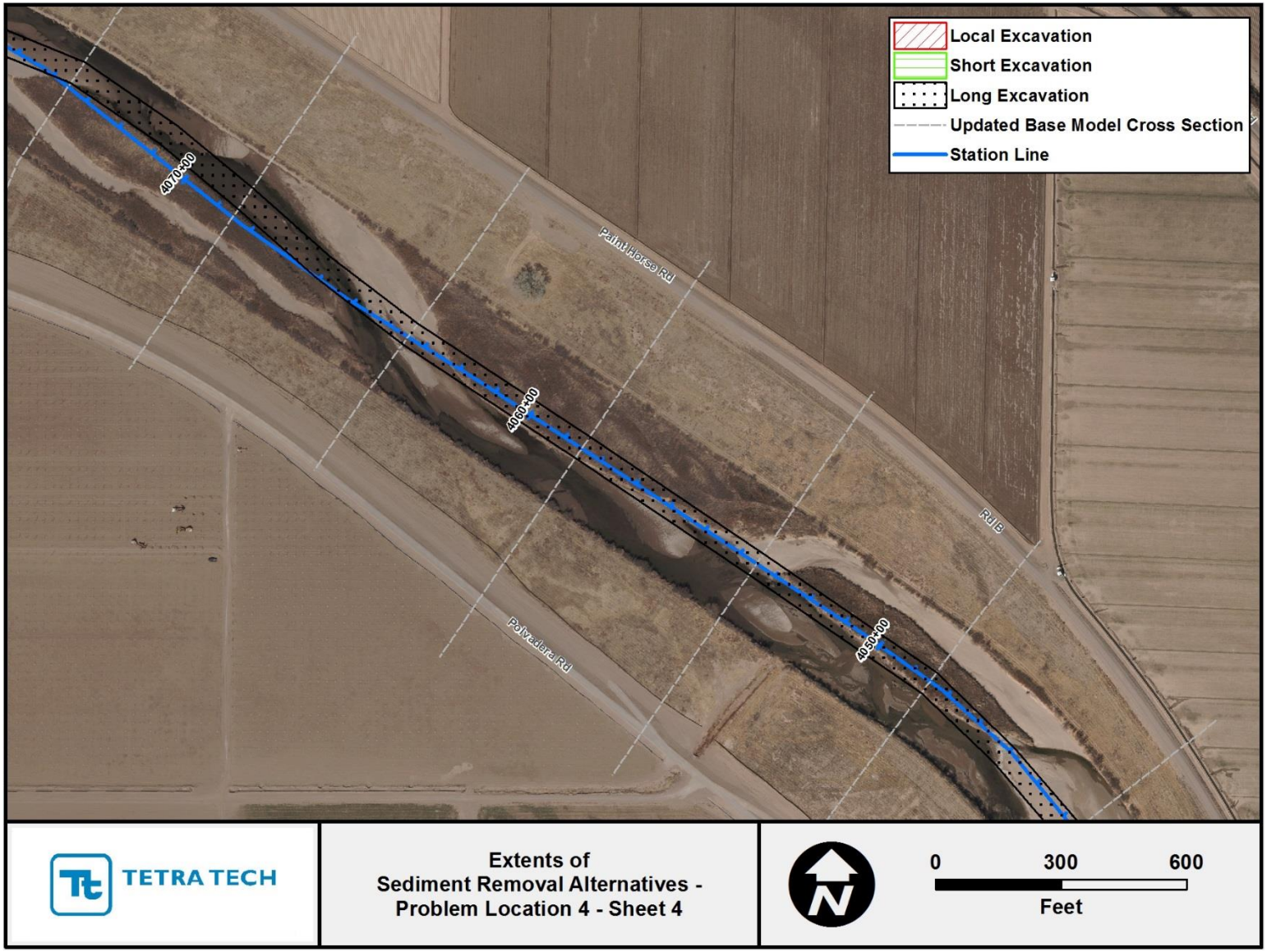


Figure G.2.12. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 4 (Sheet 4).

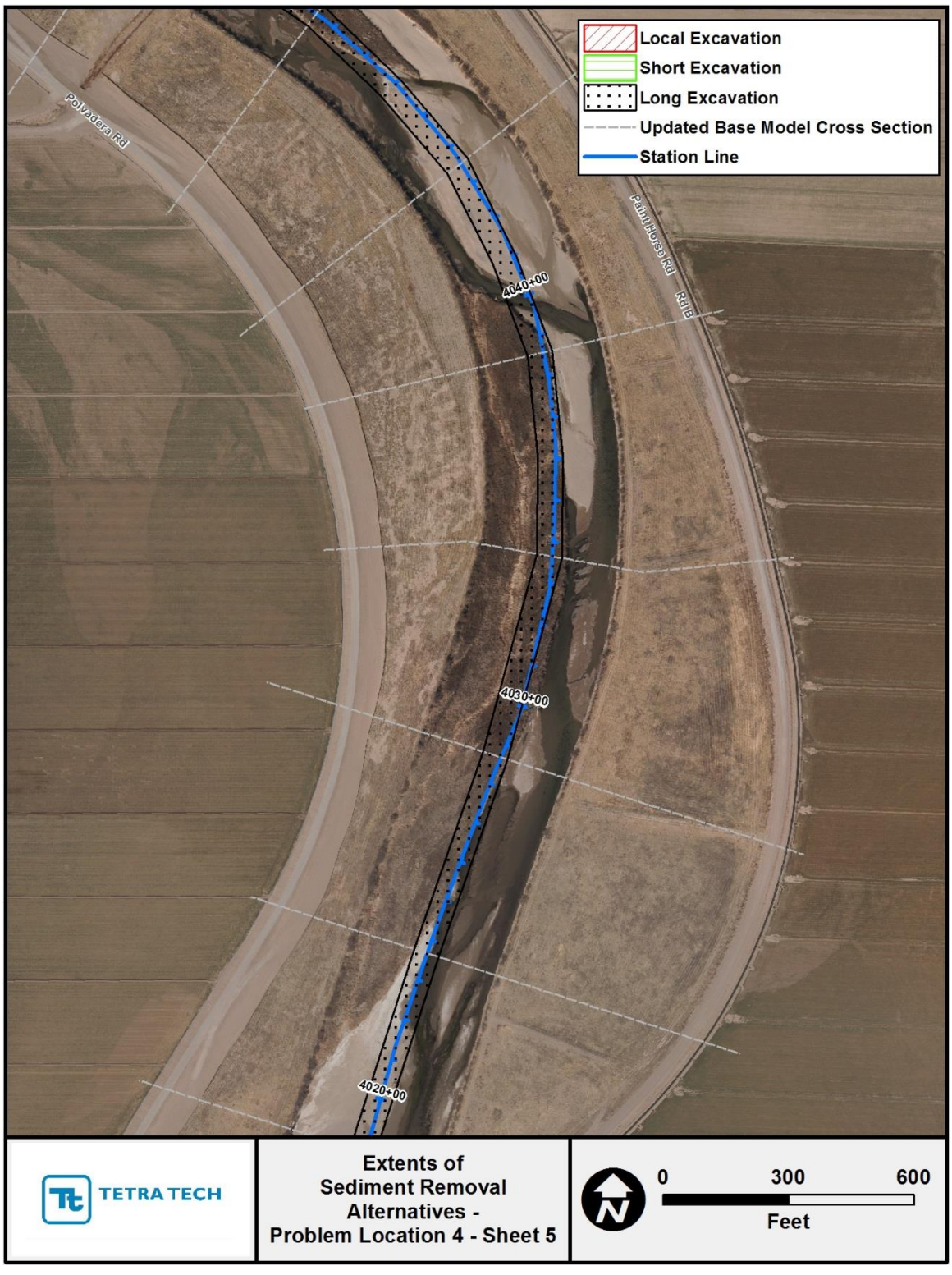


Figure G.2.13. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 4 (Sheet 5).

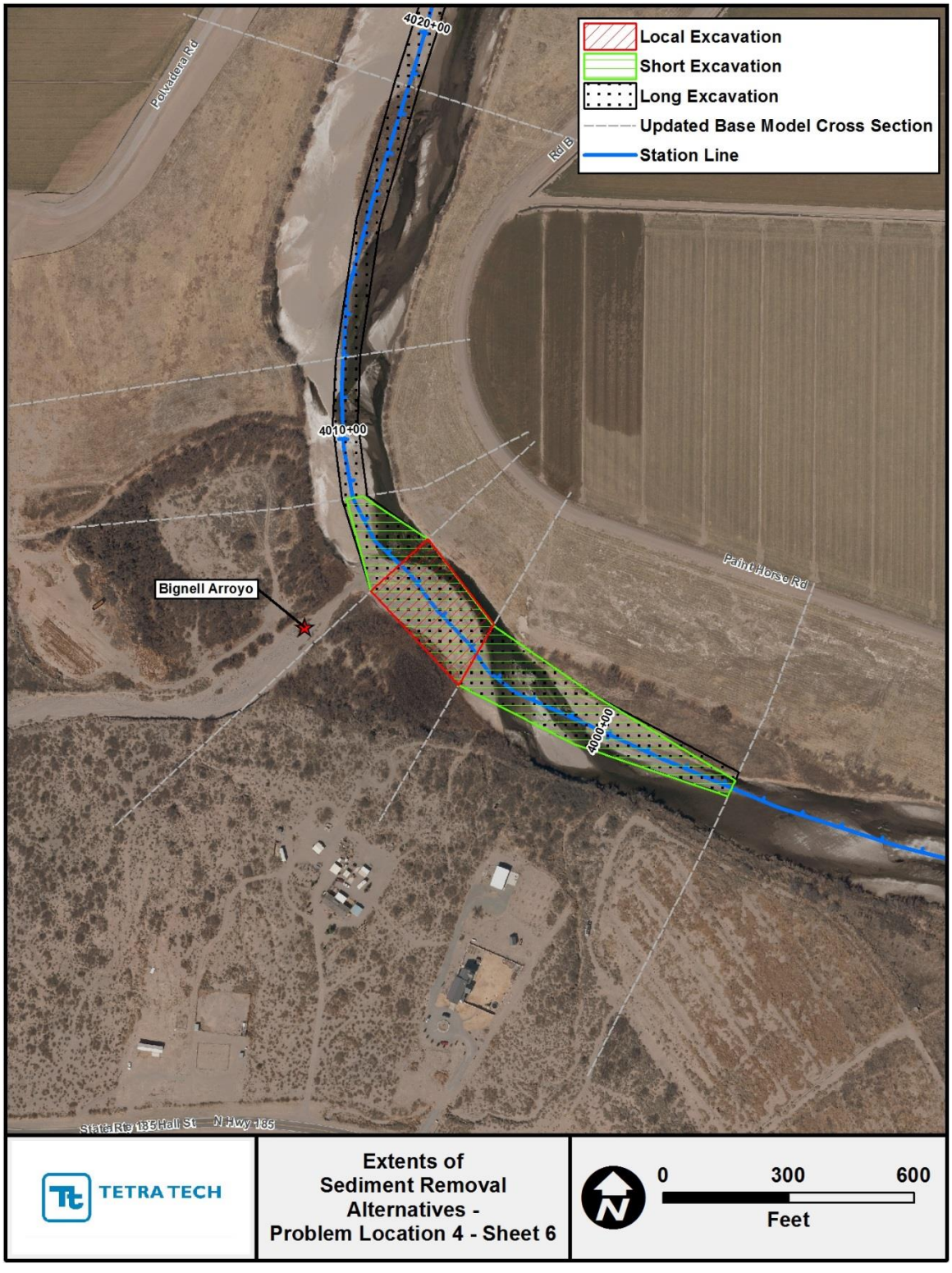


Figure G.2.14. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 4 (Sheet 6).

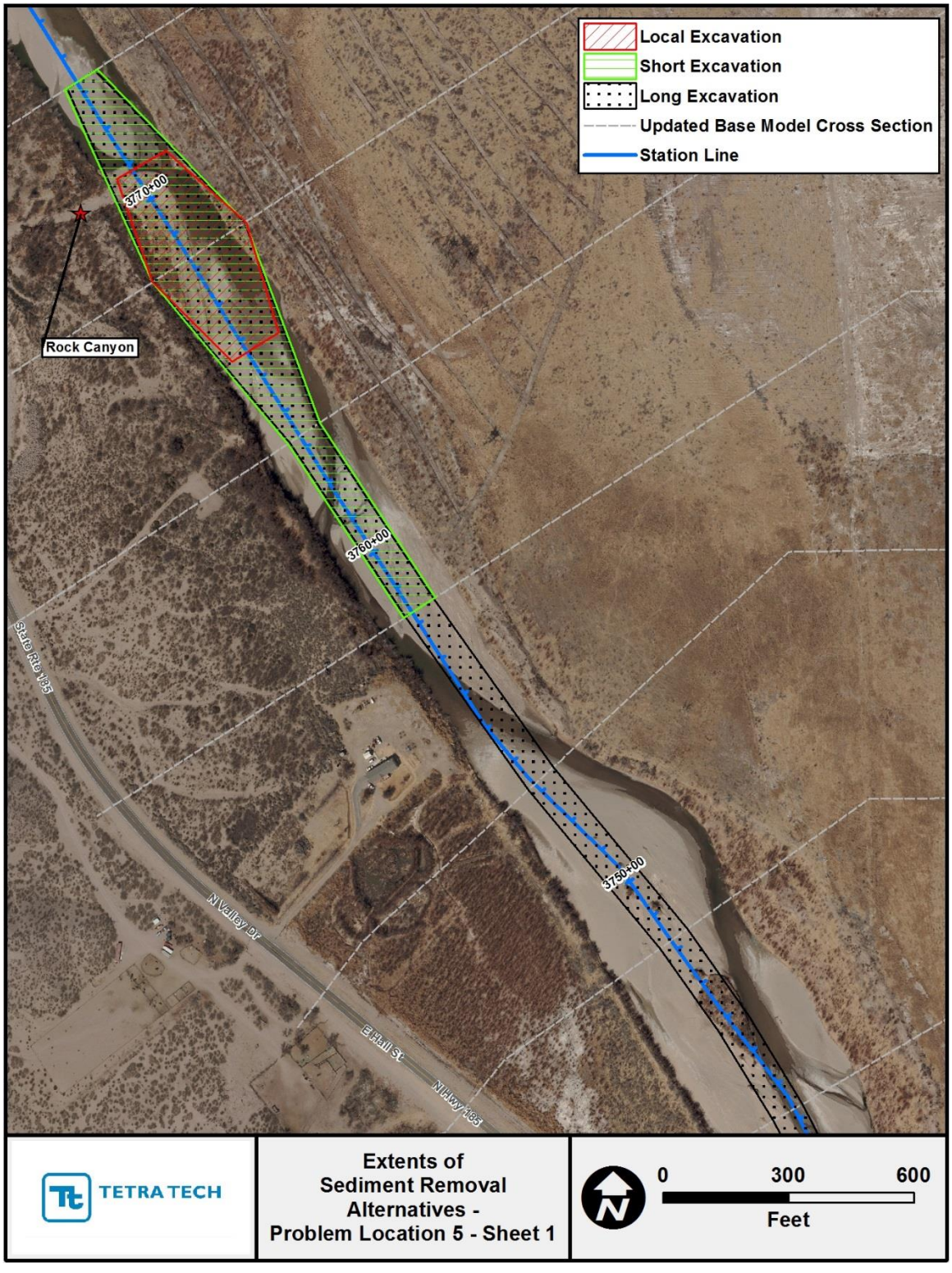


Figure G.2.15. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 5 (Sheet 1).

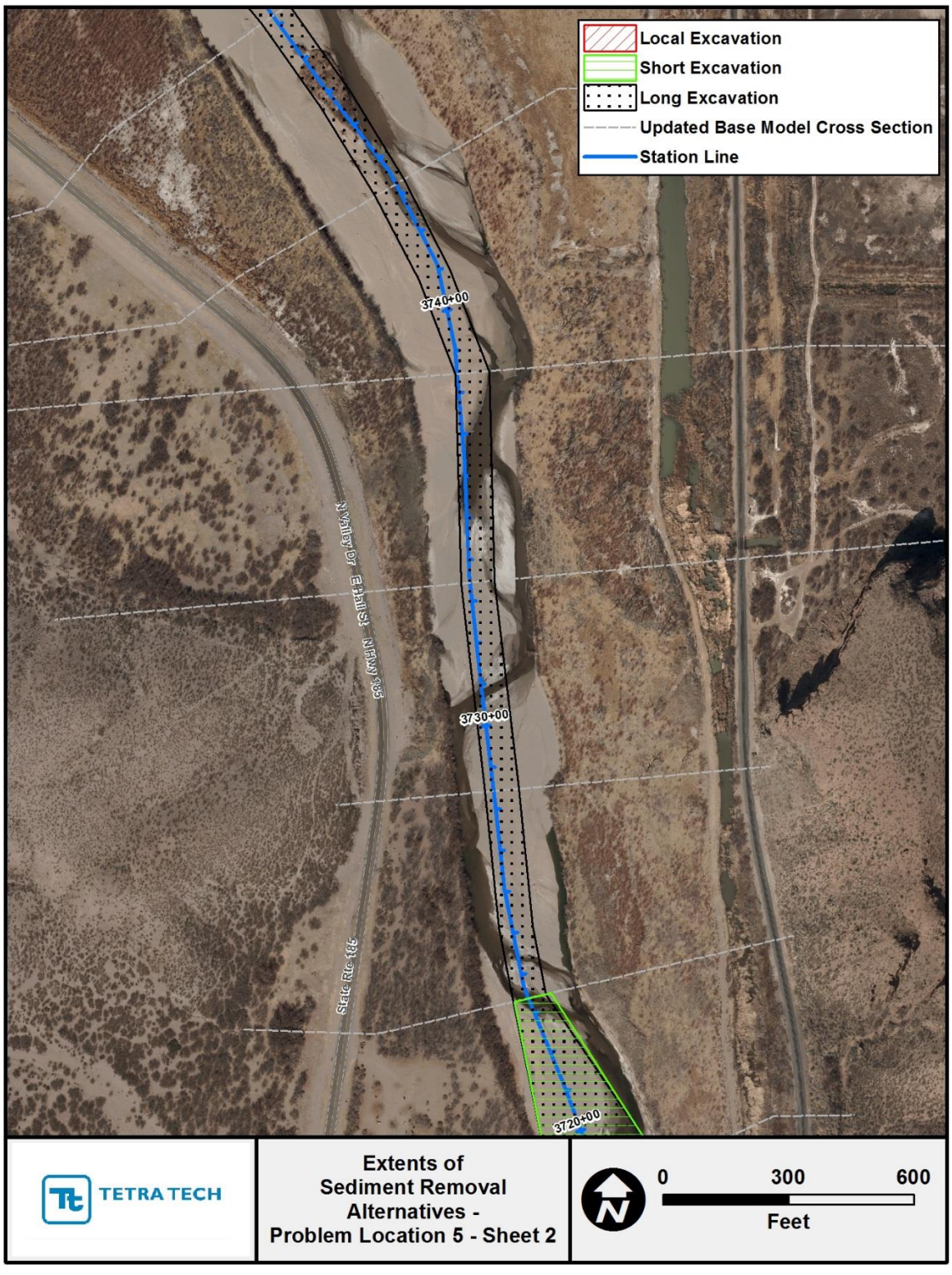


Figure G.2.16. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 5 (Sheet 2).

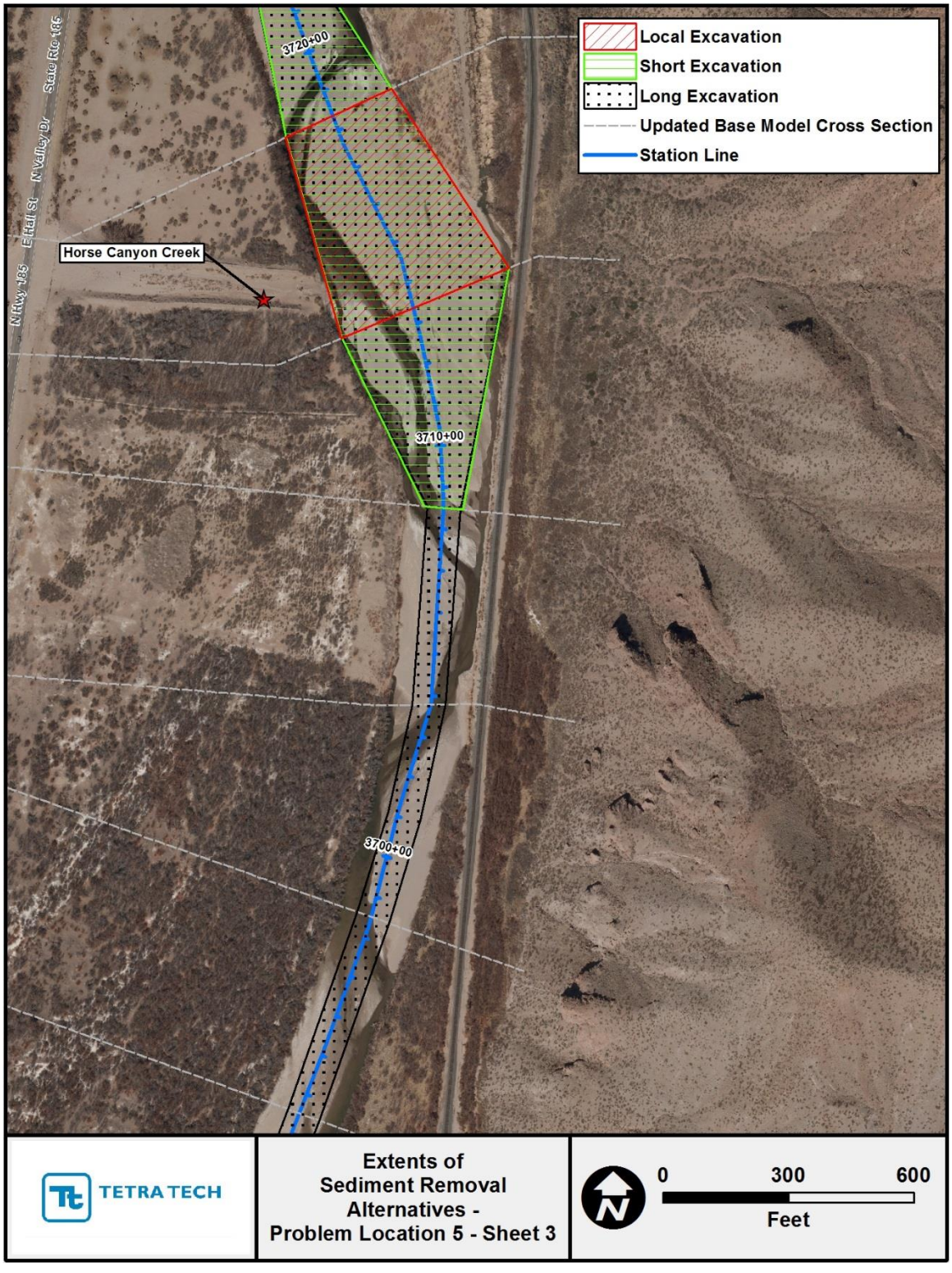


Figure G.2.17. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 5 (Sheet 3).

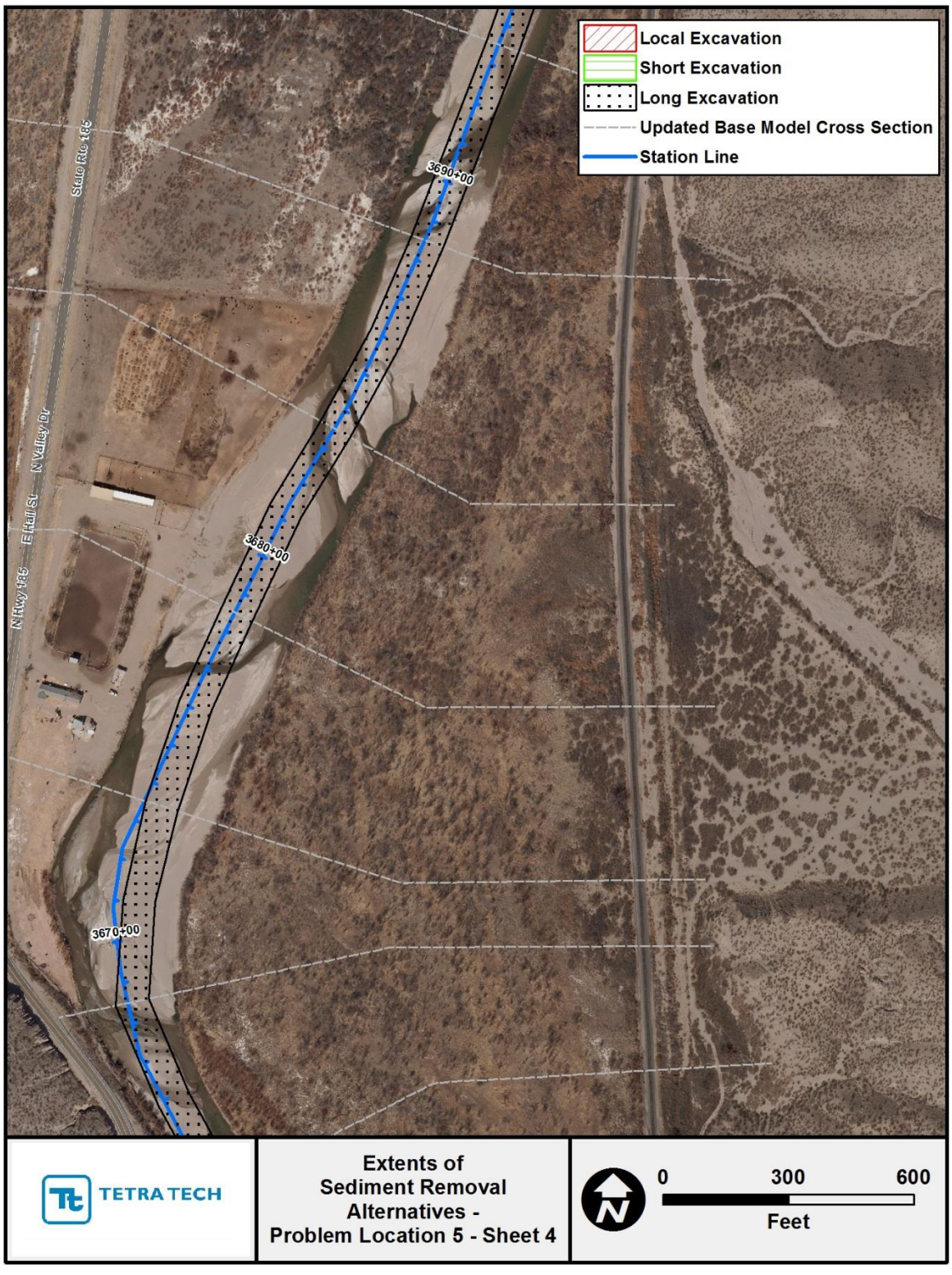


Figure G.2.18. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 5 (Sheet 4).

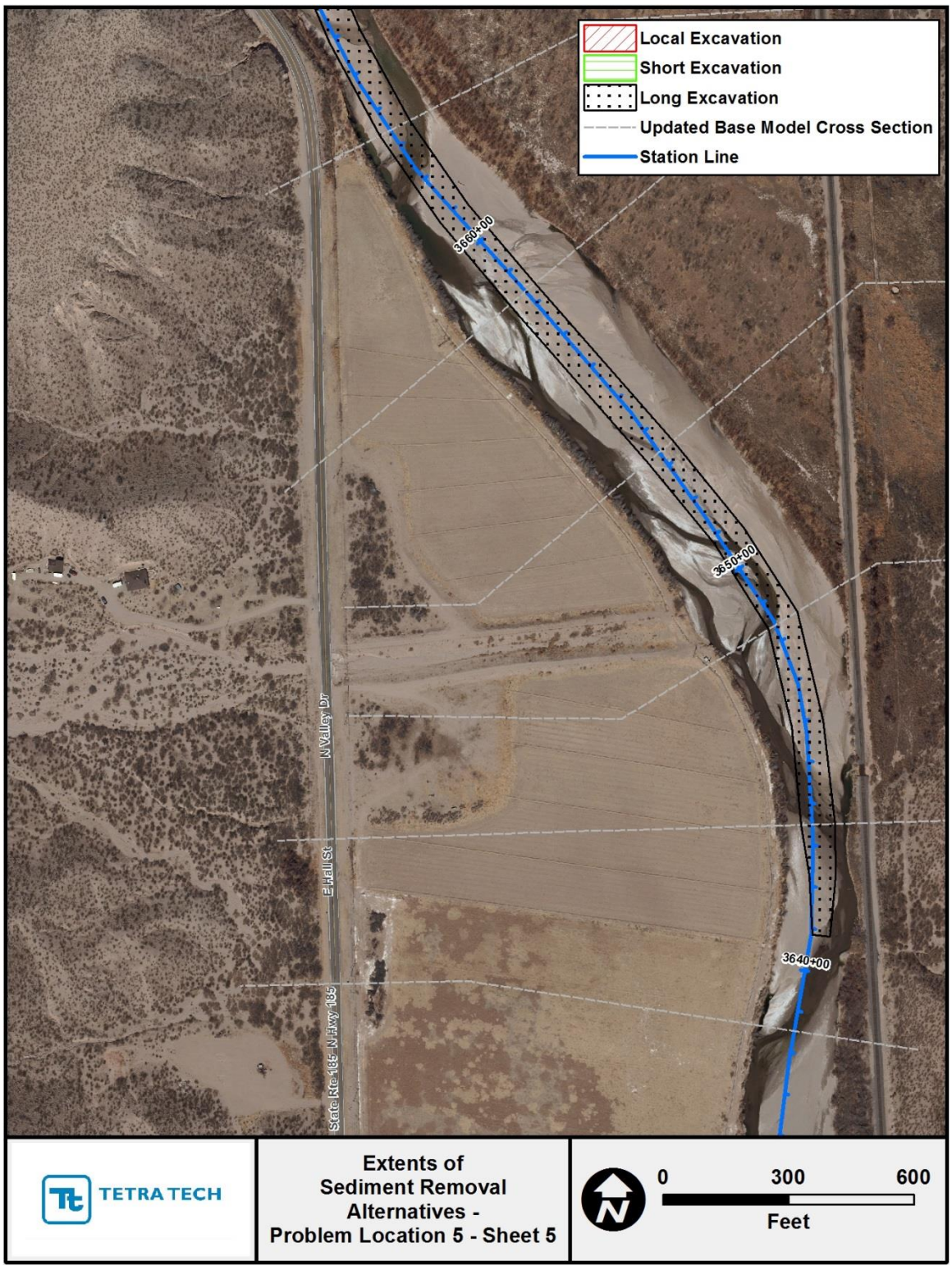


Figure G.2.19. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 5 (Sheet 5).

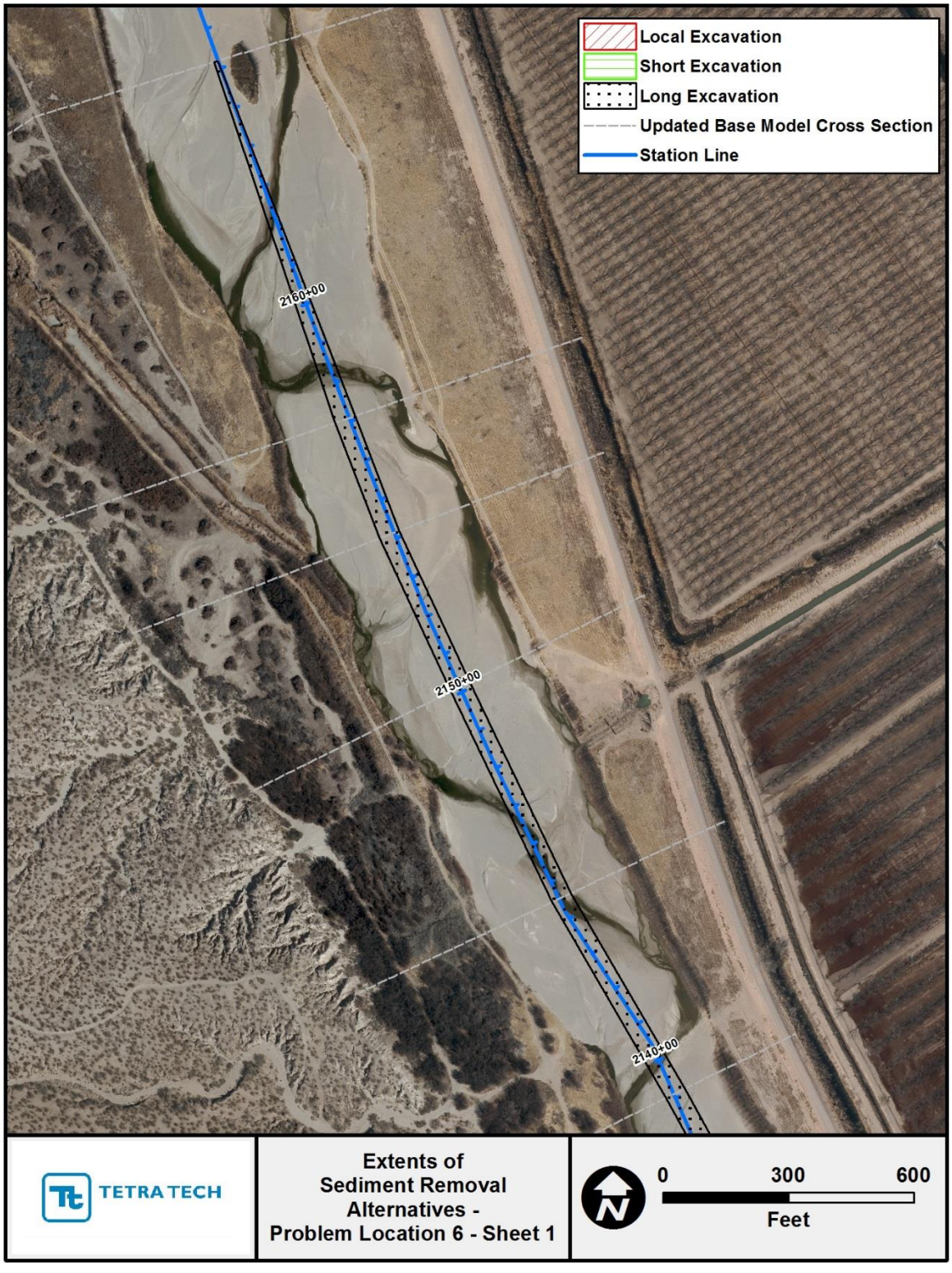


Figure G.2.20. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 6 (Sheet 1).

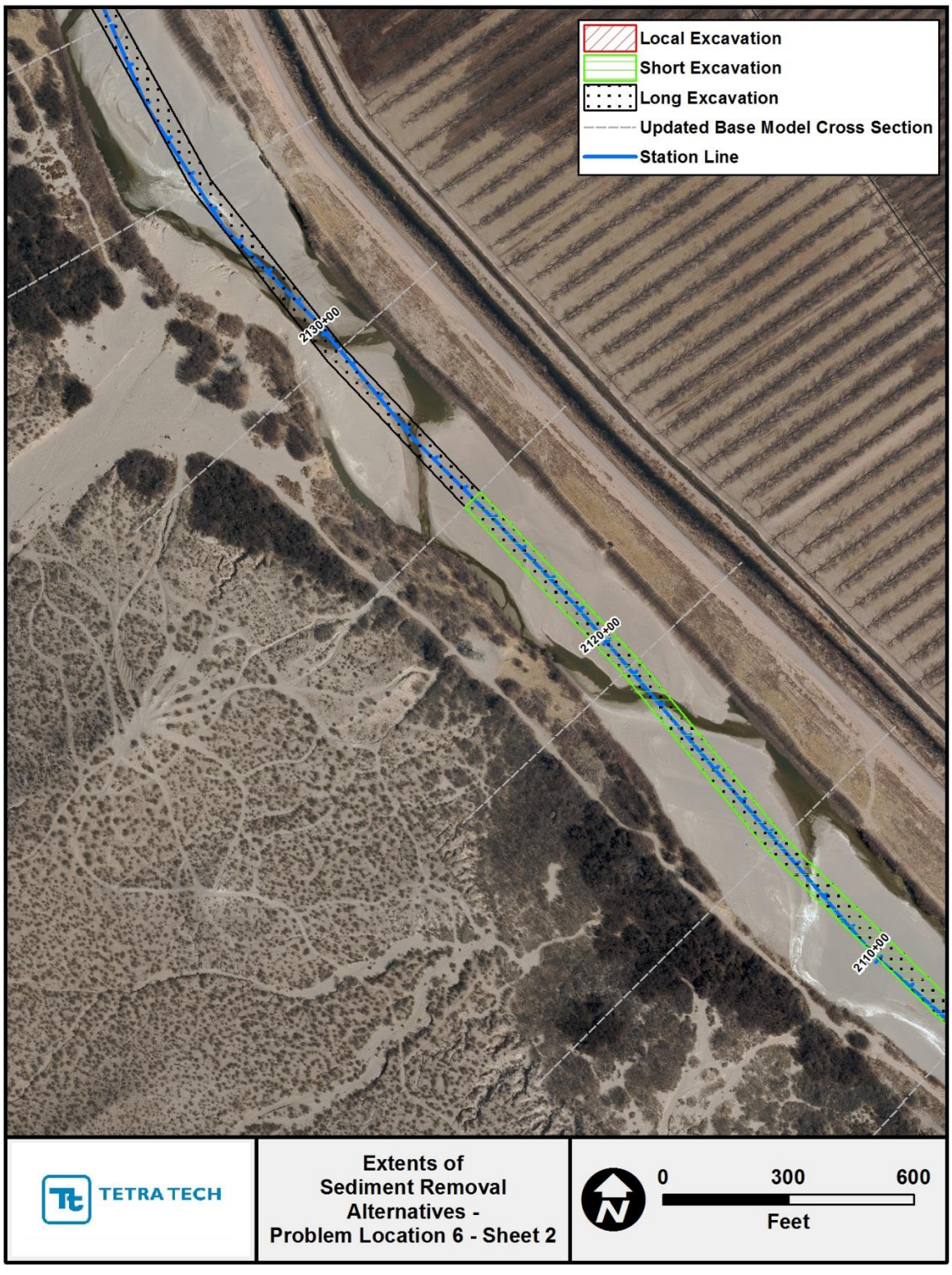


Figure G.2.21. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 6 (Sheet 2).

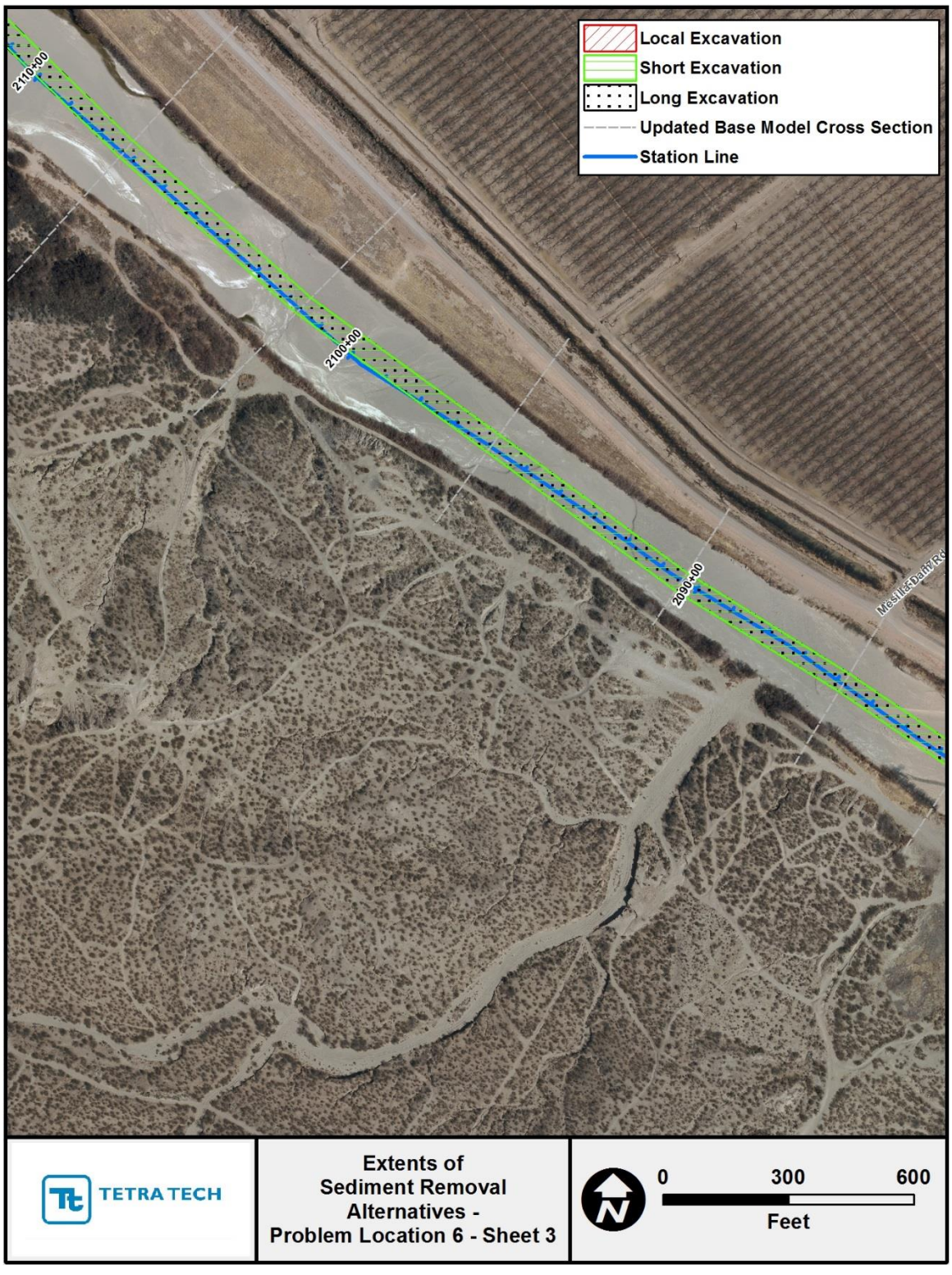


Figure G.2.22. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 6 (Sheet 3).

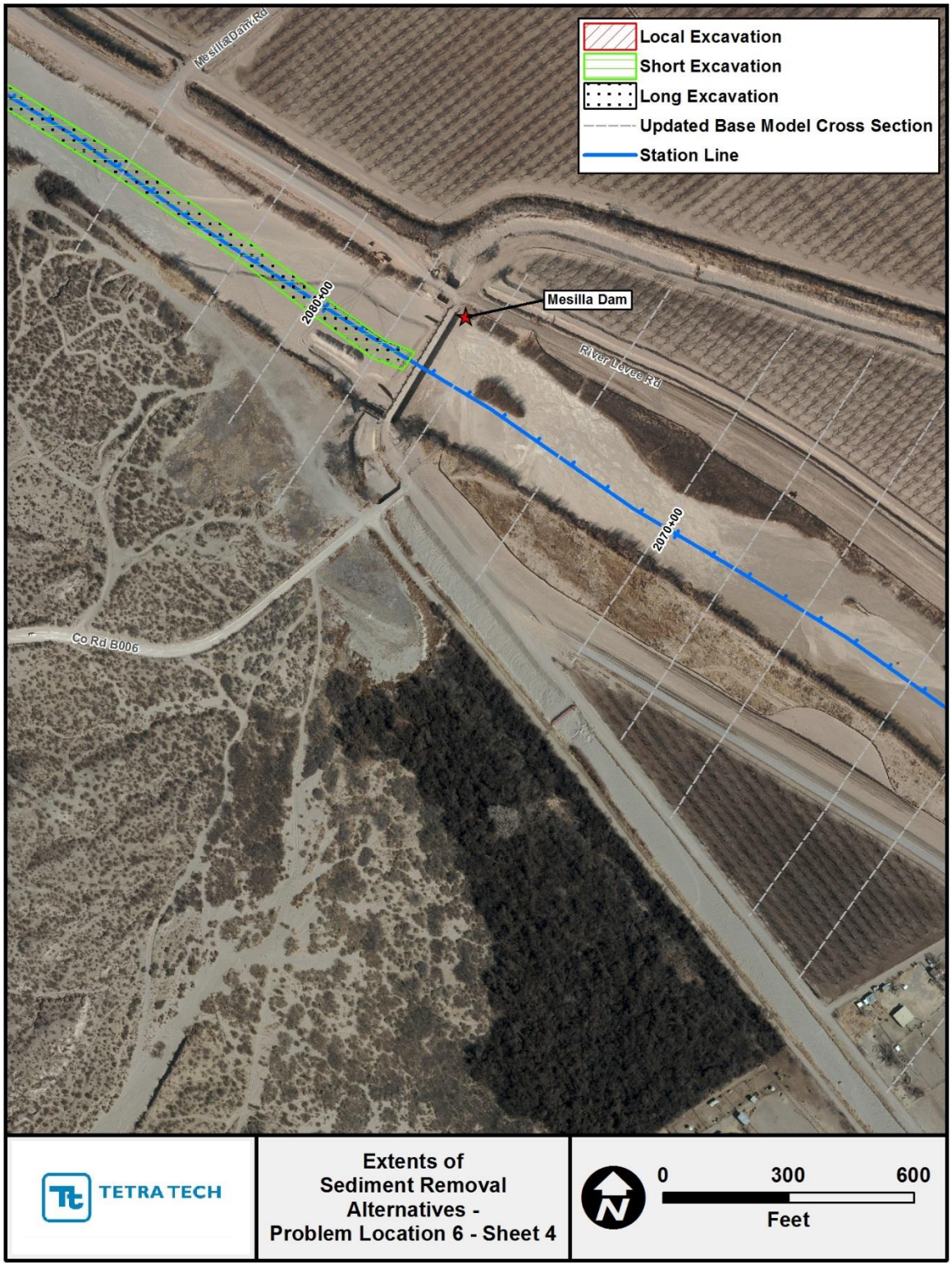


Figure G.2.23. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 6 (Sheet 4).

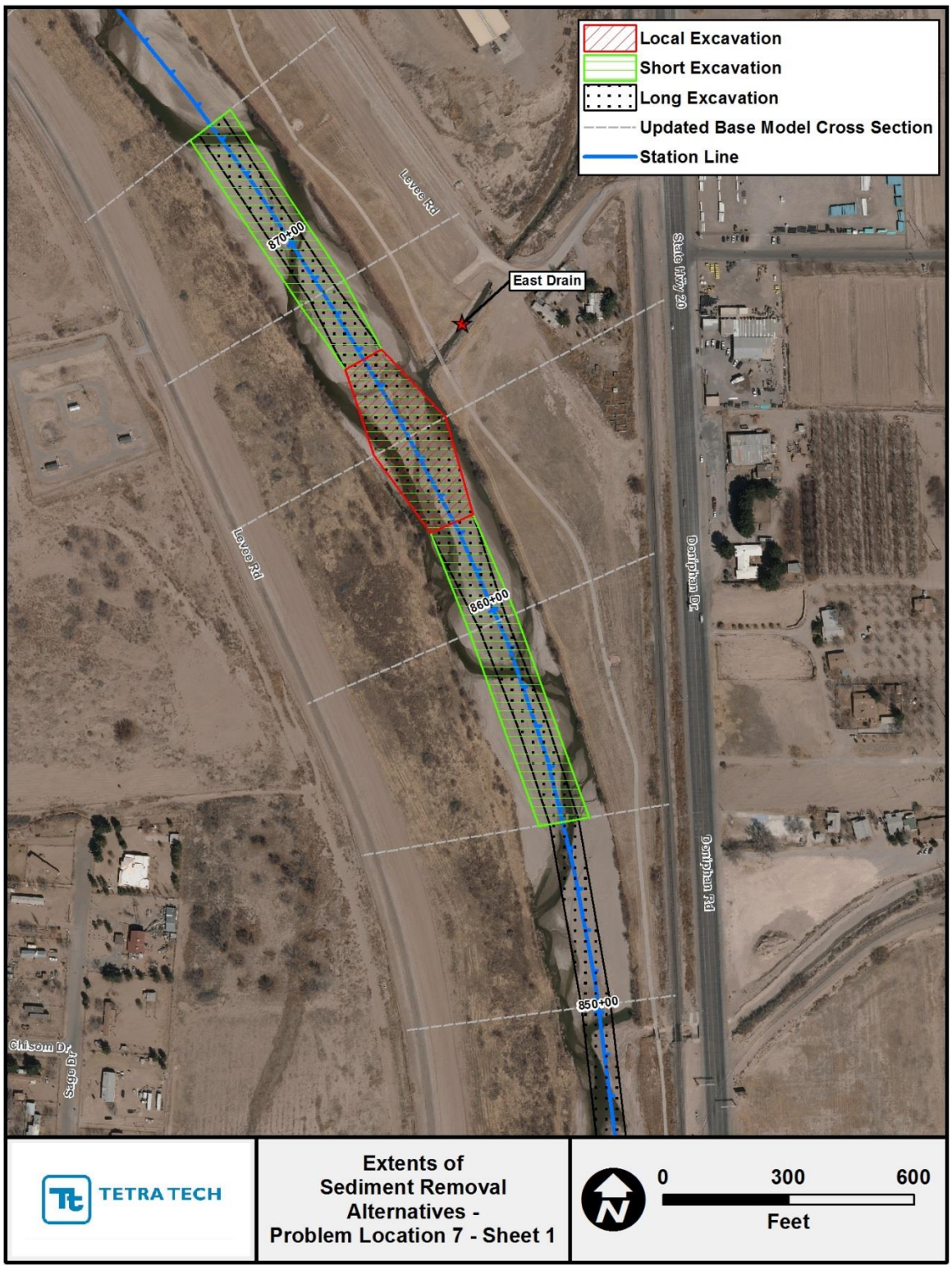


Figure G.2.24. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 7 (Sheet 1).

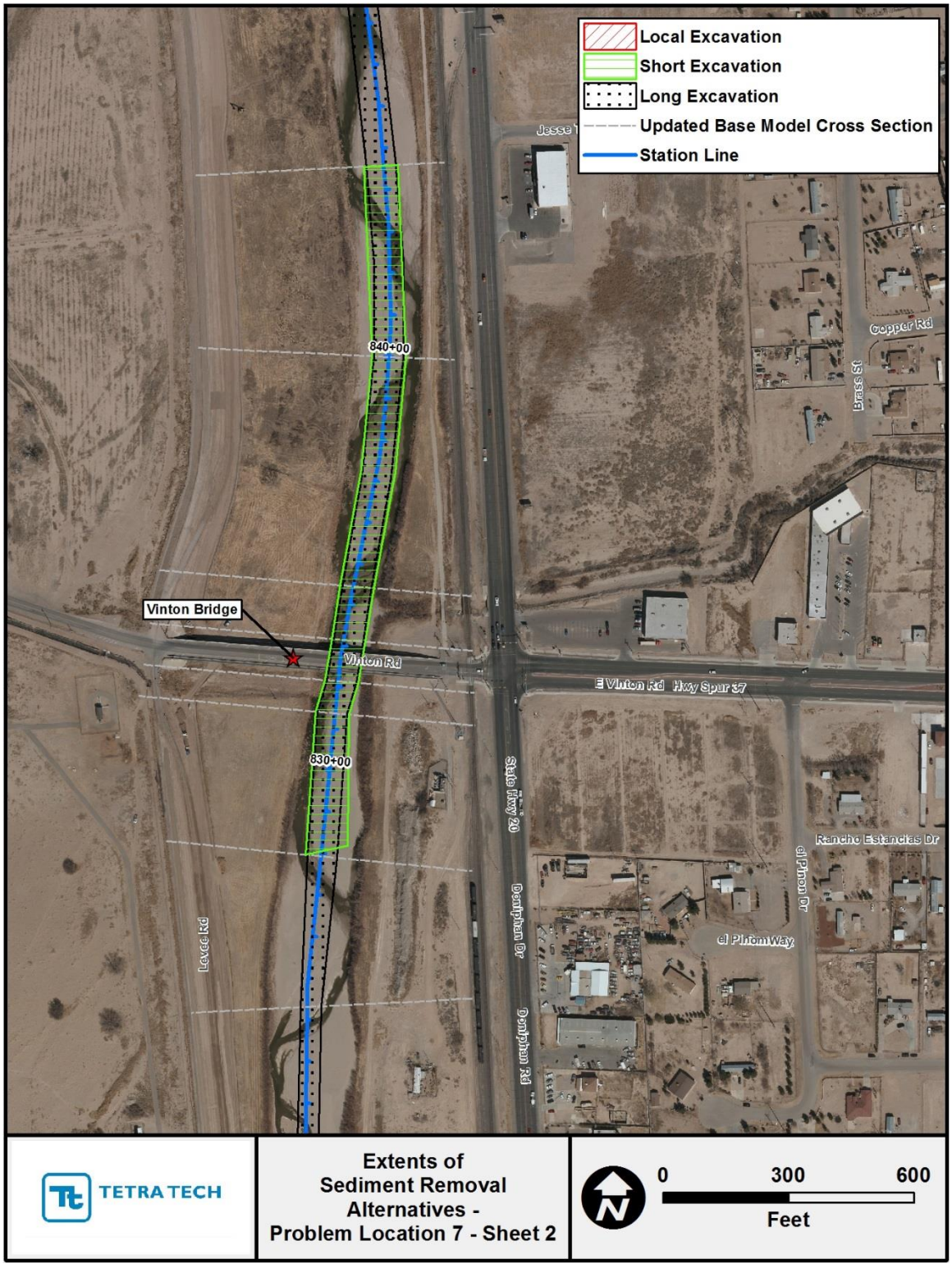


Figure G.2.25. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 7 (Sheet 2).

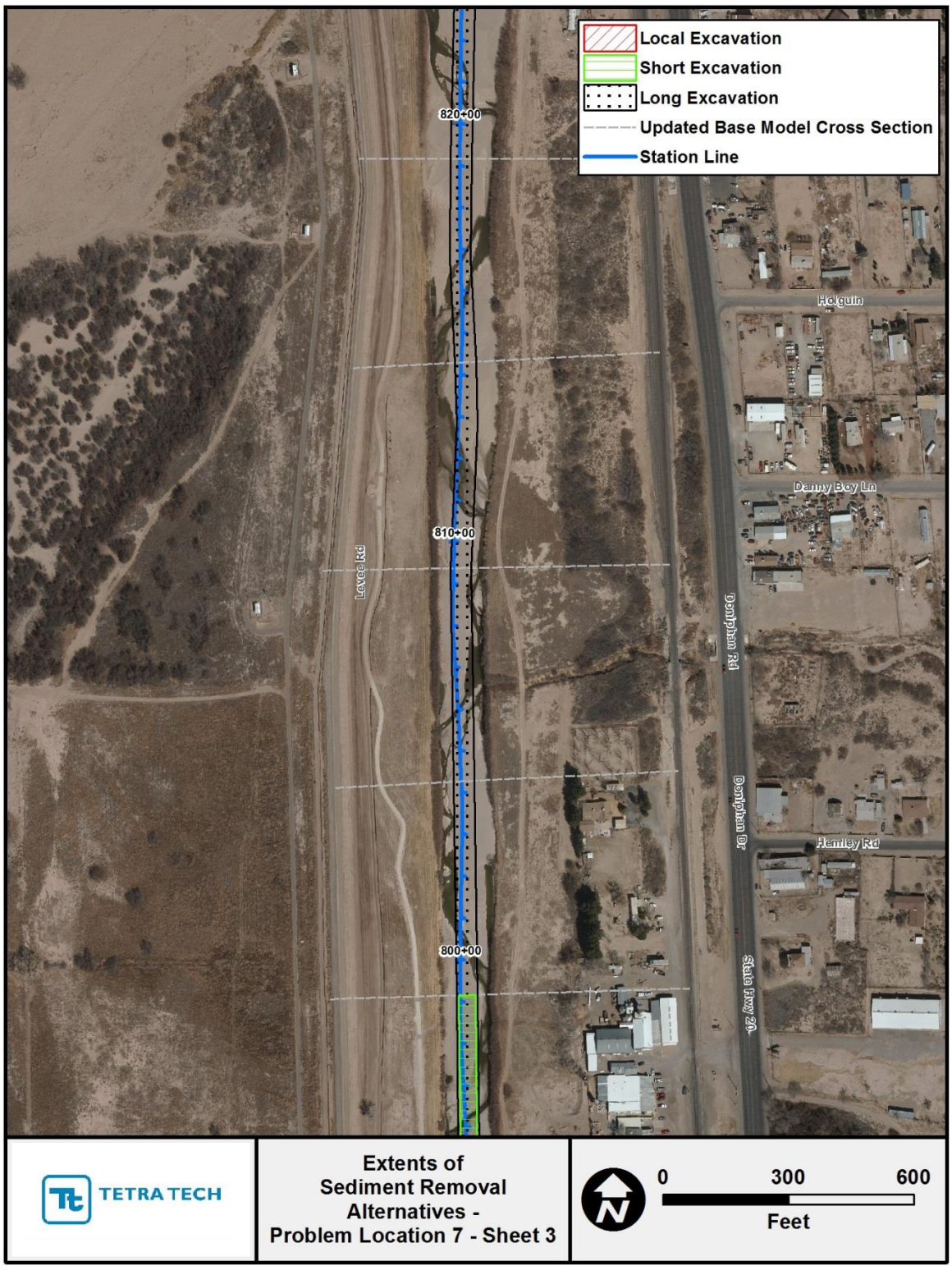


Figure G.2.26. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 7 (Sheet 3).

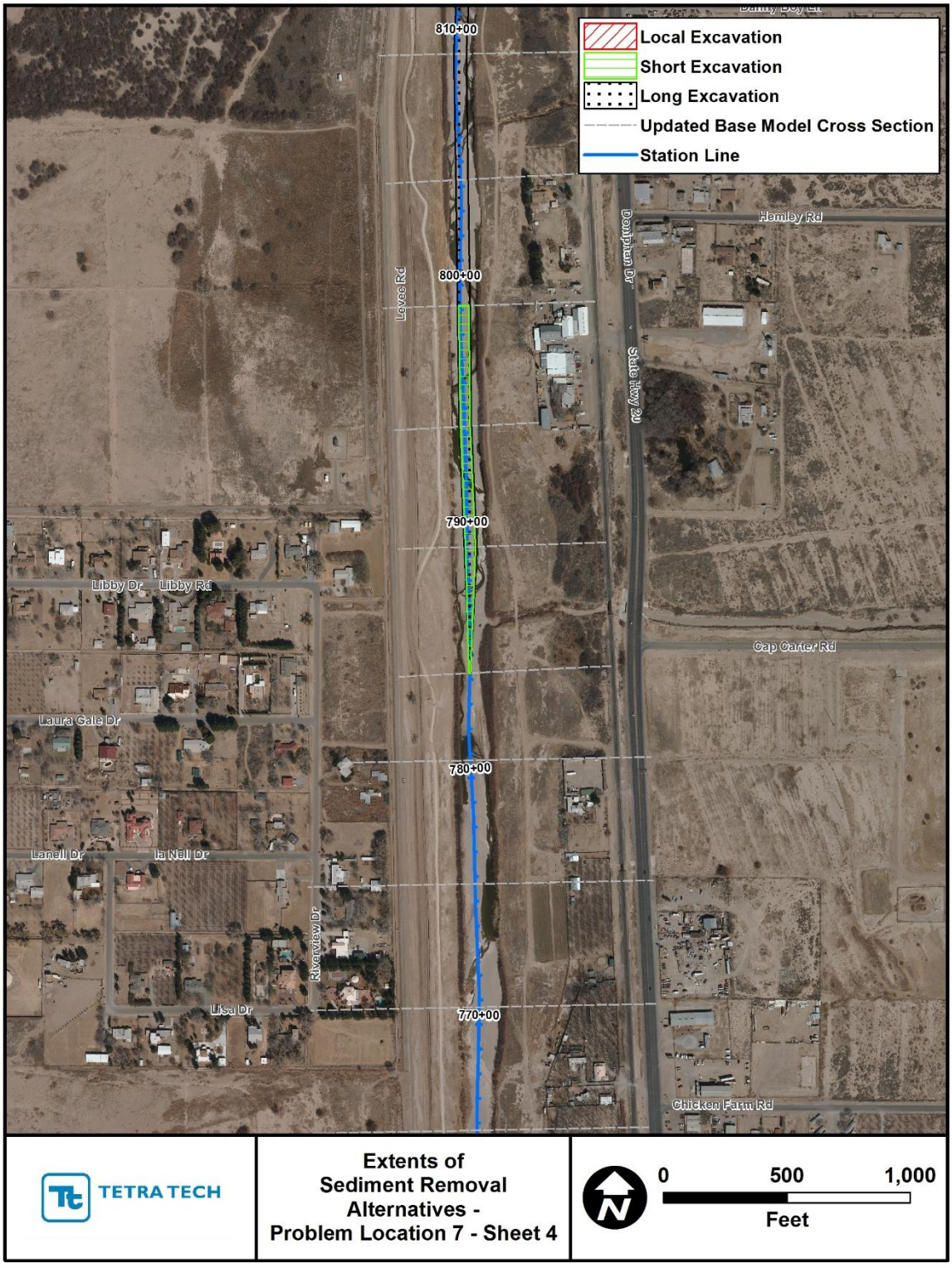


Figure G.2.27. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 7 (Sheet 4).

Figure G.2.28. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 8 (Sheet 1).

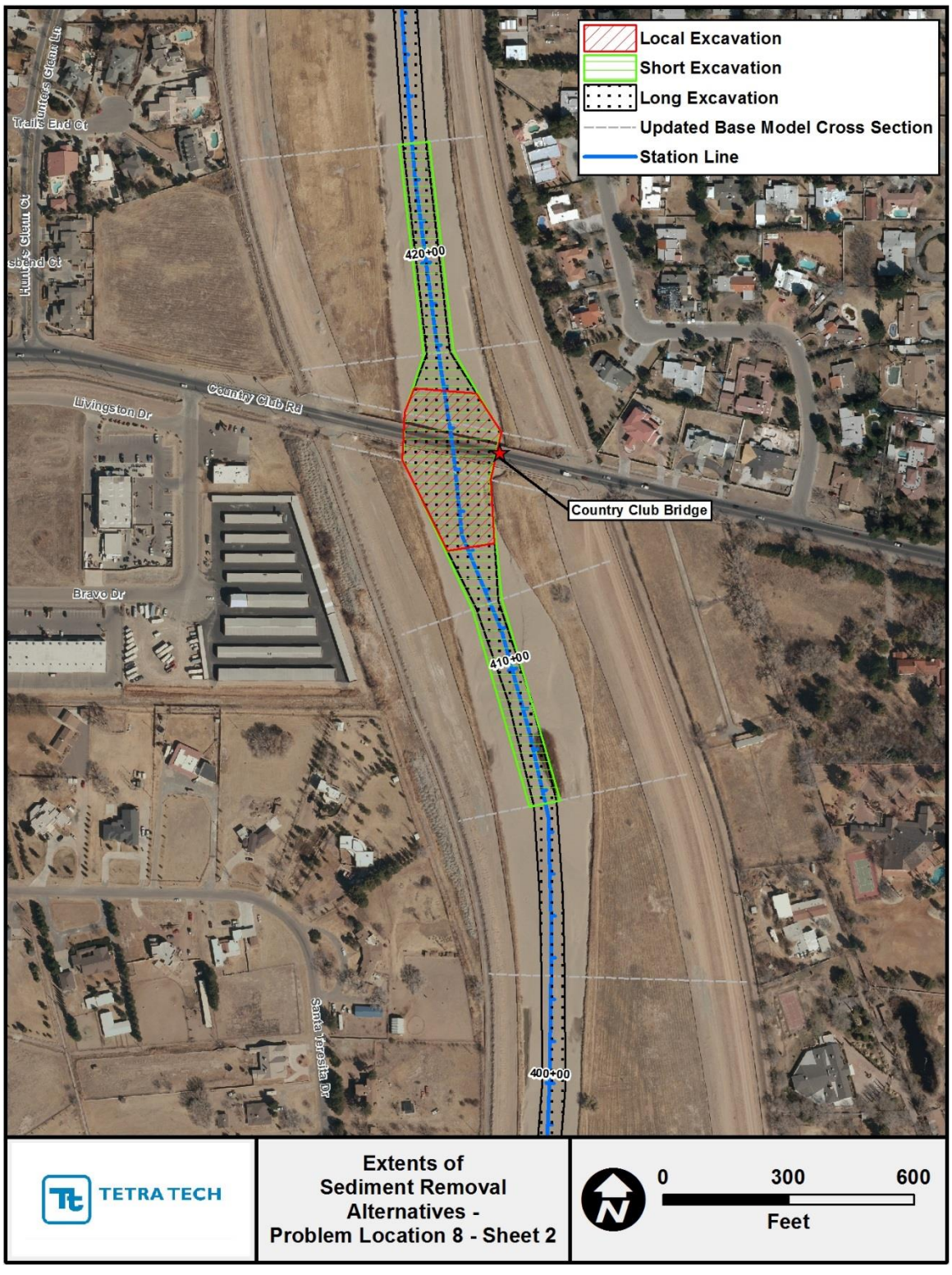


Figure G.2.29. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 8 (Sheet 2).

Figure G.2.30. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 8 (Sheet 3).

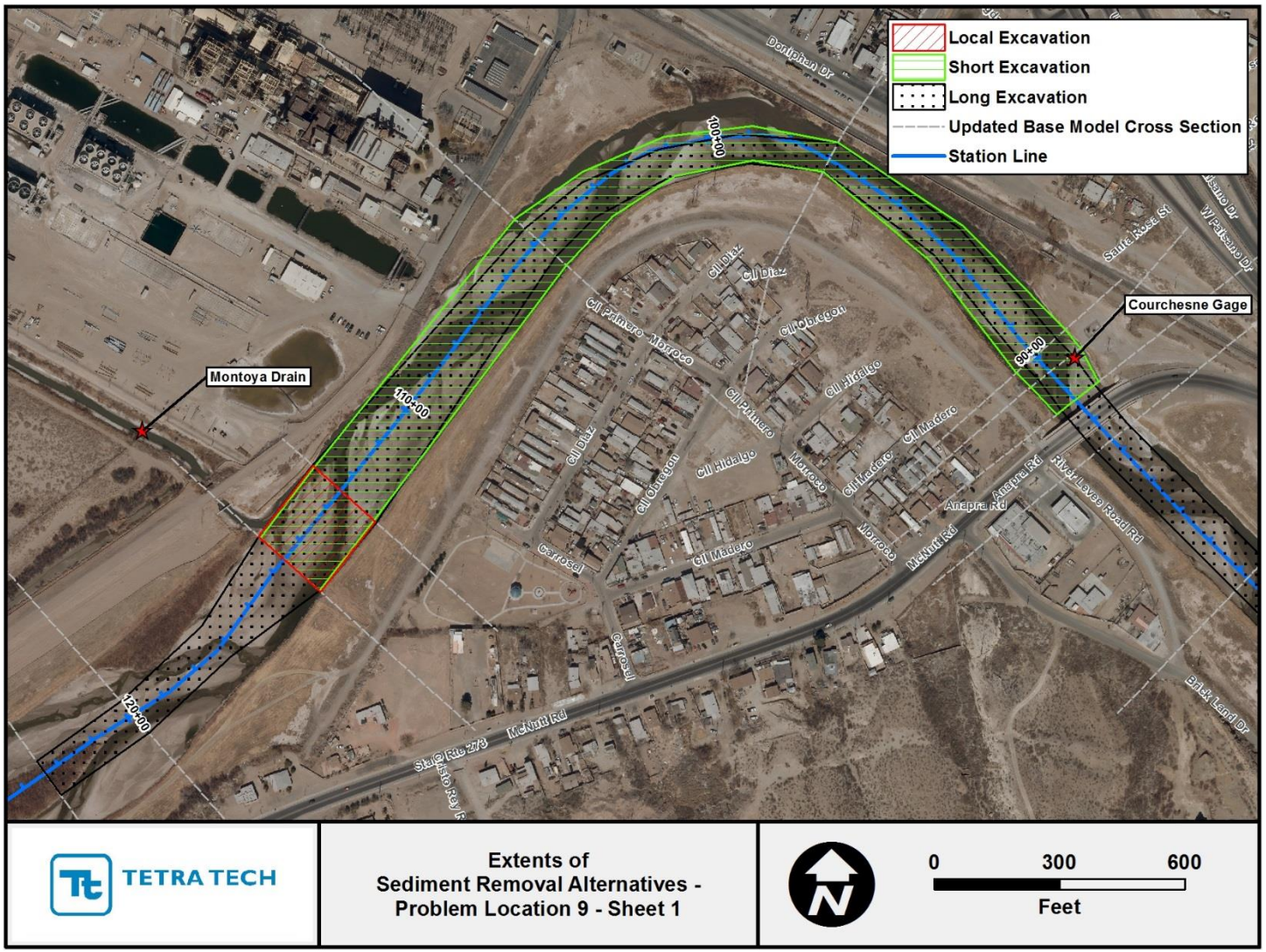


Figure G.2.31. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 9 (Sheet 1).

Figure G.2.32. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 9 (Sheet 2).

Figure G.2.33. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 9 (Sheet 3).

Figure G.2.34. Mapping showing extents of the localized, short and long sediment-removal alternatives at Problem Location 9 (Sheet 4).

Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project:
Final Report

APPENDIX H

Conceptual Layouts for Arroyo Sediment Traps

October 20, 2015

Contract No. IBM09D0006
Order No. IBM14T0016

Appendix H

Conceptual Layouts for Arroyo Sediment Traps

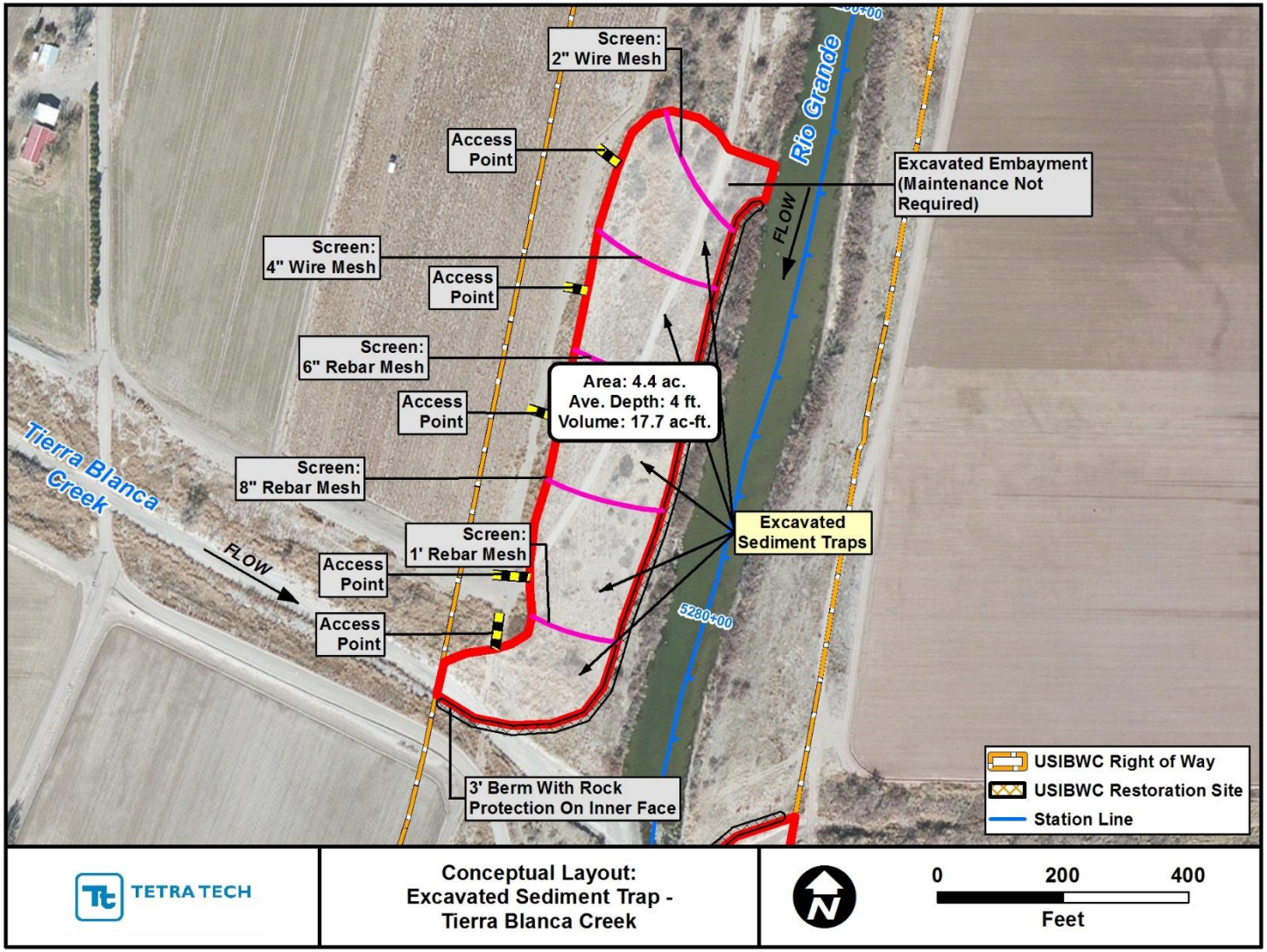


Figure H.1. Conceptual layout of sediment trap for Tierra Blanca Creek at Problem Location 1.

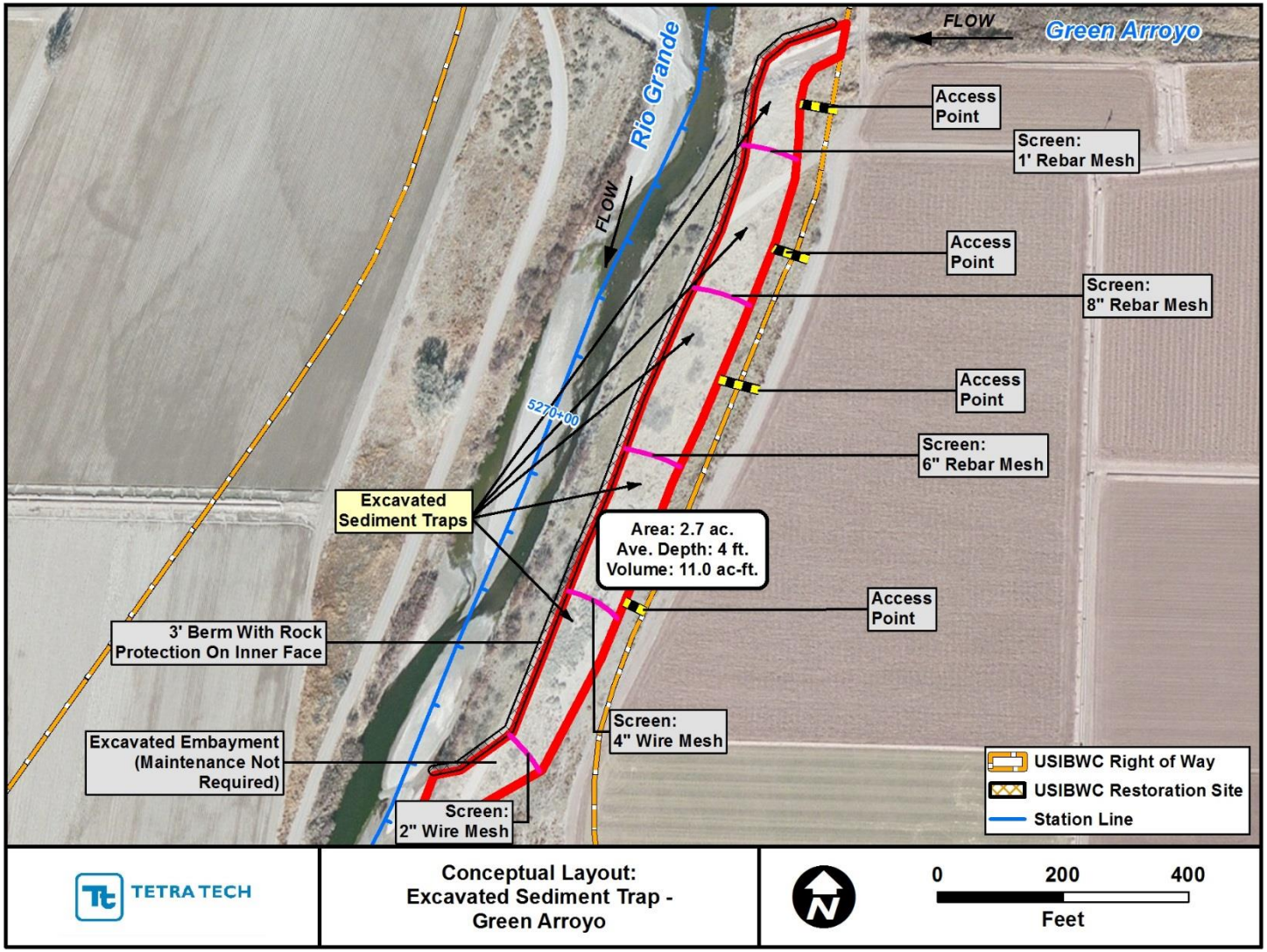


Figure H.2. Conceptual layout of sediment trap for Green Arroyo at Problem Location 1.

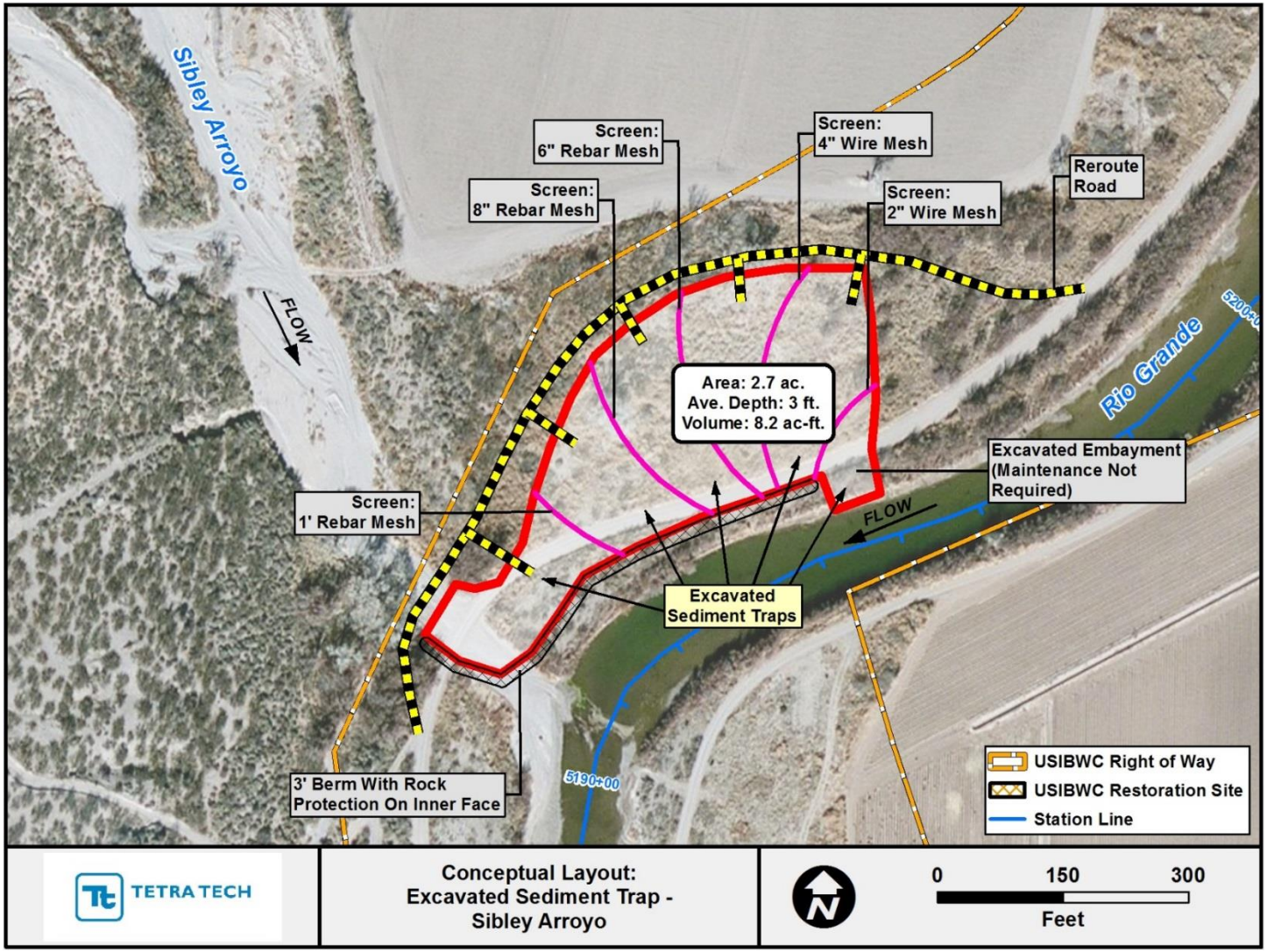


Figure H.3. Conceptual layout of sediment trap for Sibley Arroyo at Problem Location 1.

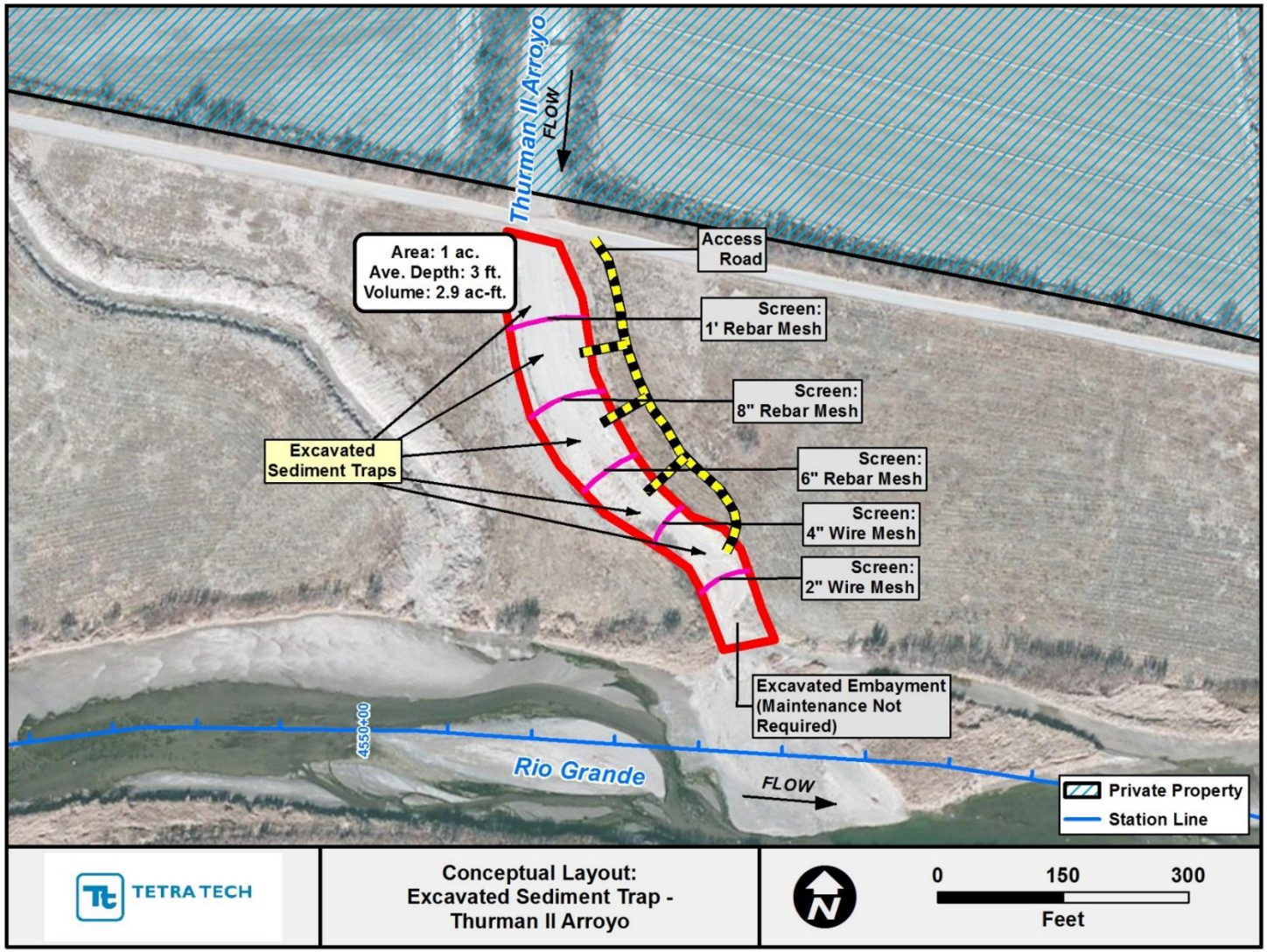


Figure H.4. Conceptual layout of sediment trap for Thurman II Arroyo at Problem Location 2.

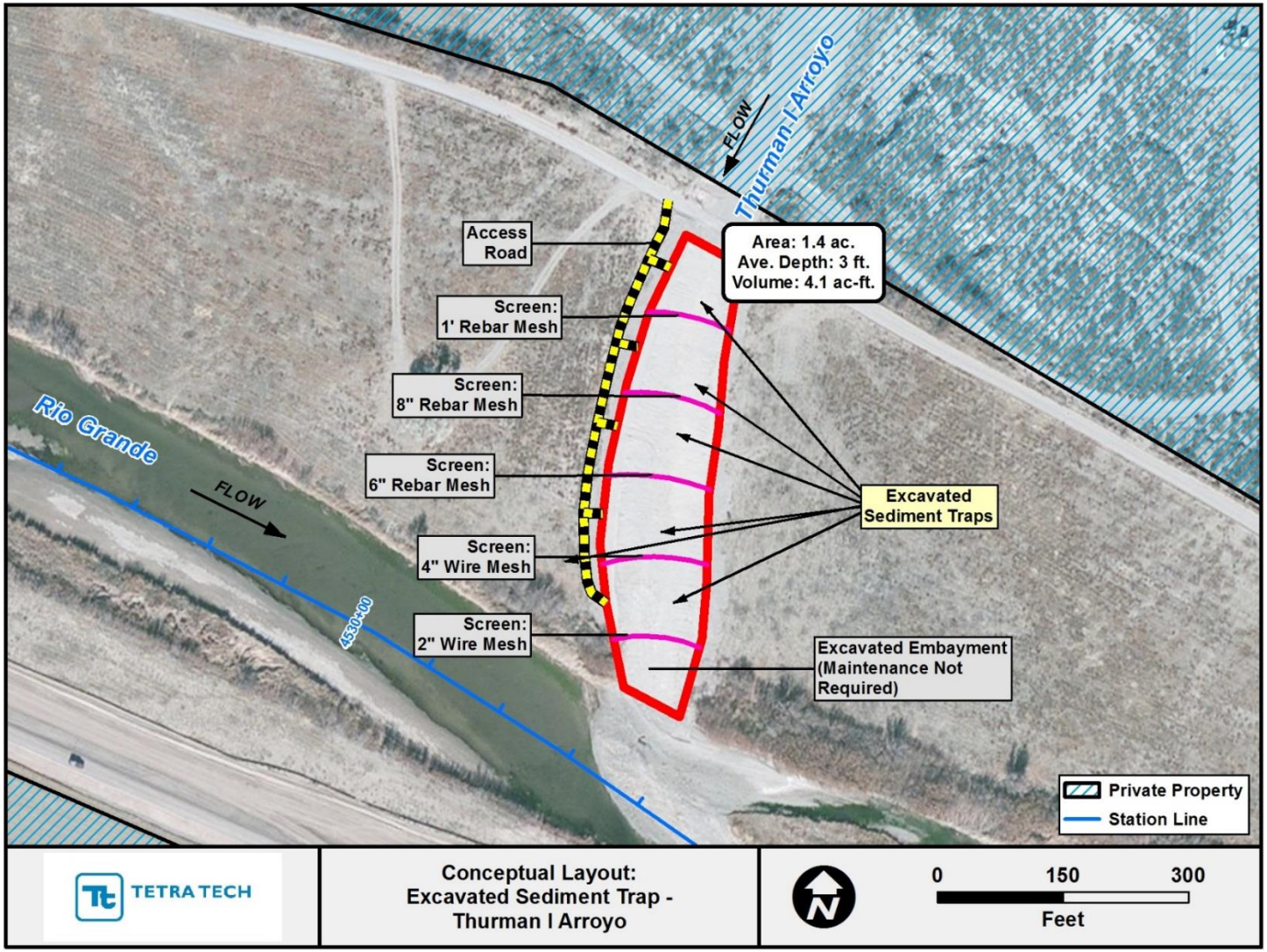


Figure H.5. Conceptual layout of sediment trap for Thurman I Arroyo at Problem Location 2.

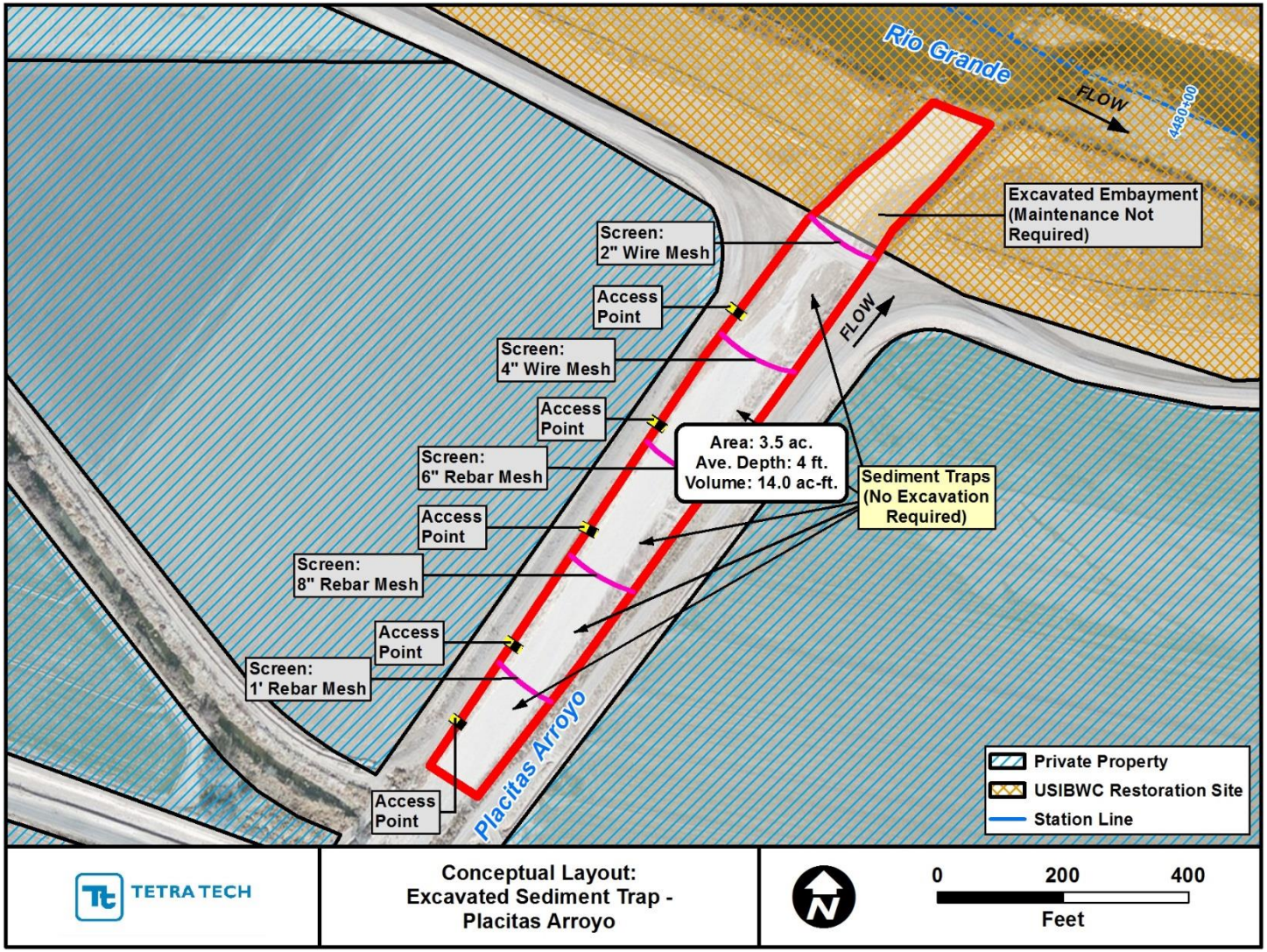


Figure H.6. Conceptual layout of sediment trap for Placitas Arroyo at Problem Location 2.

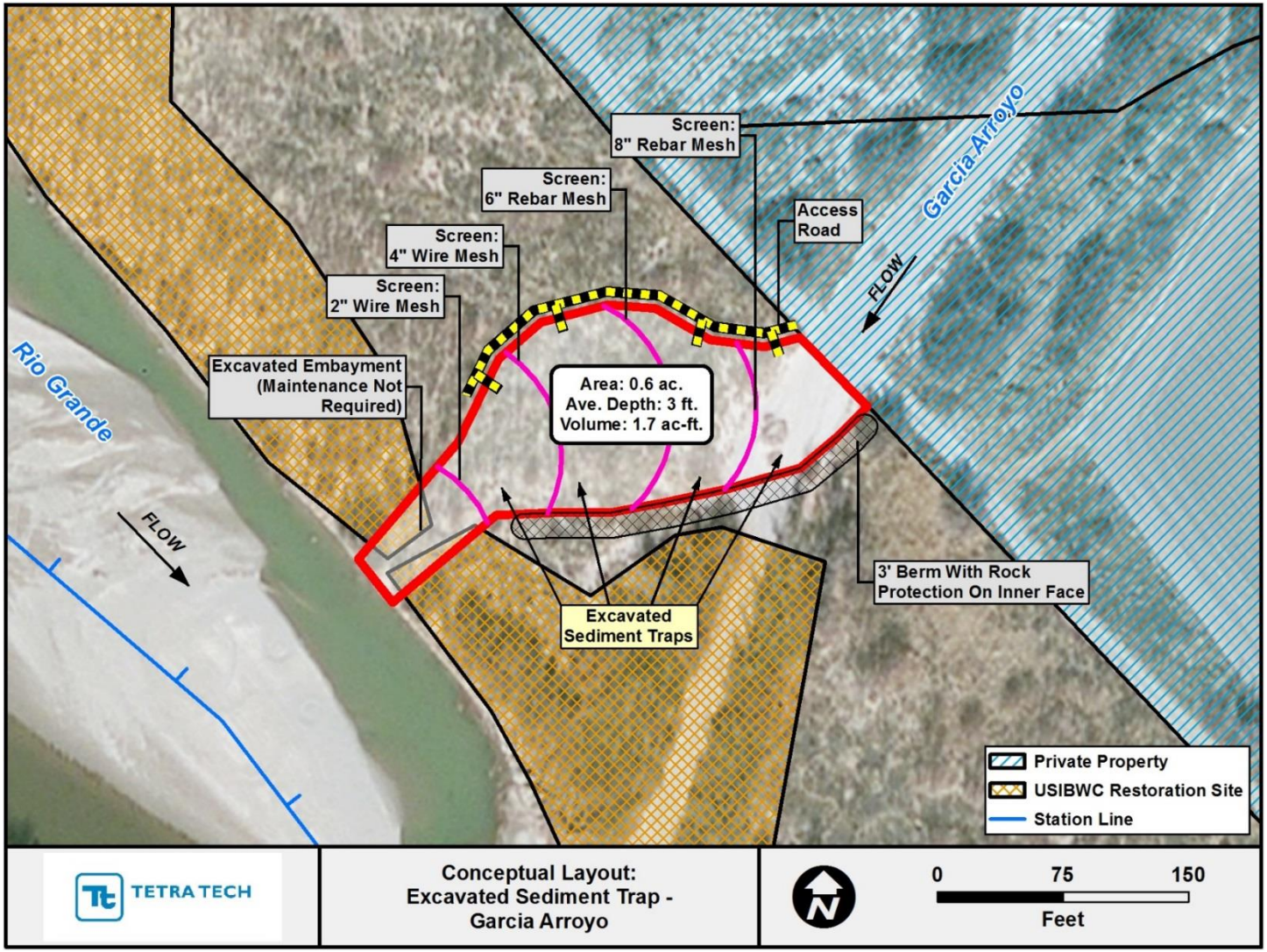


Figure H.7. Conceptual layout of sediment trap for Garcia Arroyo at Problem Location 3.

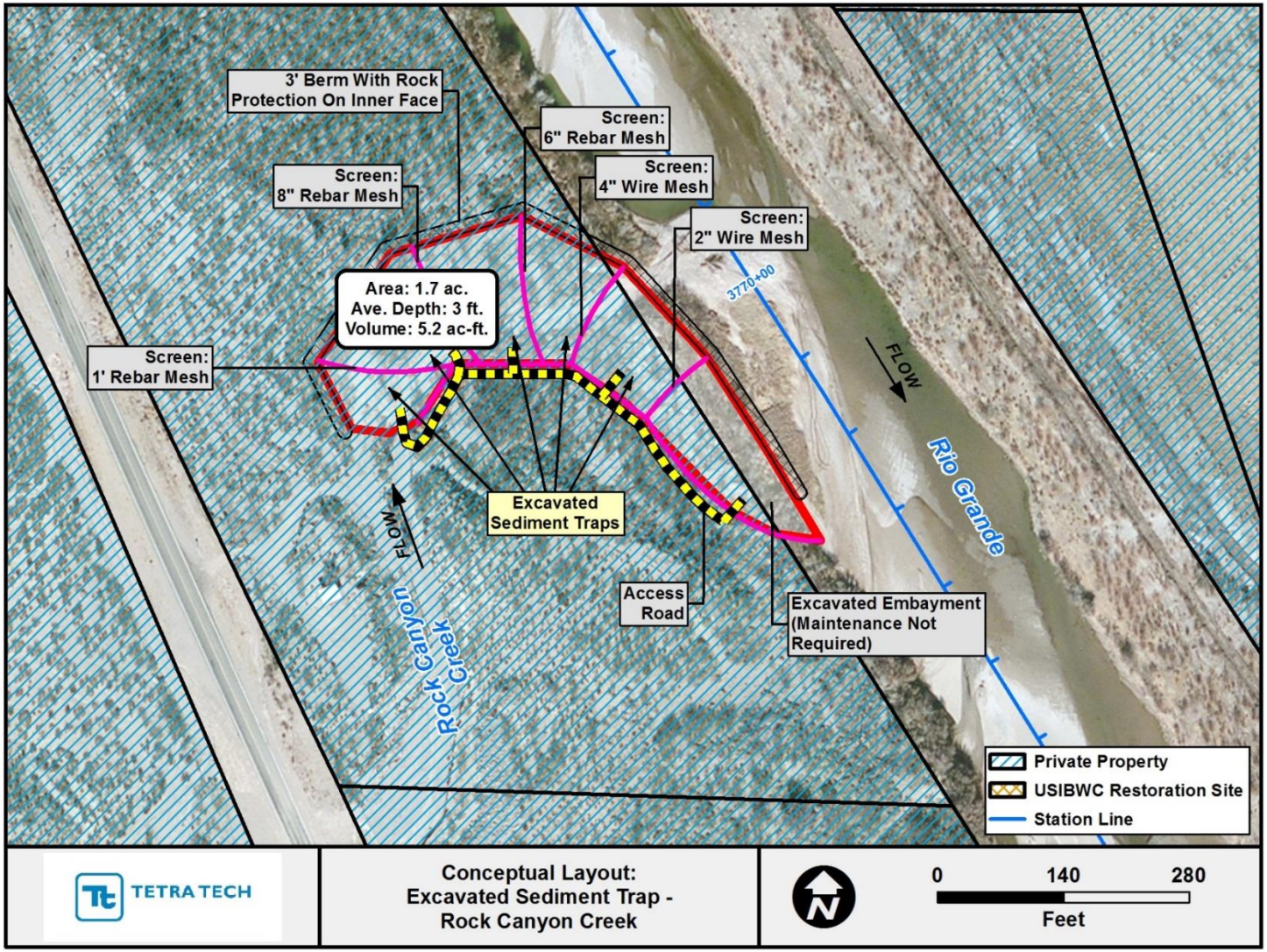


Figure H.8. Conceptual layout of sediment trap for Rock Canyon at Problem Location 5 (see also Figure 23 in the main report).

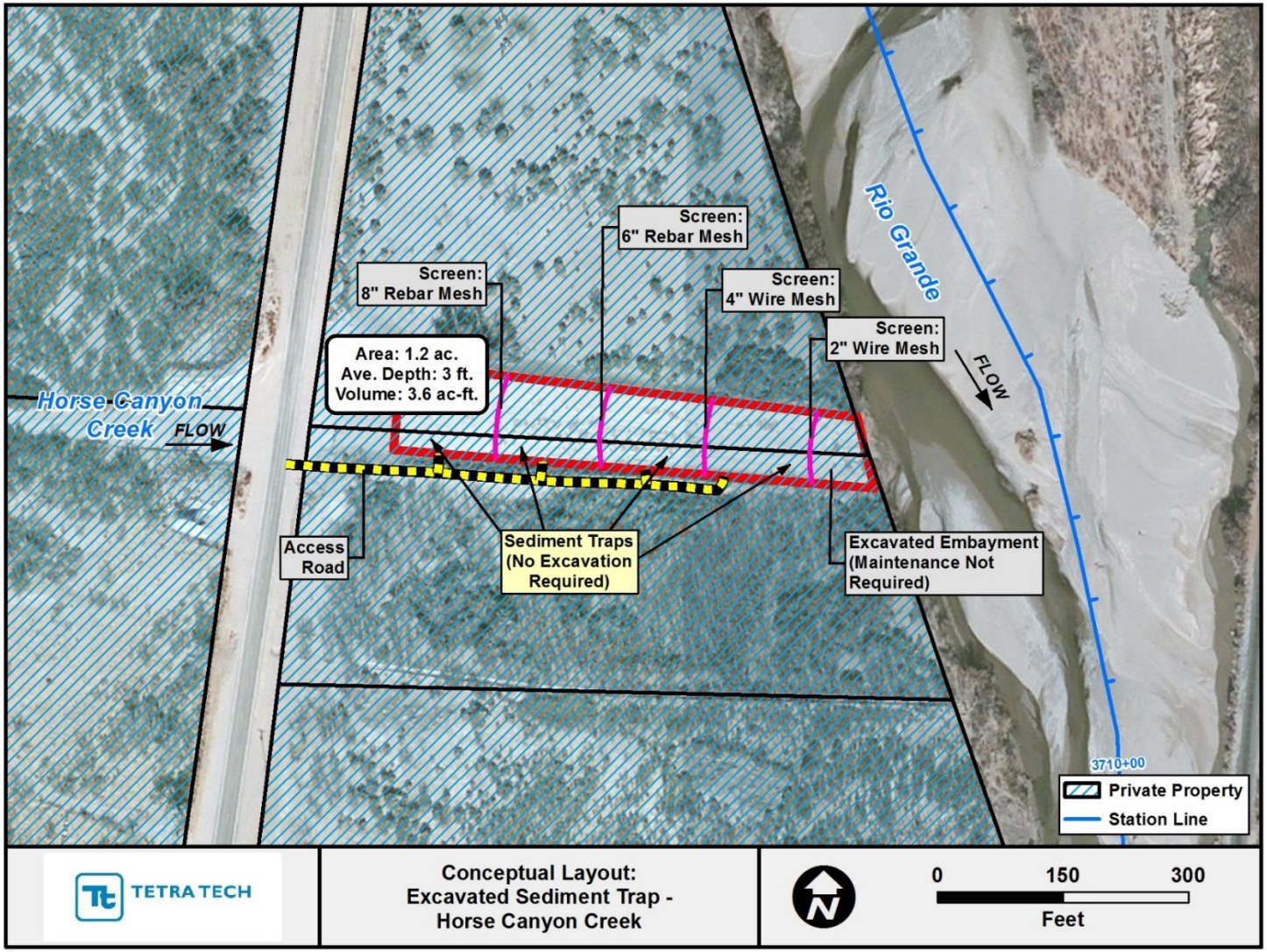


Figure H.9. Conceptual layout of sediment trap for Horse Canyon Creek at Problem Location 5.

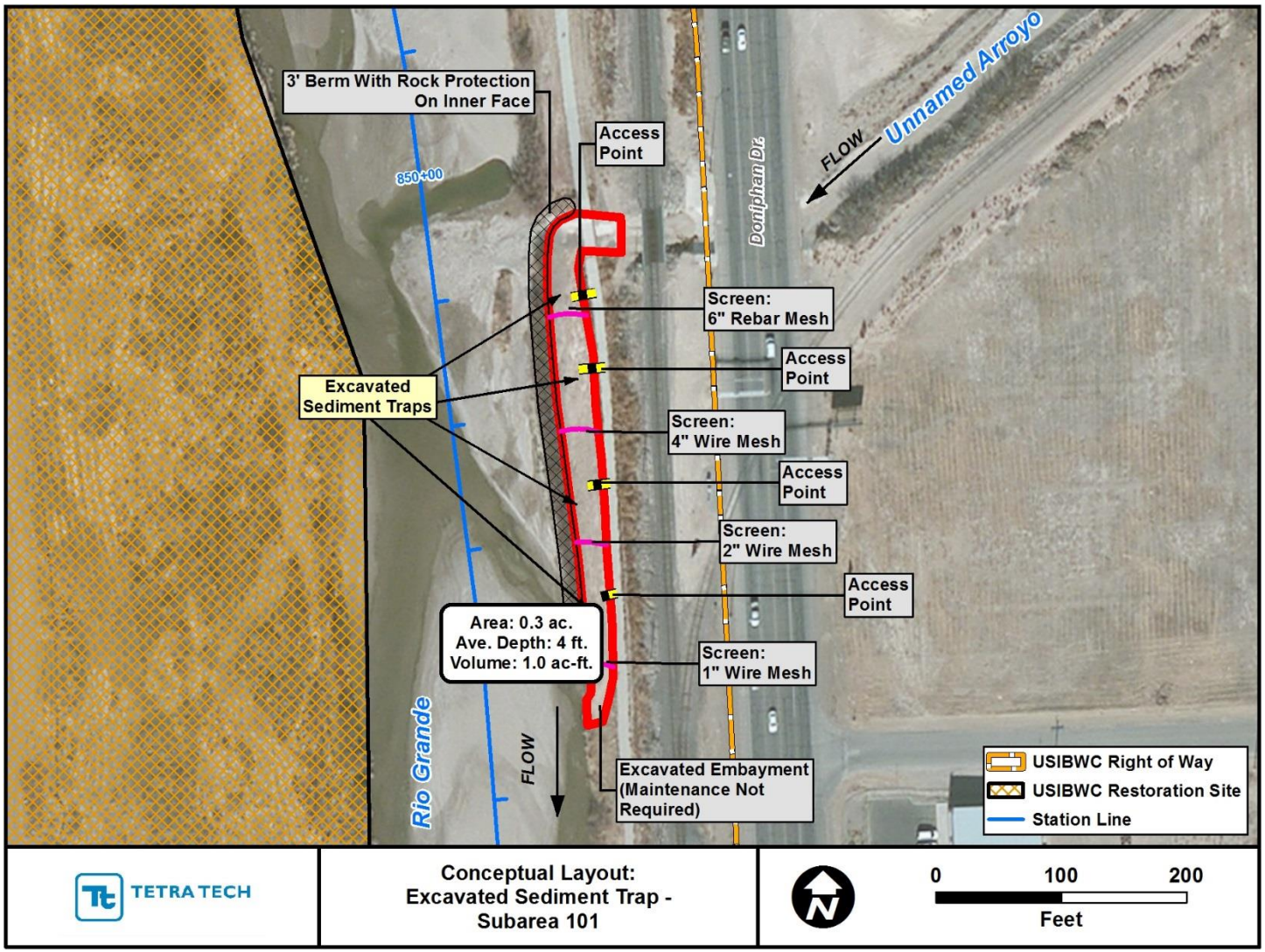


Figure H.10. Conceptual layout of sediment trap for the unnamed arroyo draining Subarea 101 at Problem Location 7.

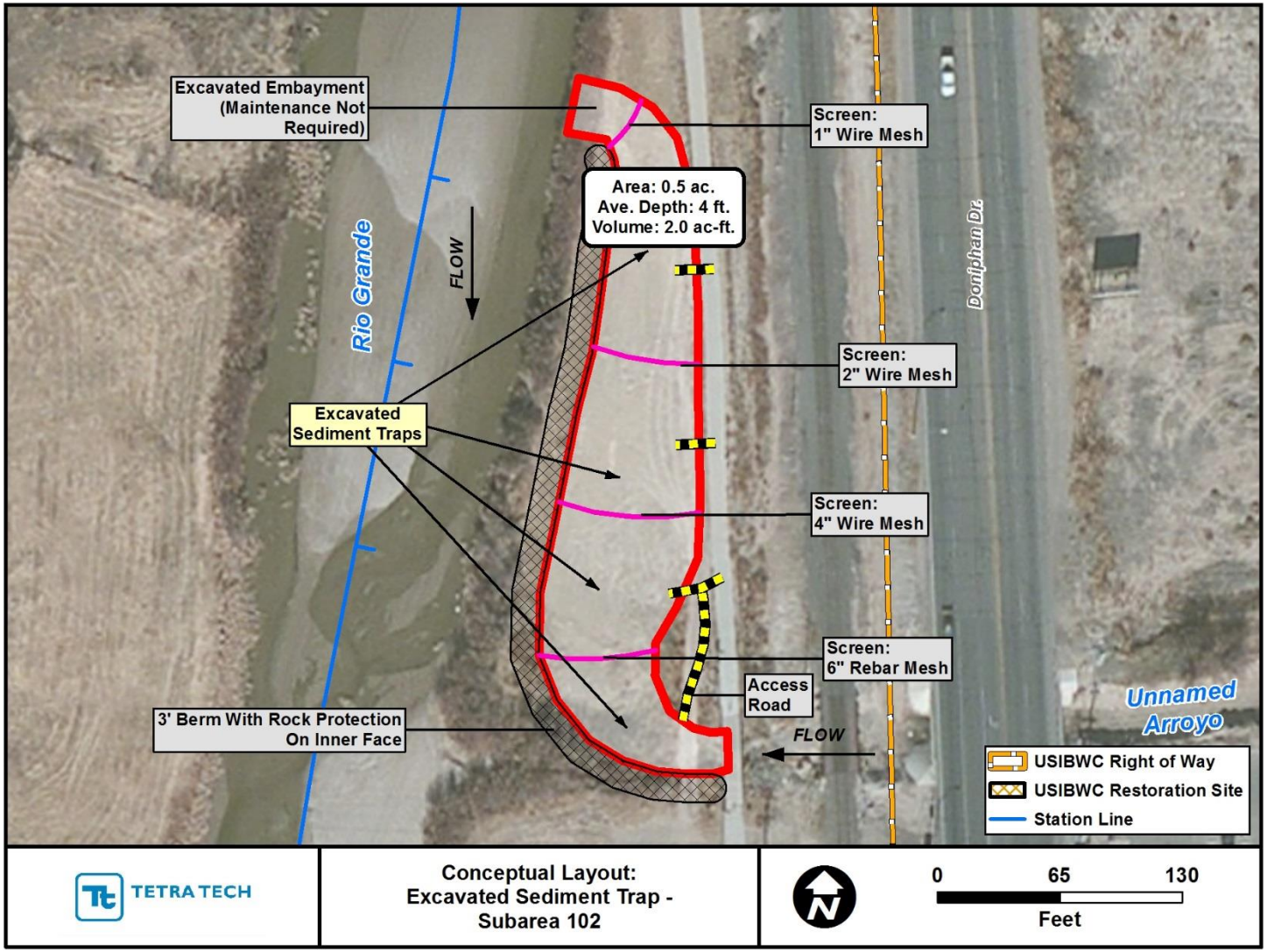


Figure H.11. Conceptual layout of sediment trap for the unnamed arroyo draining Subarea 102 at Problem Location 7.

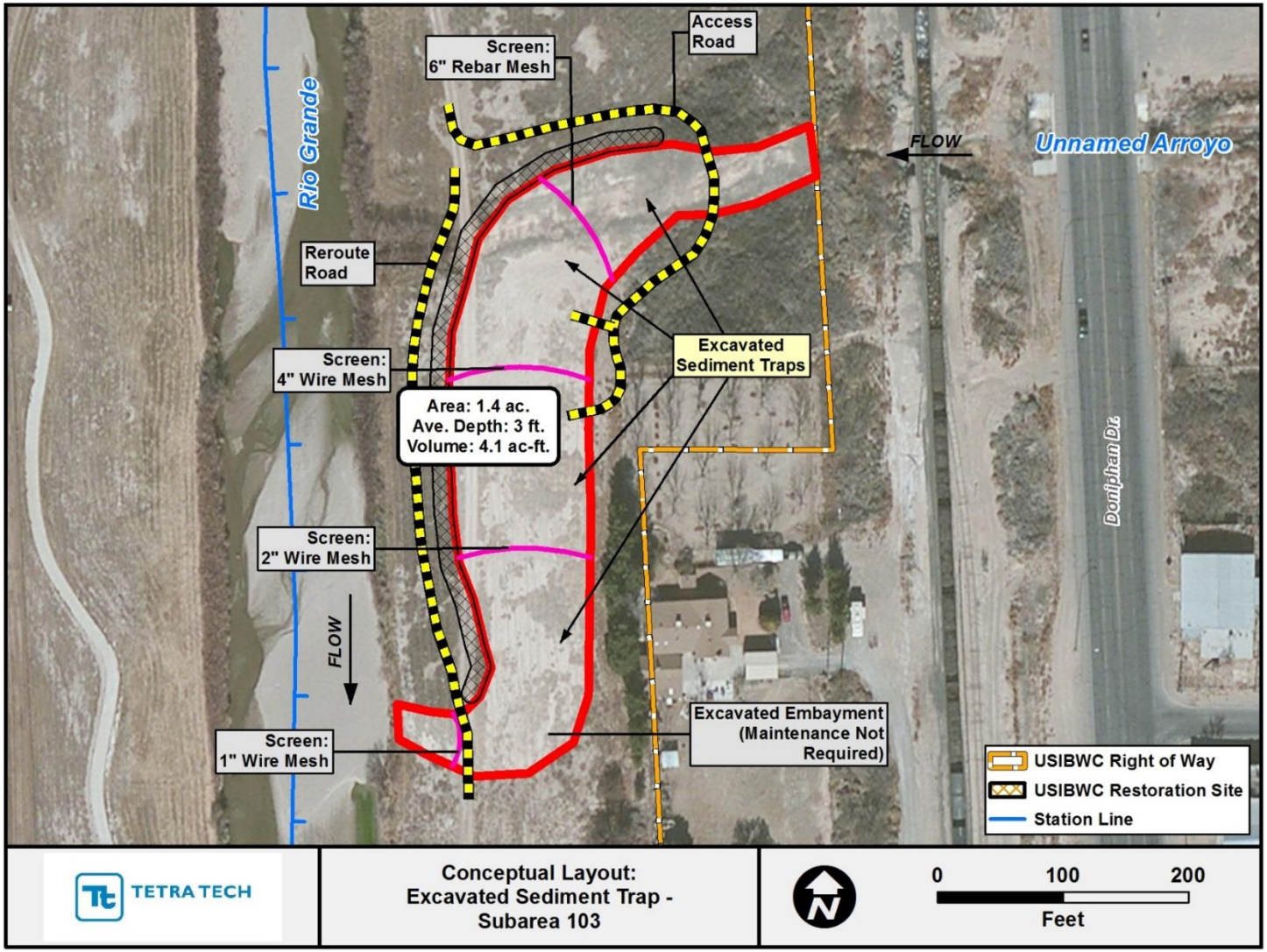


Figure H.12. Conceptual layout of sediment trap for the unnamed arroyo draining Subarea 103 at Problem Location 7.

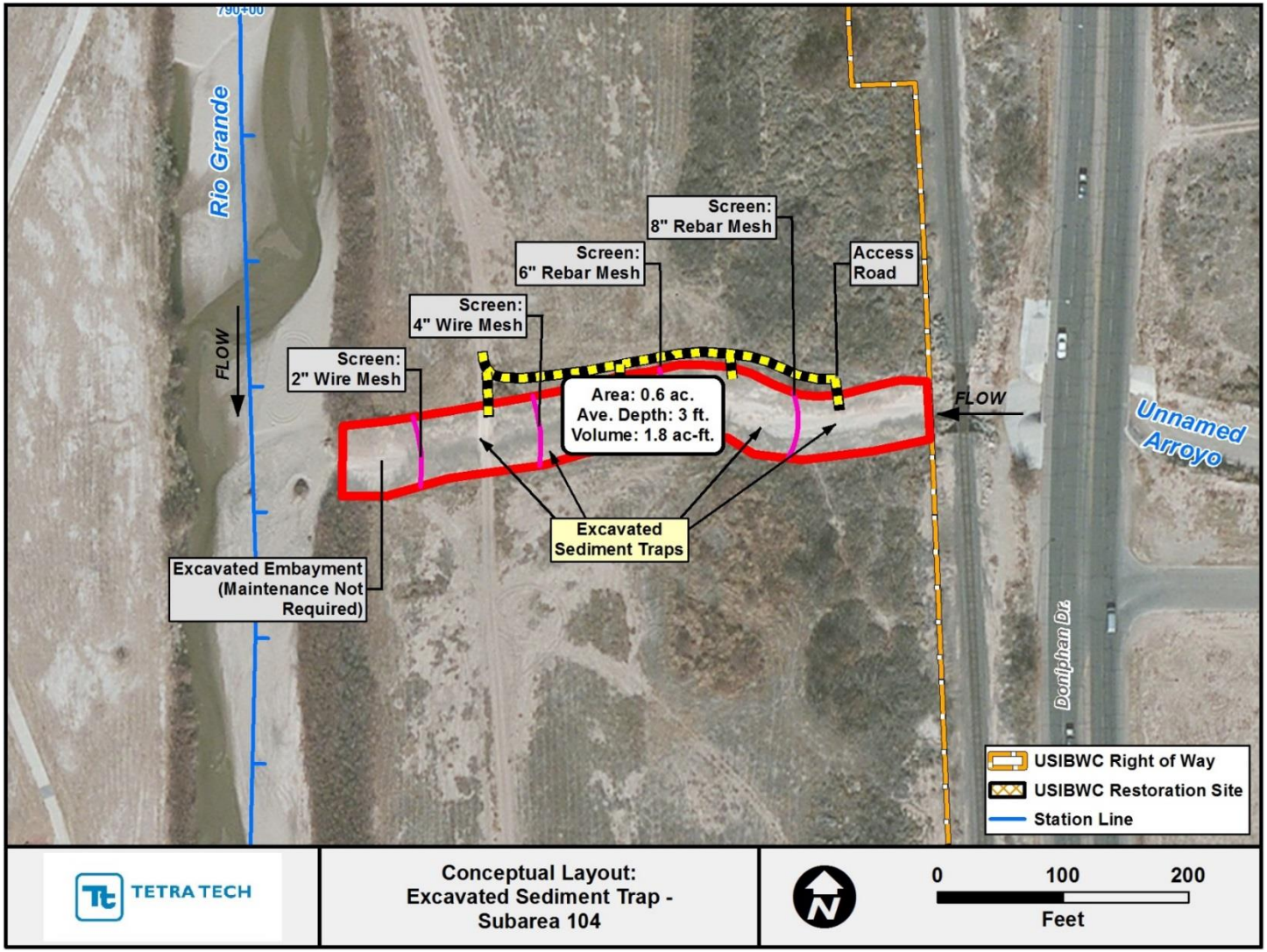


Figure H.13. Conceptual layout of sediment trap for the unnamed arroyo draining Subarea 104 at Problem Location 7.

Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project:
Final Report

APPENDIX I

Conceptual Layouts for Low-elevation Spur Dikes

October 20, 2015

Contract No. IBM09D0006
Order No. IBM14T0016

Appendix I

Conceptual Layouts for Low-elevation Spur Dikes

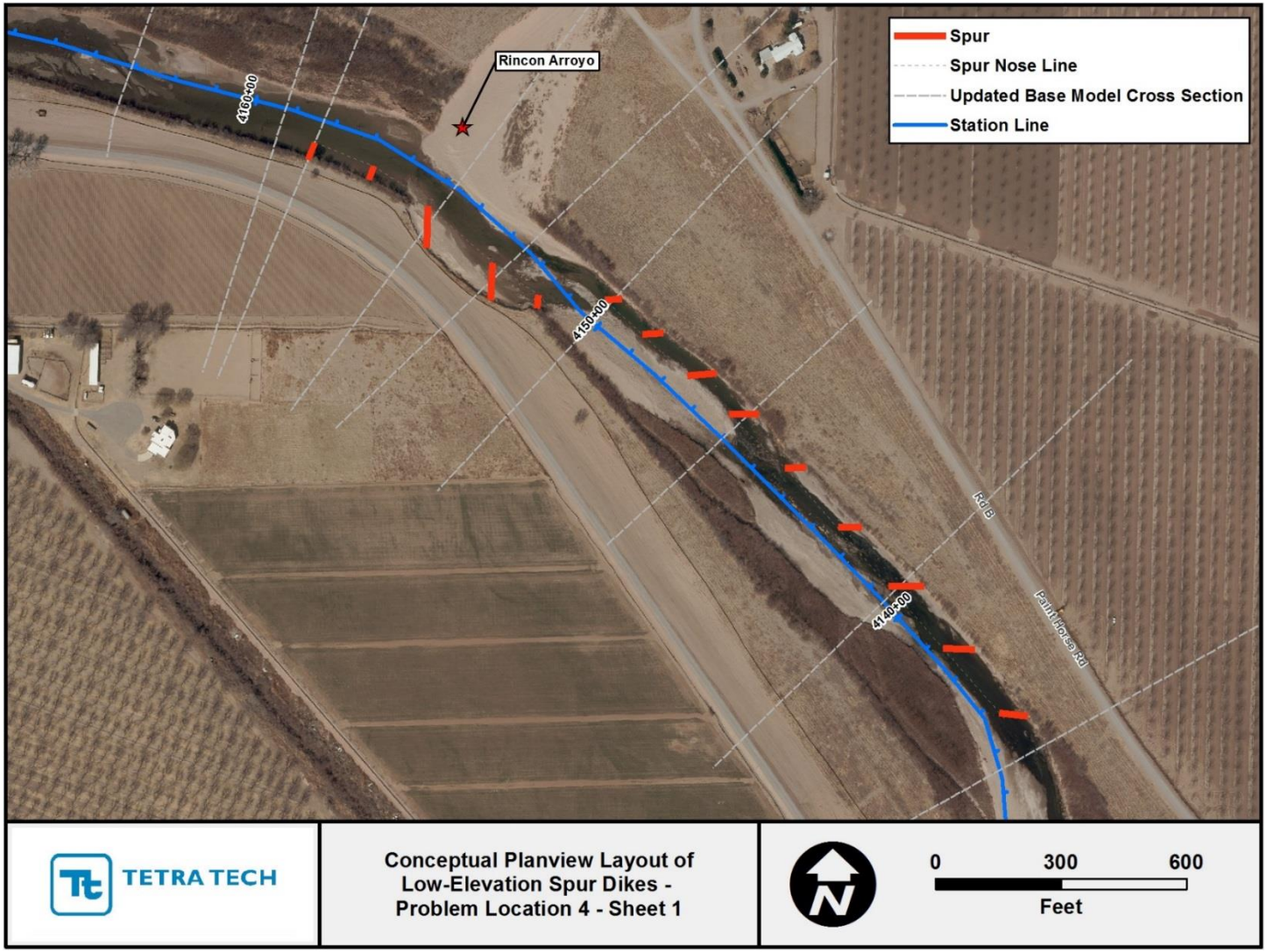


Figure I.1. Conceptual layout of low-elevation spur dikes at Problem Location 4 (Sheet 1).

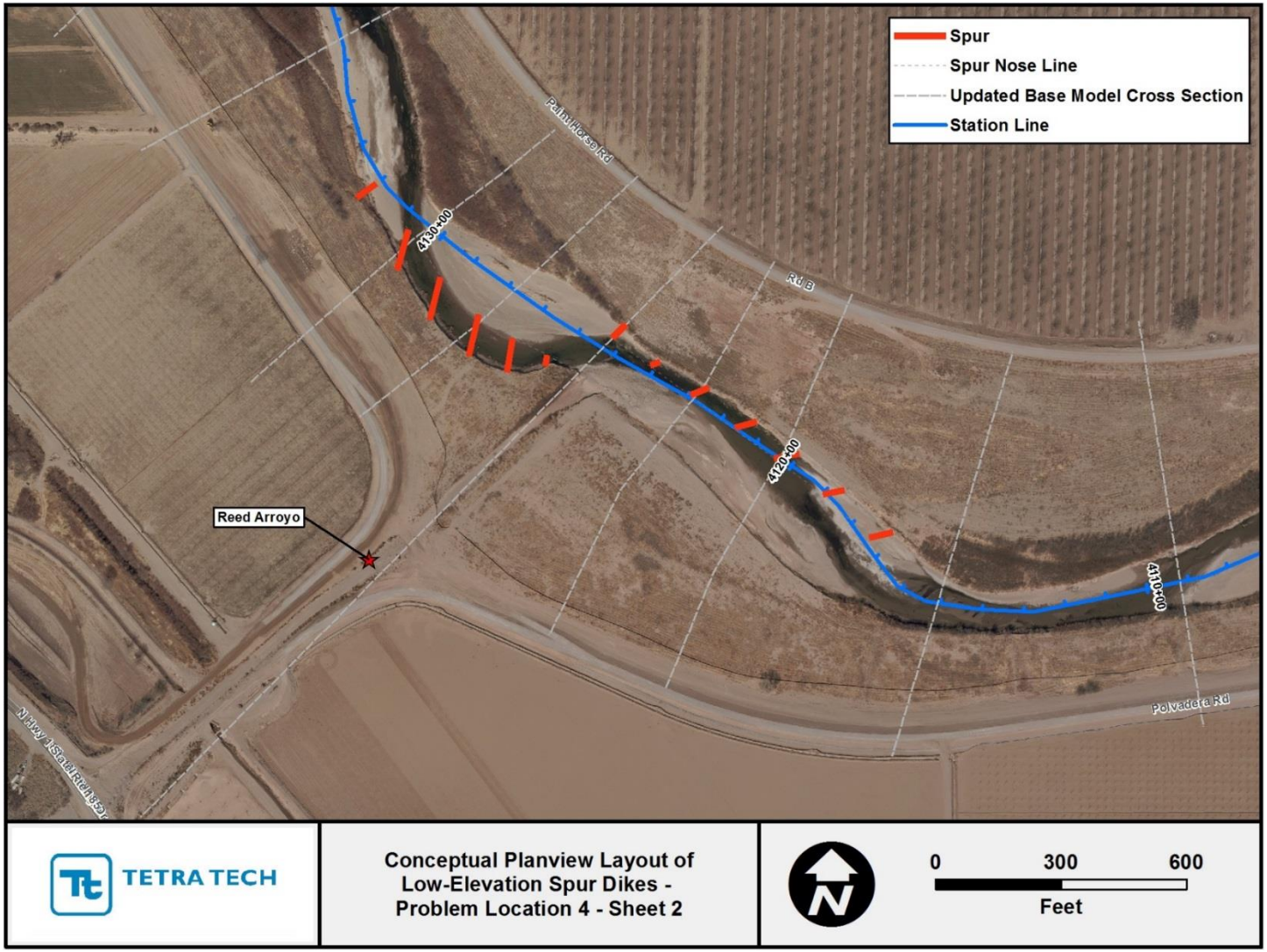


Figure I.2. Conceptual layout of low-elevation spur dikes at Problem Location 4 (Sheet 2).

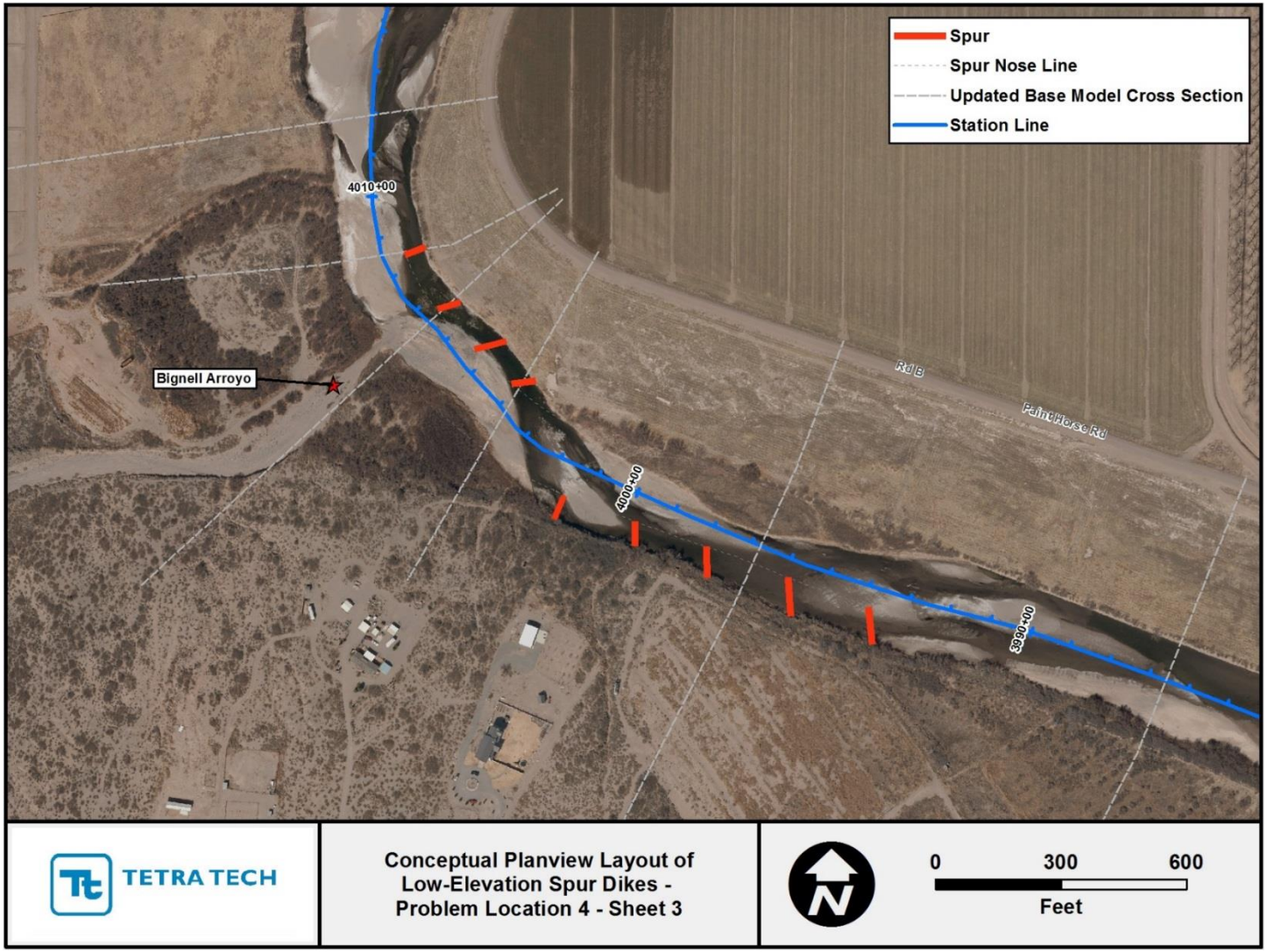


Figure I.3. Conceptual layout of low-elevation spur dikes at Problem Location 4 (Sheet 3).

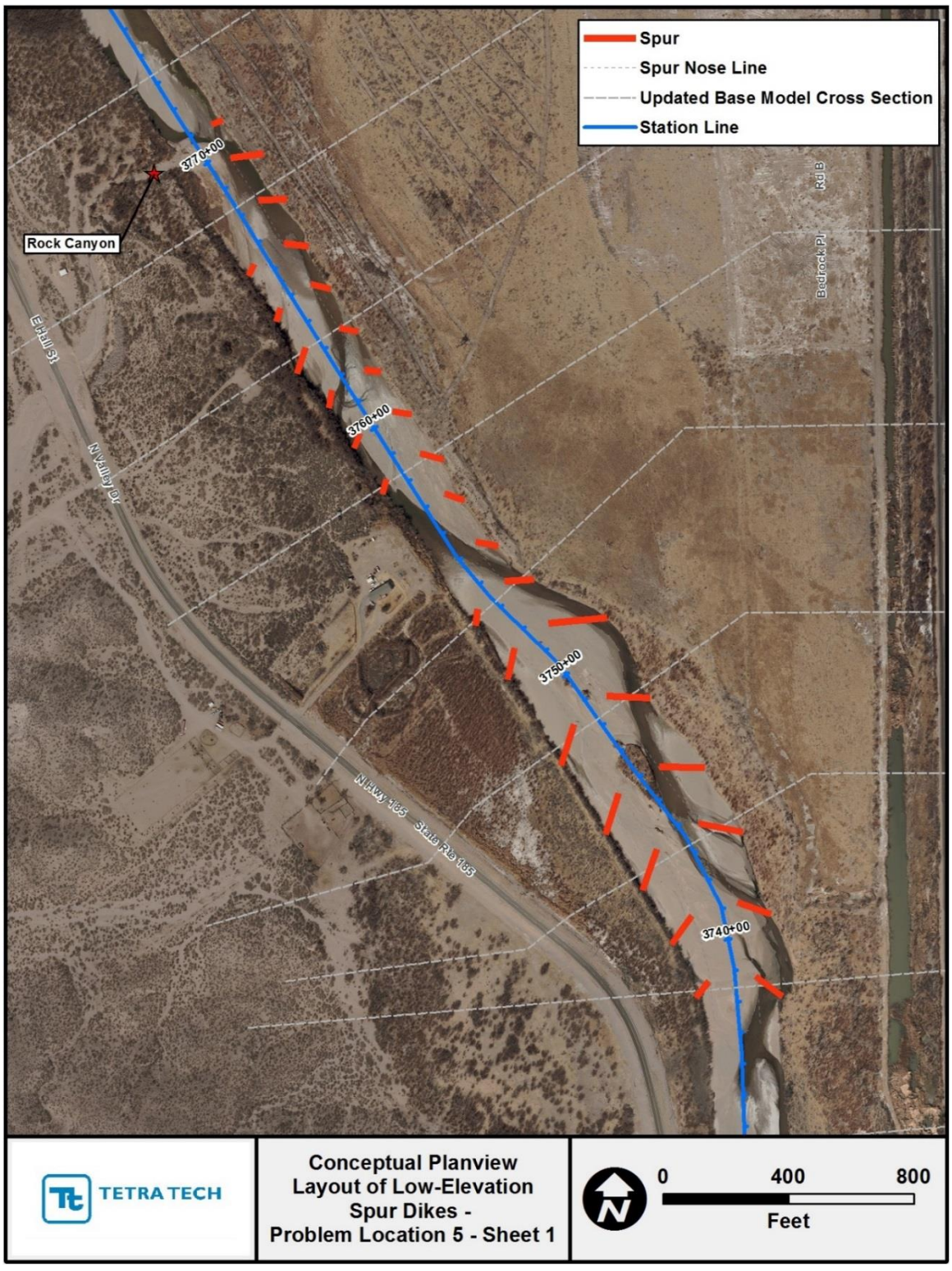


Figure I.4. Conceptual layout of low-elevation spur dikes at Problem Location 5 (Sheet 1; see also Figure 24 in the main report).

Figure I.5. Conceptual layout of low-elevation spur dikes at Problem Location 5 (Sheet 2; see also Figure 26 in the main report).

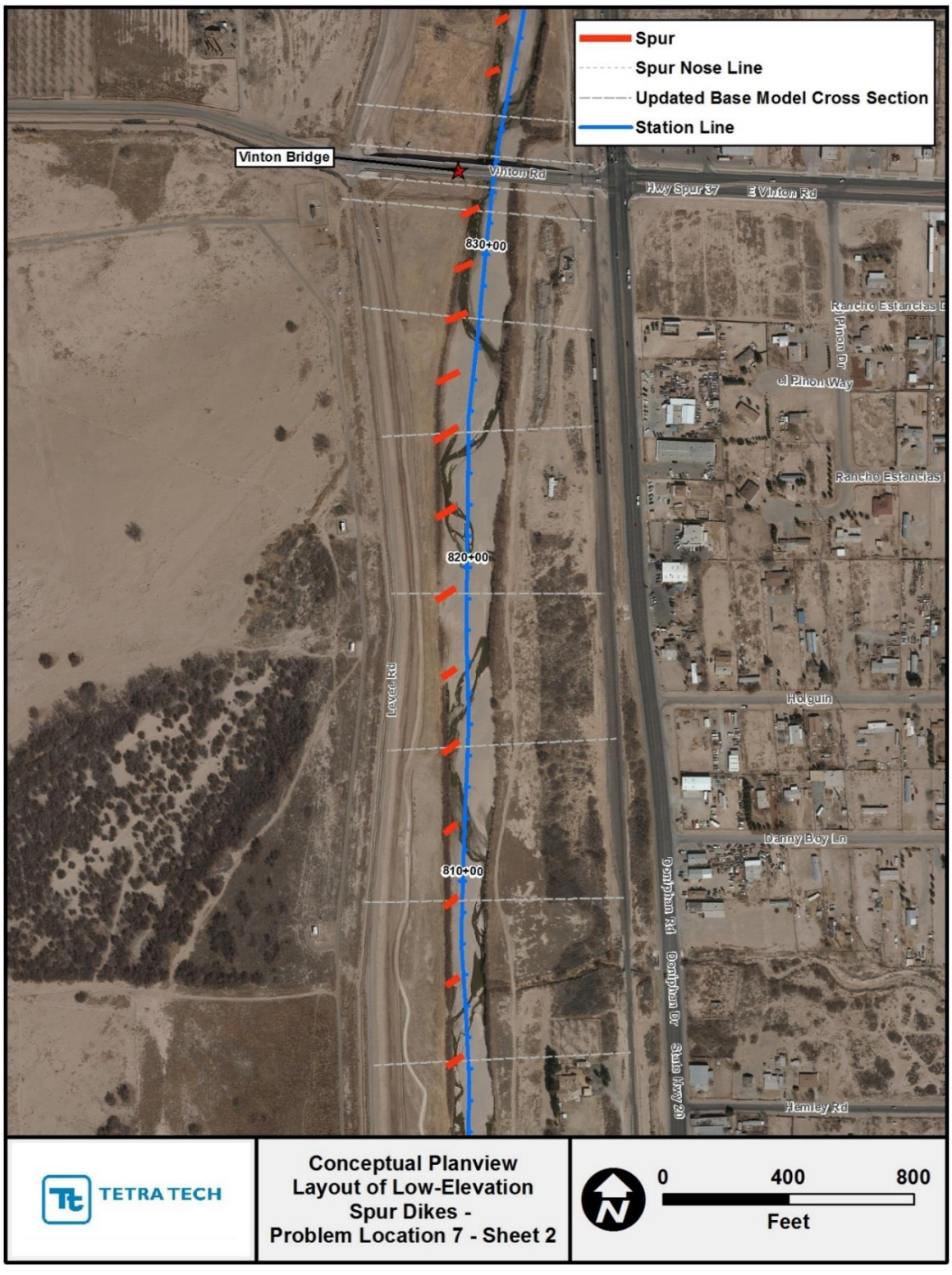


Figure I.6. Conceptual layout of low-elevation spur dikes at Problem Location 7 (Sheet 1).

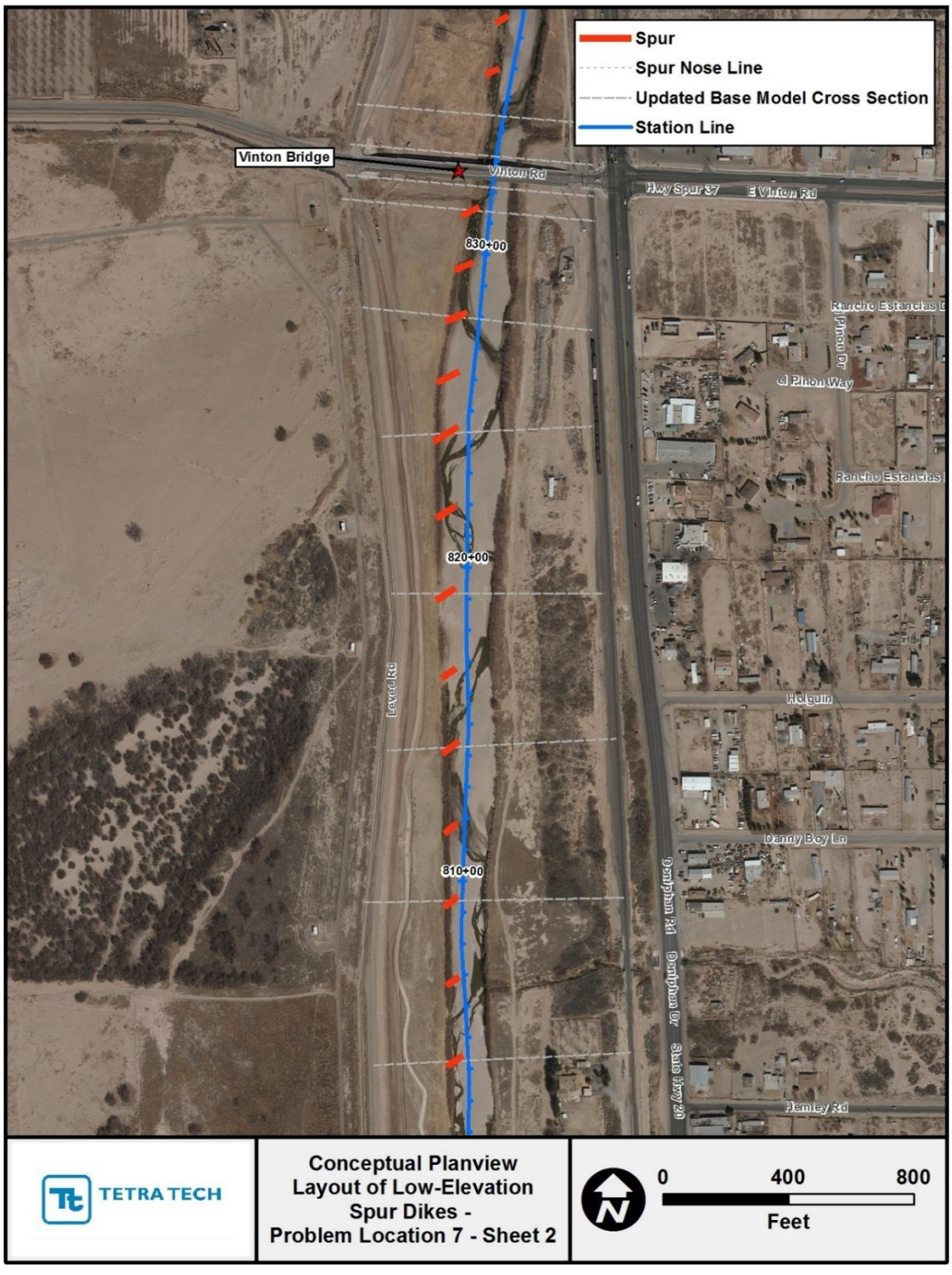


Figure I.7. Conceptual layout of low-elevation spur dikes at Problem Location 7 (Sheet 2).

Figure I.8. Conceptual layout of low-elevation spur dikes at Problem Location 7 (Sheet 3).

Figure I.9. Conceptual layout of low-elevation spur dikes at Problem Location 8 (Sheet 1).

Figure I.10. Conceptual layout of low-elevation spur dikes at Problem Location 8 (Sheet 2).

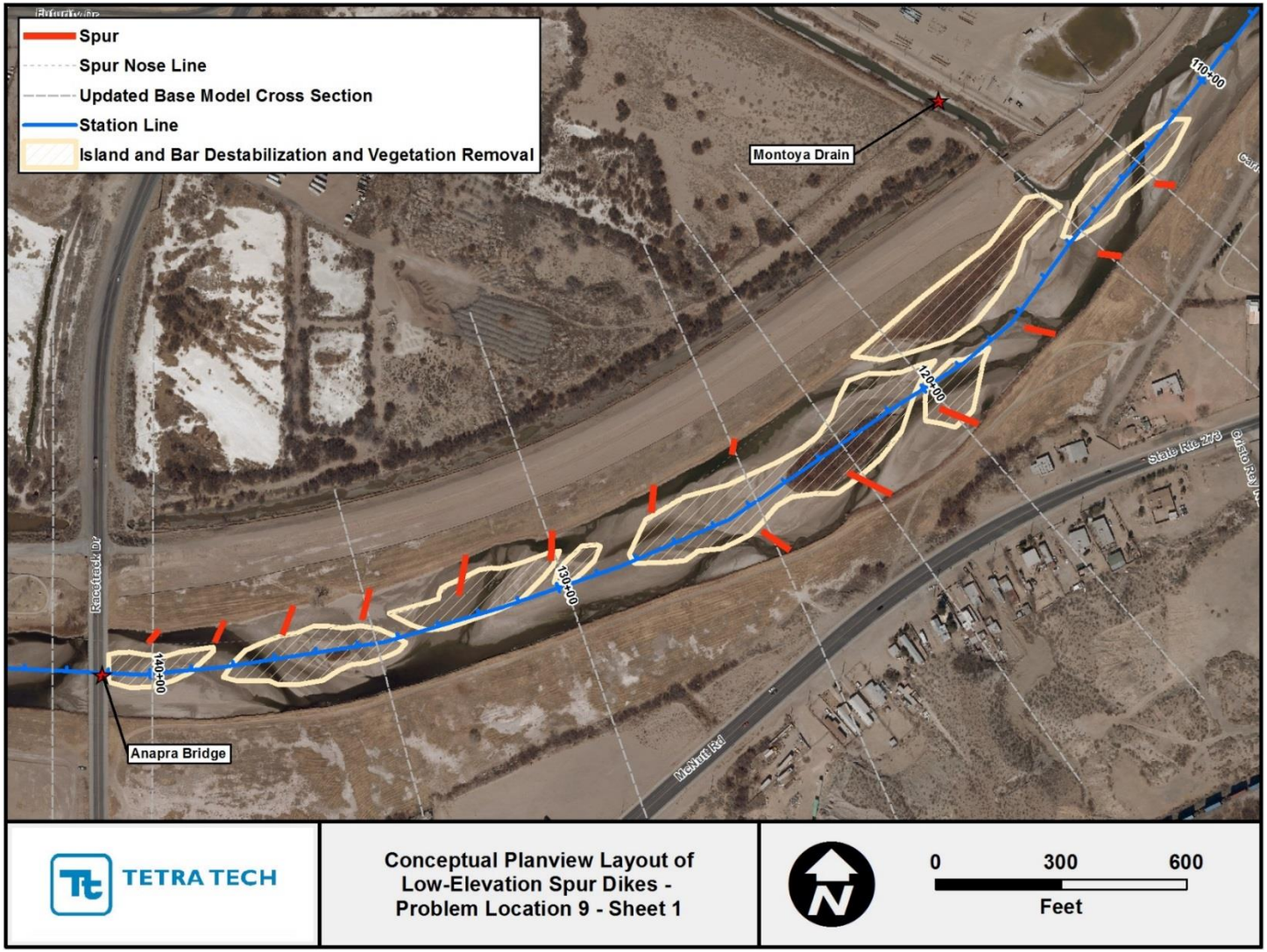


Figure I.11. Conceptual layout of low-elevation spur dikes at Problem Location 9.

Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project:
Final Report

APPENDIX J

Mapping Showing Extents of Island Destabilization and Vegetation Removal Treatments

October 20, 2015

Contract No. IBM09D0006
Order No. IBM14T0016

Appendix J

Mapping Showing Extents of Island Destabilization and Vegetation Removal Treatments

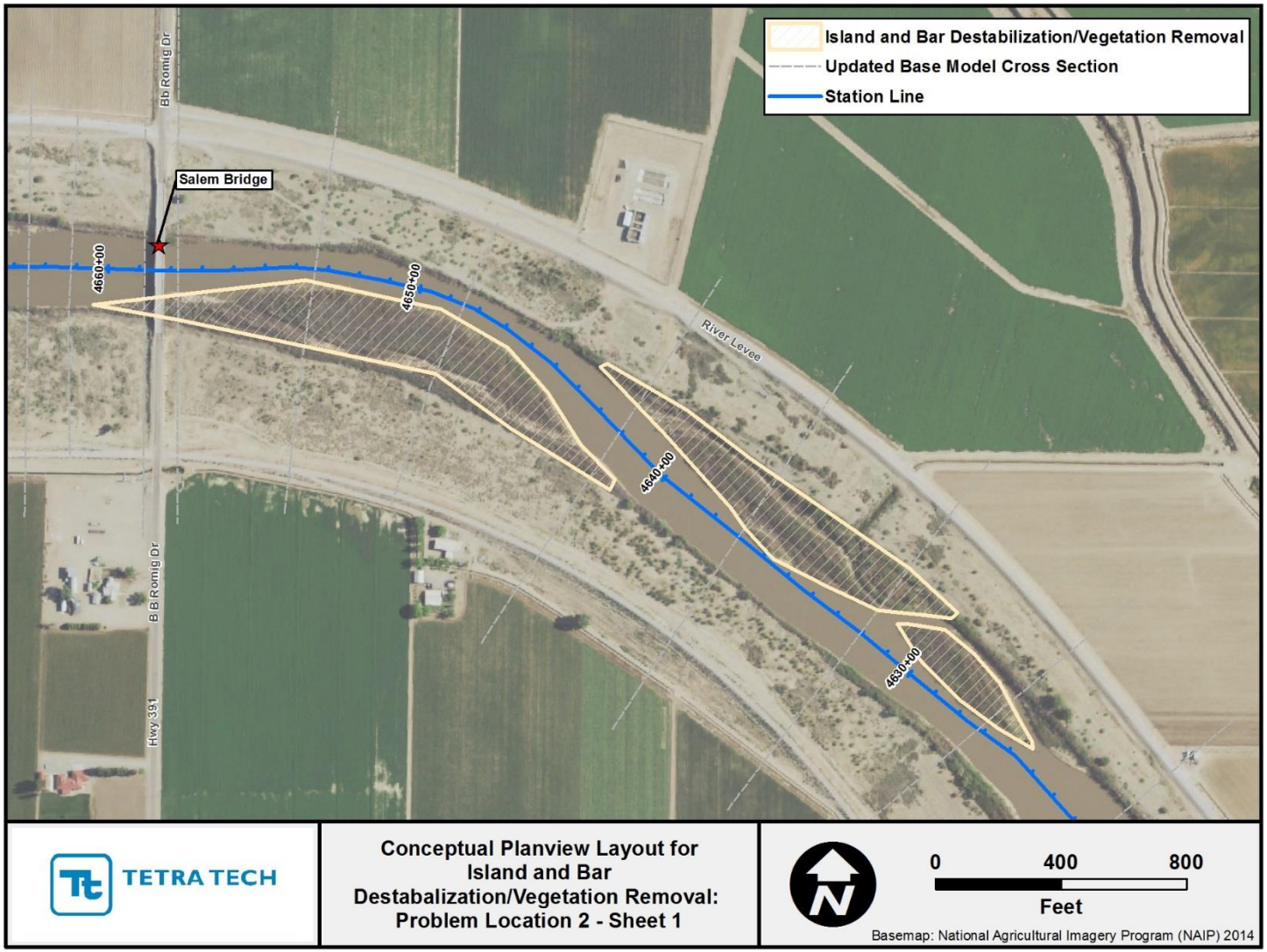


Figure J.1. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 2 (Sheet 1).

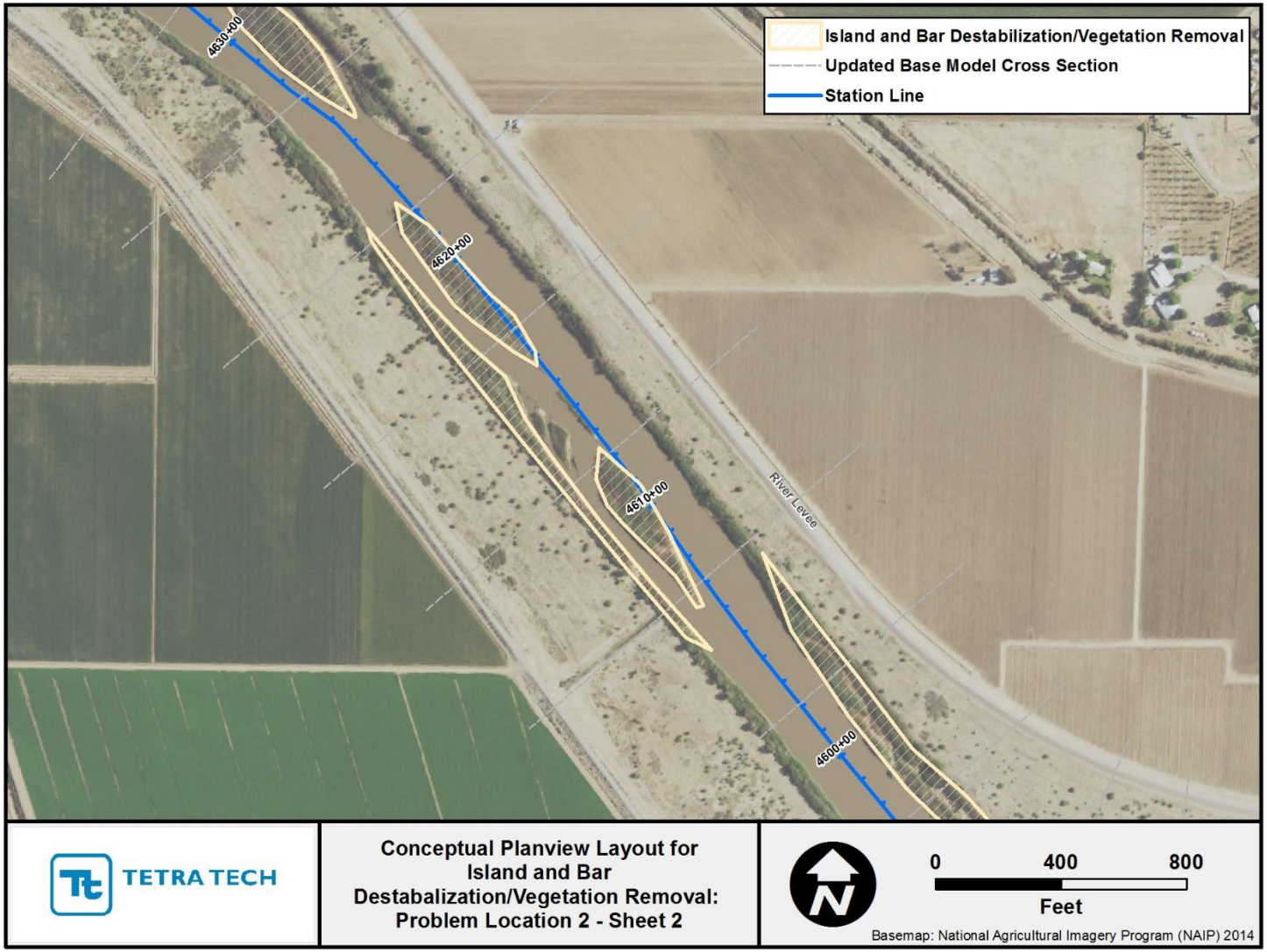


Figure J.2. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 2 (Sheet 2).

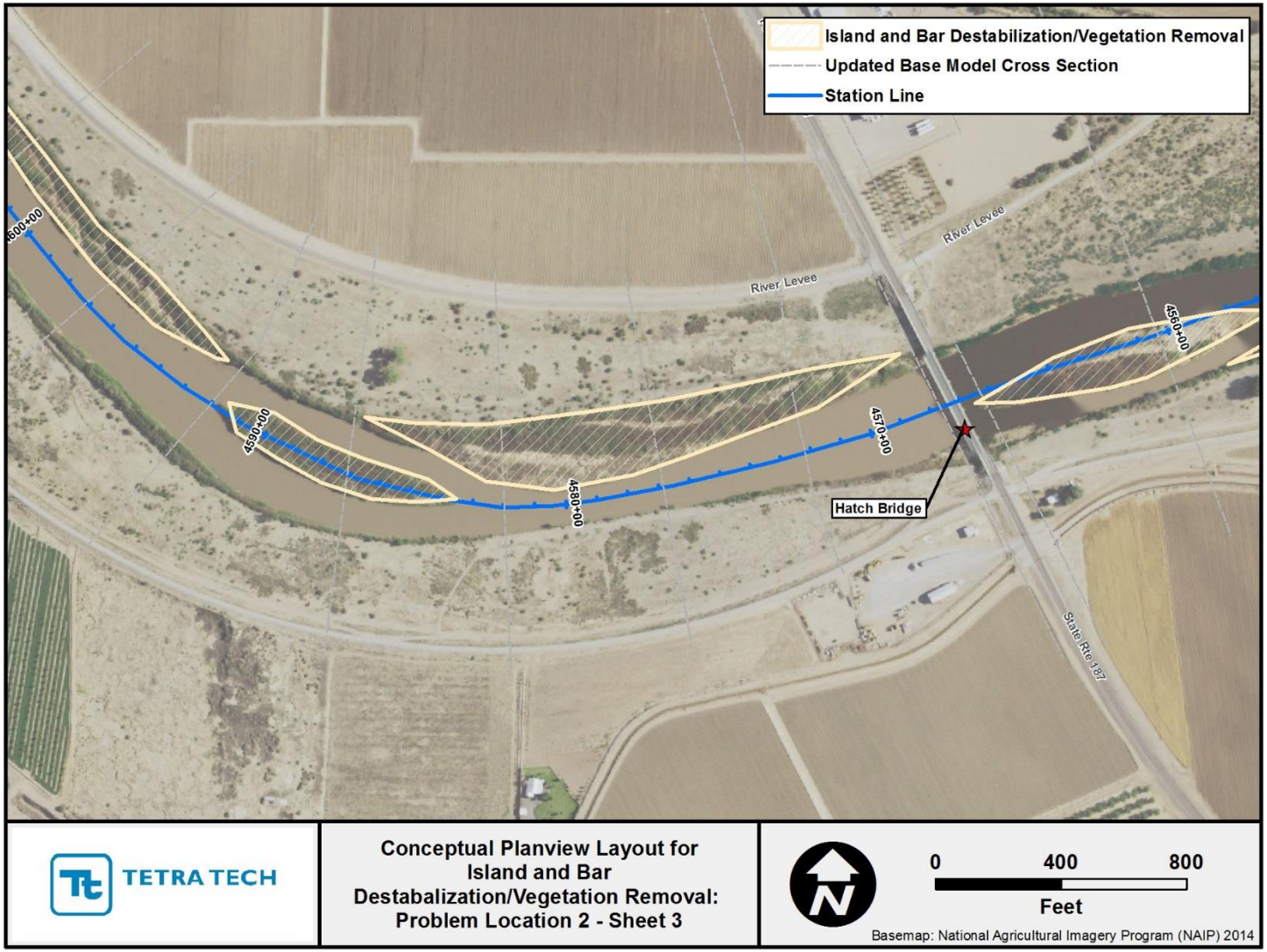


Figure J.3. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 2 (Sheet 3).

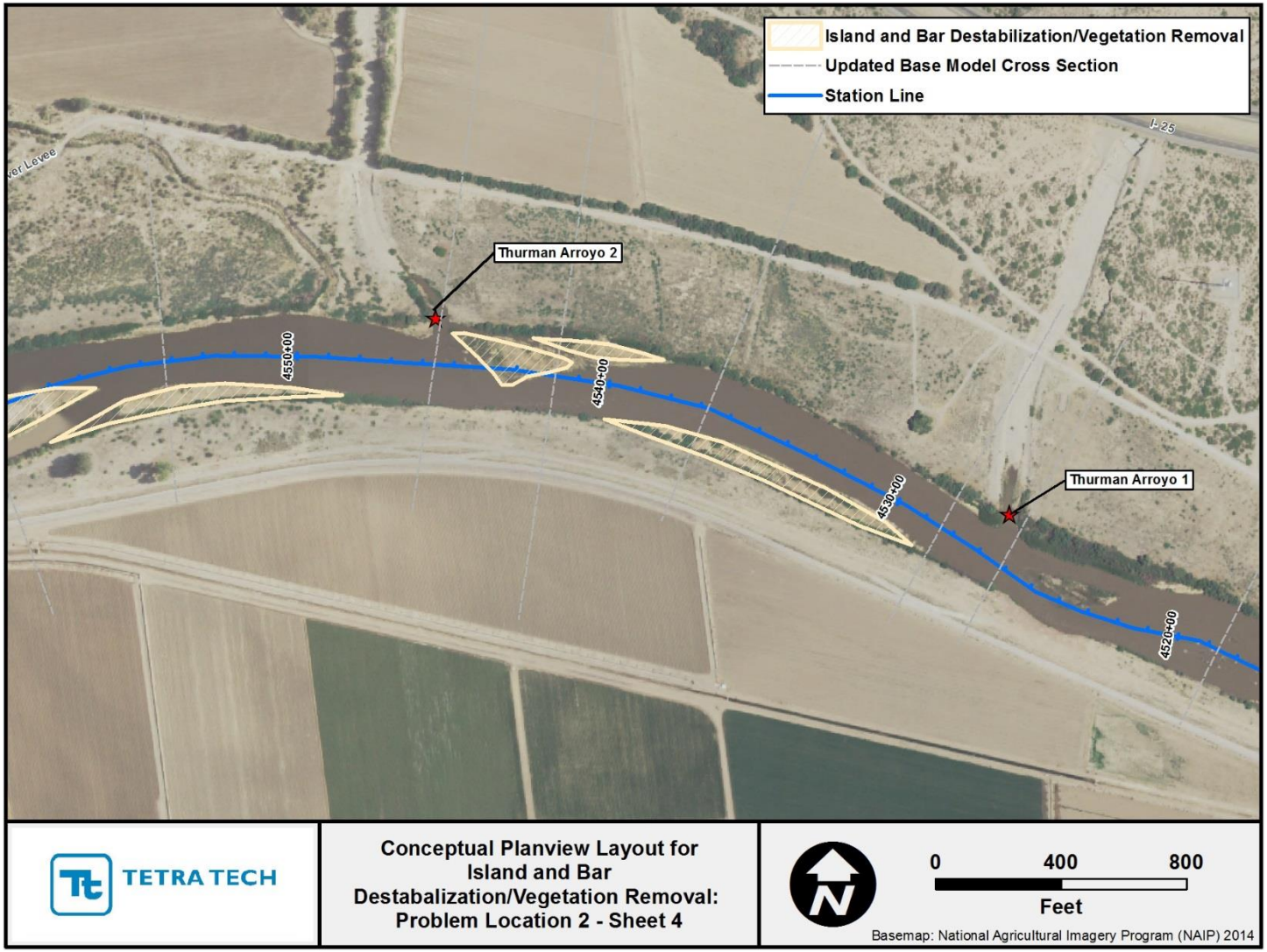


Figure J.4. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 2 (Sheet 4).

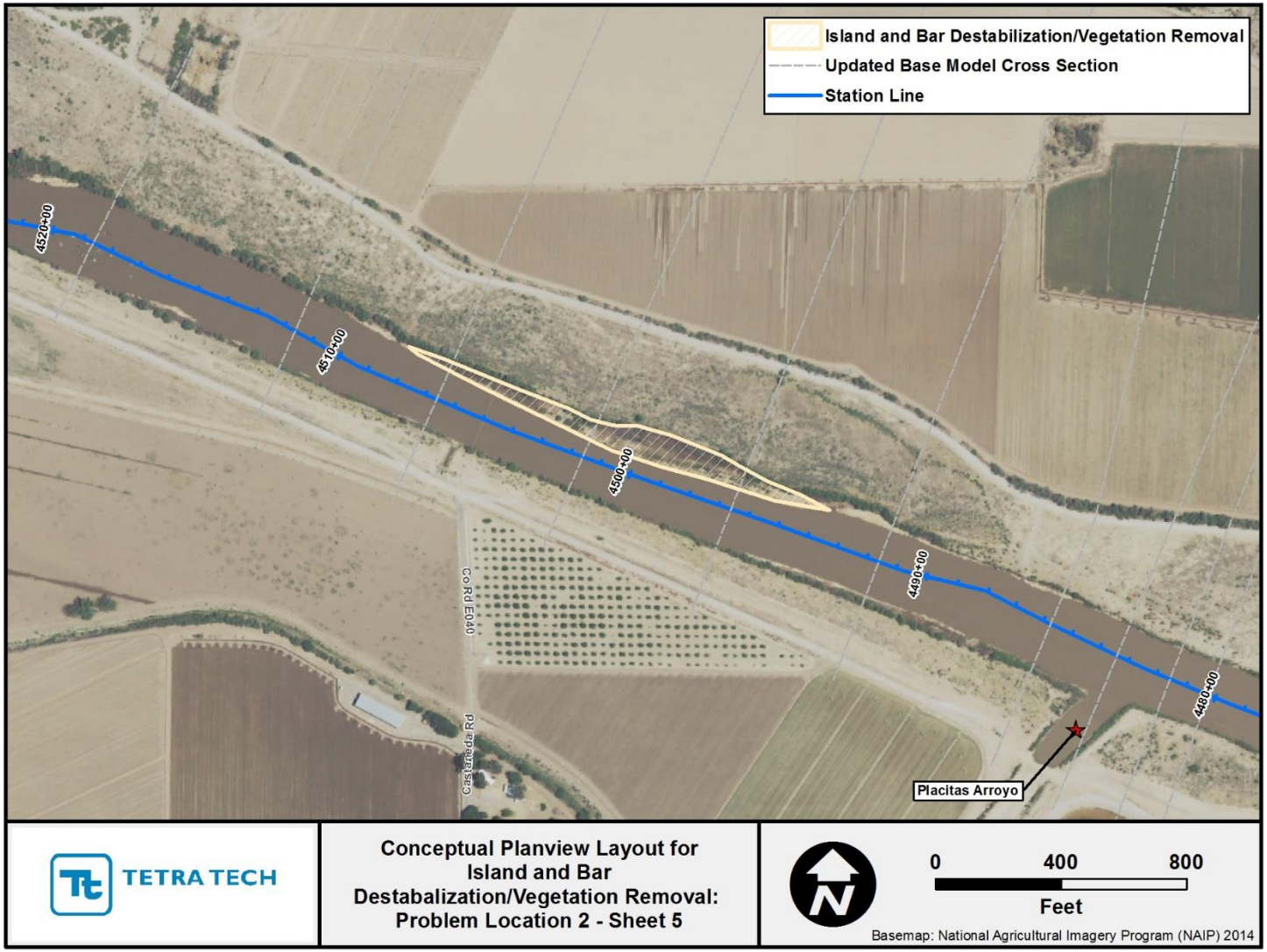


Figure J.5. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 2 (Sheet 5).

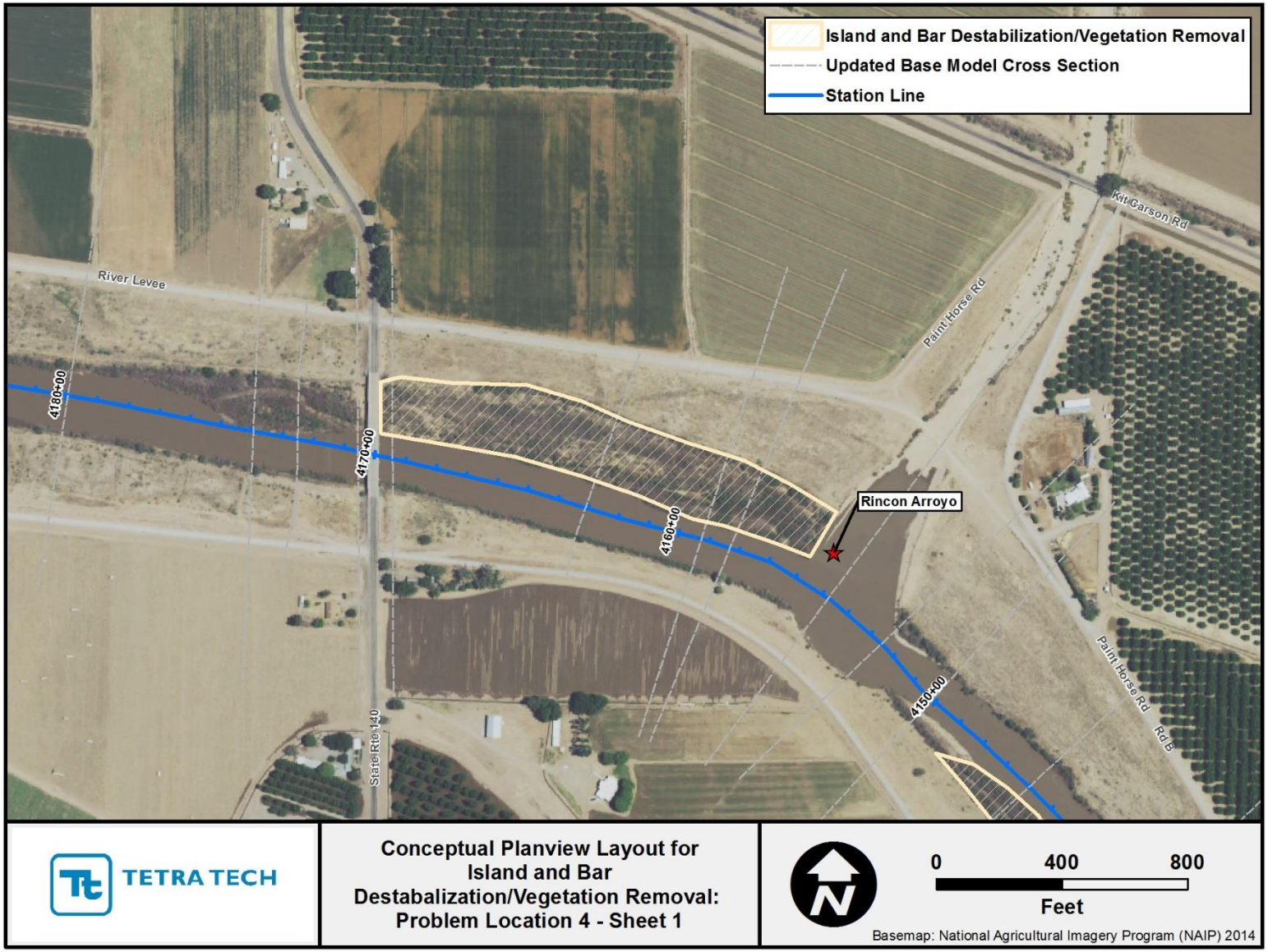


Figure J.6. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 4 (Sheet 1).

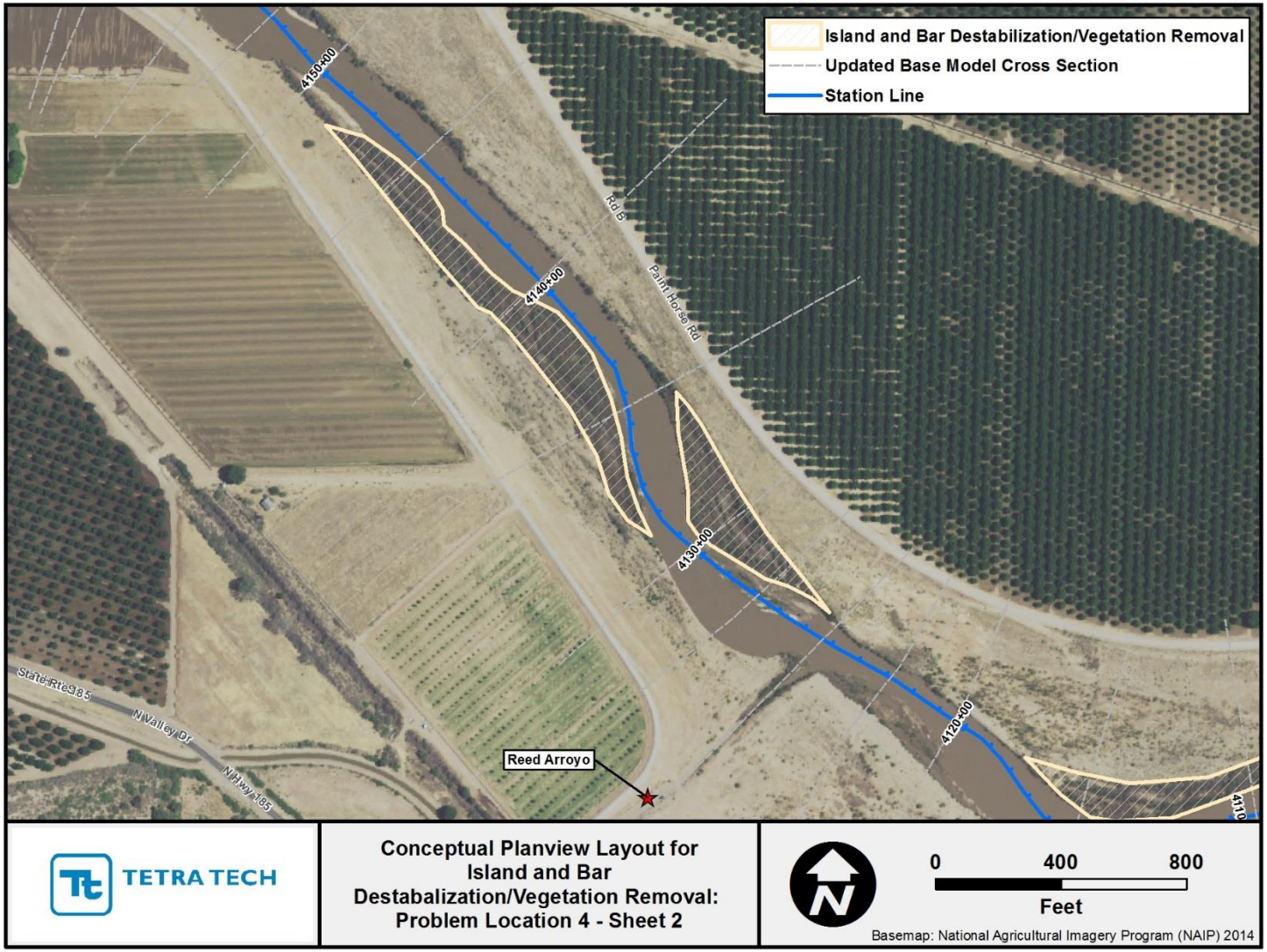


Figure J.7. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 4 (Sheet 2).

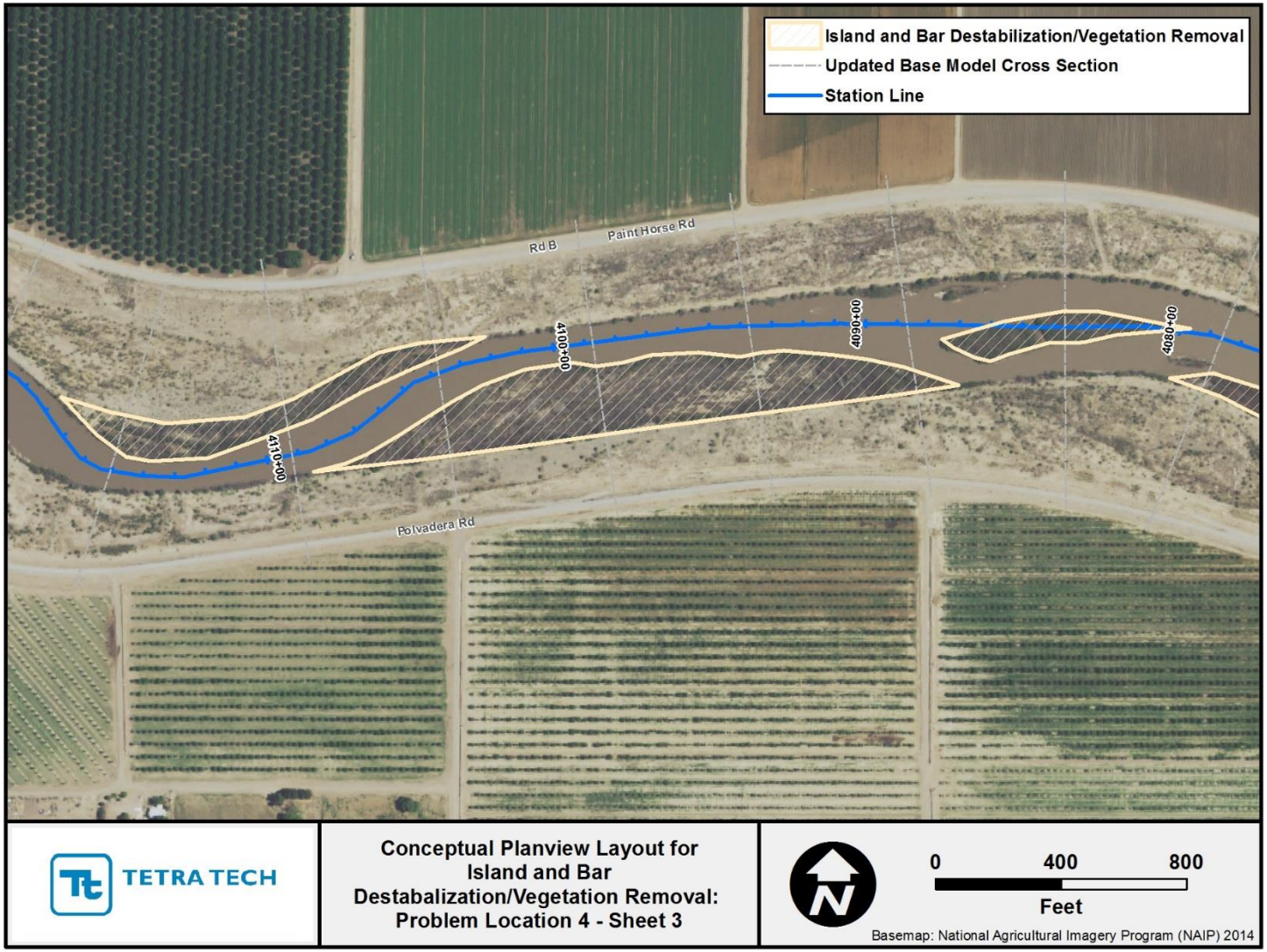


Figure J.8. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 4 (Sheet 3).

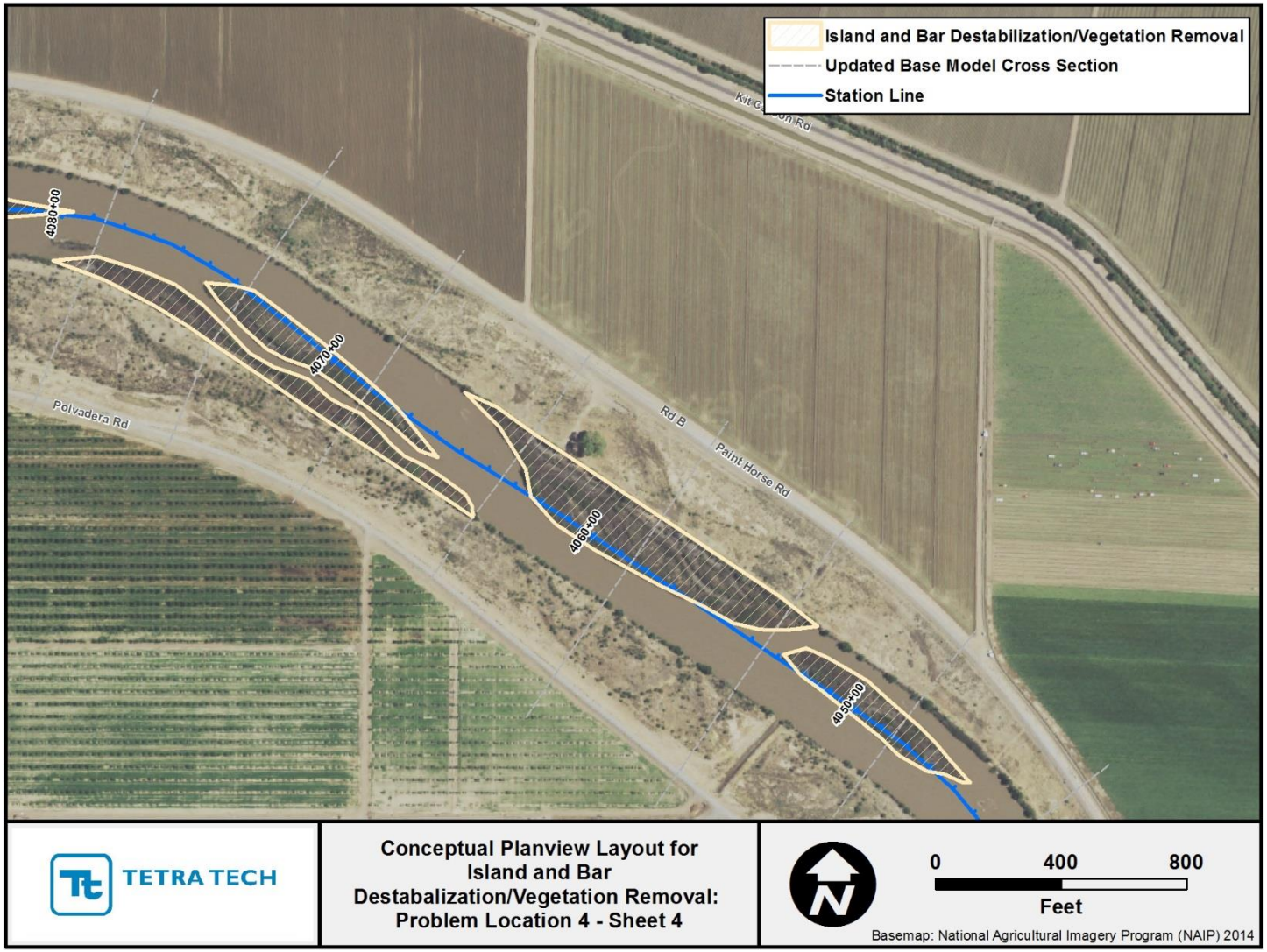


Figure J.9. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 4 (Sheet 4).

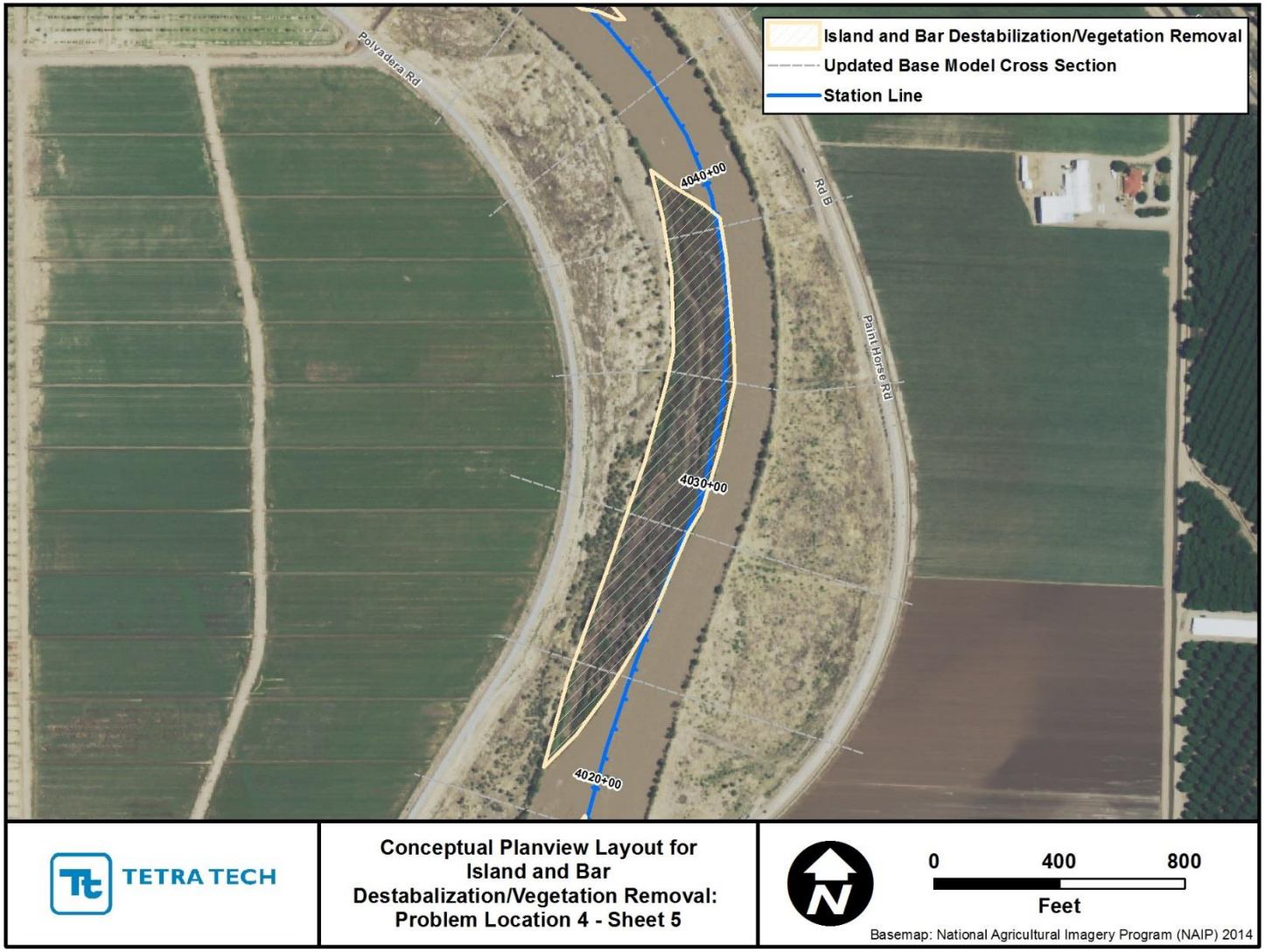


Figure J.10. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 4 (Sheet 5).

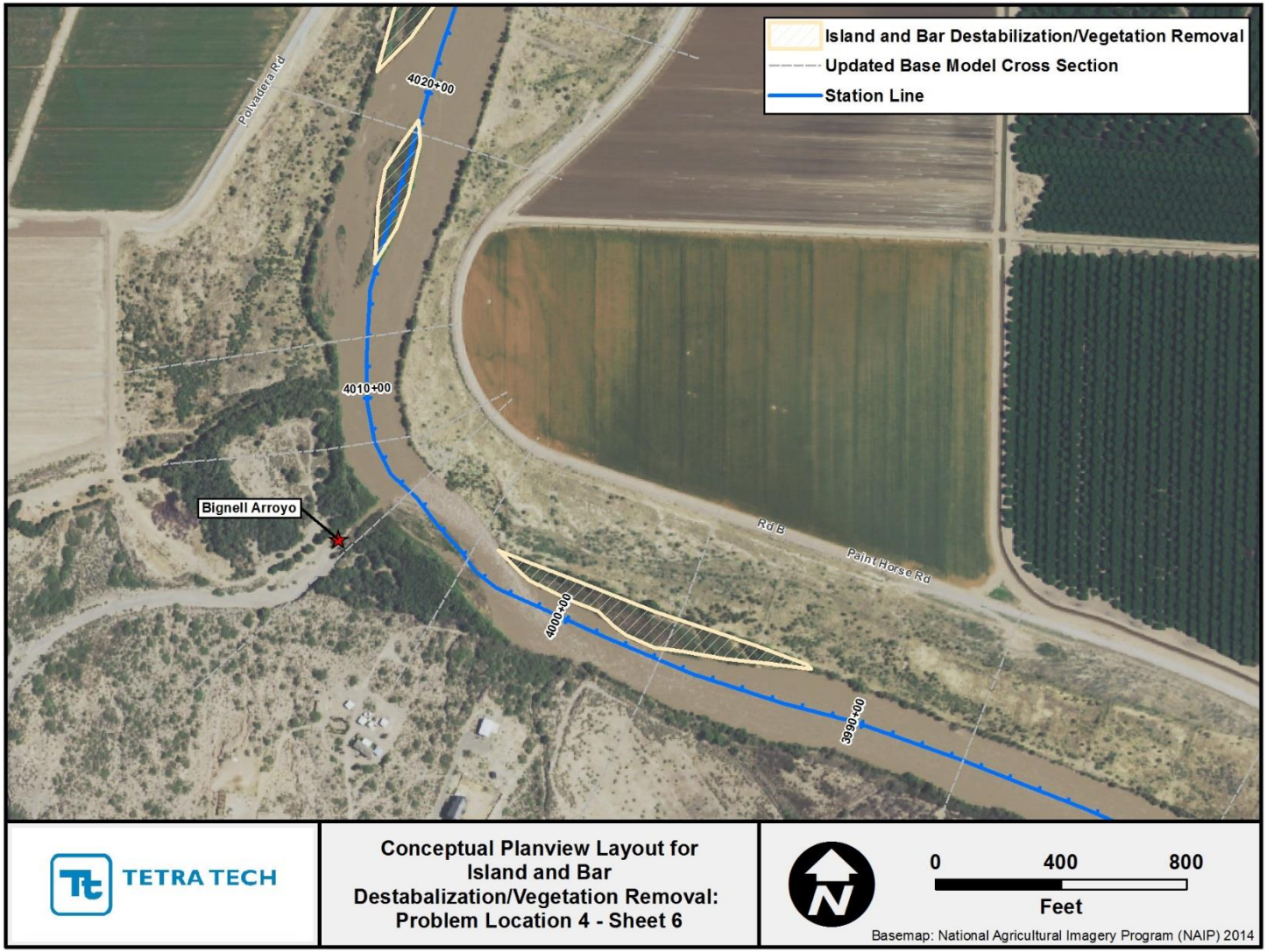


Figure J.11. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 4 (Sheet 6).

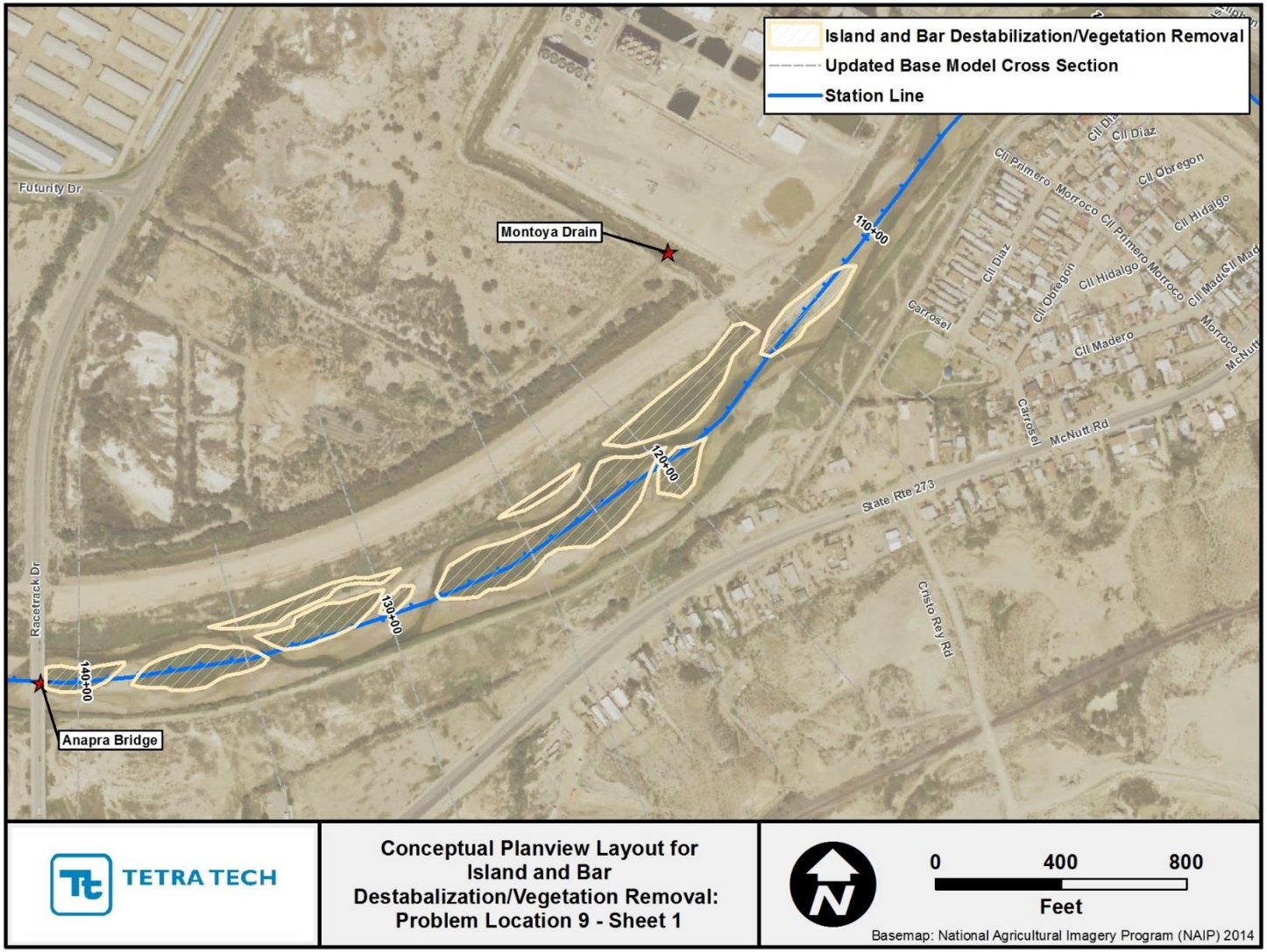


Figure J.12. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 9 (Sheet 1).

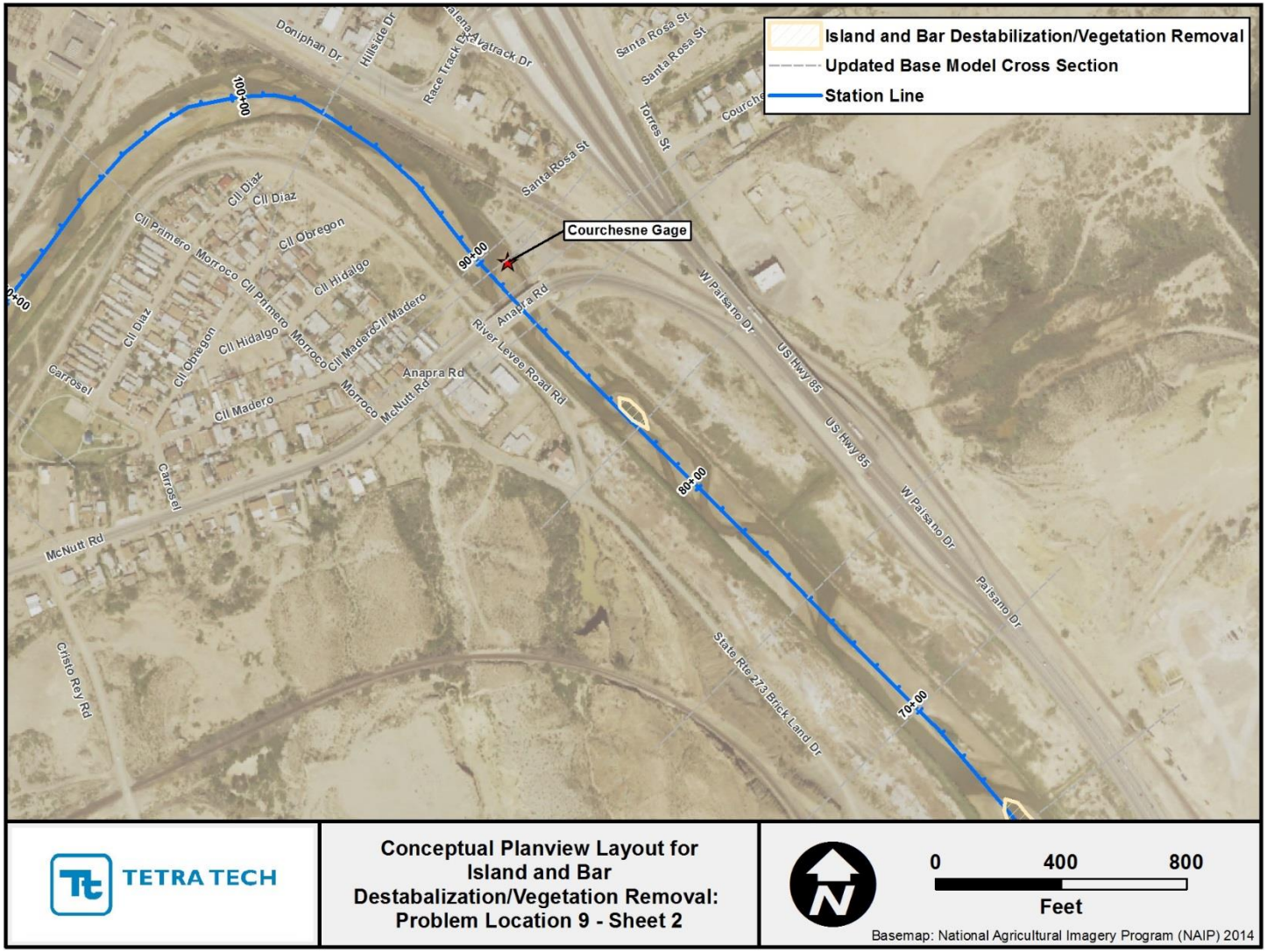


Figure J.13. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 9 (Sheet 2).

Figure J.14. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 9 (Sheet 3).

Figure J.15. Aerial photography showing extents of features treated with island/bar destabilization and vegetation removal at Problem Location 9 (Sheet 4).

Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project:
Final Report

APPENDIX K

EBID River Sediment Management Alternatives Report Excerpts

October 20, 2015

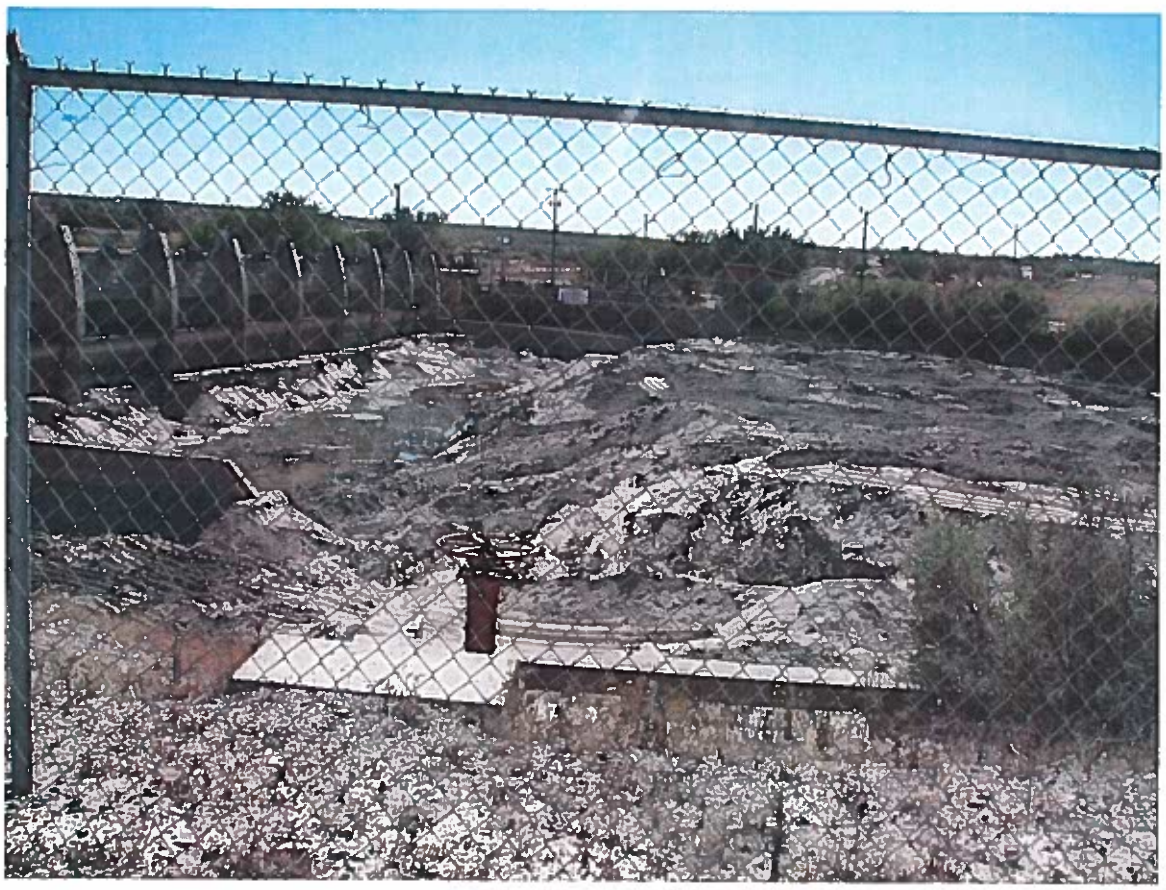
Contract No. IBM09D0006
Order No. IBM14T0016

River Sediment Management Alternatives

Proposed by Elephant Butte Irrigation District

To US Section International Boundary and Water Commission

C/O Elizabeth Verdecchia
Natural Resources Specialist
4171 N. Mesa St C-100
El Paso, TX 79902



Submitted: June 17, 2014

Table of Contents

Introduction and History

Sediment management within the Rio Grande Channelization Project (RGCP) is critical to channel flood capacities and efficient deliveries to the two United States irrigation districts and Mexico. Sediment management within the RGCP must compare historical maintenance and recent neglect for the sediment accumulation by the US Section of the International Boundary and Water Commission (IBWC) which is in charge of maintenance of the channel in the RGCP.

Since the Canalization Project began, the IBWC engaged in multiple preventive measures and annual sediment removal for sediment management within the river channel. To reduce the need for mechanical dredging, the IBWC constructed five watershed dams for soil and water conservation and to reduce the amount of flood-borne sediments reaching the river channel. These projects have been successful in reducing the sediment load from several major arroyos. Other arroyos and watersheds were not suitable for the construction of dams and therefore remain as wild arroyos which bring in massive amounts of sediment to the channel during major storm events. EBID is in support of additional projects to keep sediment upstream of the river channel as indicated the letter dated April 10, 2014 from IBWC Commissioner Edward Drusina to the Interstate Stream Commission which is included as Appendix 1.

The Rio Grande Project has historically relied on mechanical removal of sediment from the river channel by the IBWC. The IBWC engaged in annual maintenance and sediment removal throughout the channelization Project to ensure channel flood capacities and efficient irrigation flow deliveries. Sediment was removed annually from problem areas using dredging and excavation to maintain the design grade and capacities of the river channel. Since approximately 1997, the IBWC has ceased sediment removal in response to threatened litigation over endangered species[1]. As indicated in this reference, the sediment accumulation has increased with the current drought because the smaller releases from Project storage have less sediment transport capacity than full releases. Currently the sediment loading on the river continues unmitigated. EBID's formal comments to this reference is included in Appendix 2 of this proposal.

Within the Channel Maintenance Plan, support was included for alternative measures, which are expanded within this proposal. These proposed improvements to EBID's interaction with IBWC's river channel are intended to compliment future river channel maintenance. However, river channel maintenance and annual sediment removal by the IBWC will remain necessary due to the issues expounded in EBID's comments to the Channel Maintenance Plan. It is important to mention that Audubon New Mexico, through its representative, Beth Bardwell have also expressed her support for the alternatives proposed within this document.

[1] USIBWC Rio Grande Canalization Project, River Management Plan, DRAFT, International Boundary, Water Commission, December 12, 2013.

EBID's diversion dams were designed and built with some consideration to sediment exclusion. For this reason, the invert of the canal heading gates were engineered higher than the invert of river sluice gates thus preventing sediment carryover into the diverted water while allowing for efficient passage of sediment downstream. However, lack of channel maintenance has caused aggradation of the bed channel so that presently sediment increasingly flows directly into the canal heading.

Once the water from the Rio Grande is diverted at one of EBID's diversion dams for irrigation the high level of suspended sediments in the river water causes difficulty in delivering water to our agricultural constituency because the irrigation canals are aggrading at an accelerated pace, causing reductions in capacity and freeboard. Also, since most of the irrigation within the Rio Grande Project is done by flood irrigation techniques, increased sediment loads translate into negative impacts for on-farm efficiencies. Farm fields, which are aggraded by suspended sediment, have decreased available hydraulic head to deliver water swiftly and evenly across the farm field. Aggradation of a farm field causes an increased disparity of infiltration from the near end of the field to the far end of the field which translates into decreased irrigation efficiency.

This document includes three alternative sediment management proposals. First, new check structures with a sluice way near the two Mesilla Dam headings will reduce the sediment transport into our agricultural irrigation canals. The proposed structures are intended to reroute diverted sediment back to the river channel for both EBID's Westside and Eastside Main Canals. Second, we propose a trash rack to be installed immediately upstream of the Leasburg Dam's diversion and sluice gates to improve existing sediment sluicing for the Leasburg Main Canal and operation of the sluice gates and diversion gates. Third, two additional automated electric operators for the Mesilla Dam, to compliment the two already installed, will promote hydraulic mobilization of sediment and reduce accumulation upstream of the diversion dam.

These proposal items were presented to a group of stakeholder engineers and scientists who were called to meet on March 27, 2013 to discuss river management issues. The purpose of this presentation was to communicate the river sediment issues which are, to a great extent, a result of the lack of channel maintenance by the IBWC. Since that time this written proposal was requested by Mrs. Elizabeth Verdecchia as part of the Record of Decision (ROD) working group. In our opinion, the discussions within the ROD working group has been cooperative and informative for most stakeholders but have not proven fruitful for the technical issues that EBID faces due to the lack of maintenance by IBWC.

In summary, EBID raises two major concerns due to the lack of channel maintenance by the IBWC: channel flow/delivery efficiencies and prevention of sediment which reach the canal system and eventually farmers' fields. This proposal only addresses mitigation of sediment load delivered to EBID's canals. As explained within the Channel Maintenance Plan written by IBWC, and explained in greater detail within EBIDs comments, it is a statutory responsibility of the

IBWC to efficiently deliver water to the two irrigation districts within the United States as well as Mexican farmers.

These proposed improvements to EBID's interaction with IBWC's river channel are intended to compliment future river channel maintenance and will allow for more efficient deliveries and should greatly reduce annual sediment removal within the irrigation district. The cooperation which encouraged this proposal to be submitted to the IBWC is a testament to IBWC's renewed willingness to address the needs of its US constituents through the ROD working group.

Westside and Eastside Main Canal sediment sluice structures

Sluiceway concept overview:

It is critical for efficient water conveyance to prevent excessive sediment from entering the canal system. Canal headings are the most logical locations to engineer solutions to this ever-increasing problem. The Elephant Butte Irrigation District proposes that new check structures be constructed downstream of the headings of the Westside and Eastside Main Canals. The purpose of these check structures is to reduce the sediment load into the main canals by actively ejecting sediment immediately upstream of the checks. As proposed here, each structure entails an adequate width of overflow gates to allow the current canal design capacities to flow past while maintaining a metering structure to serve as the heading of the canal. The sluicing structure upstream of the check structure allows flow from the canal bottom to be bypassed back to the river. The transition of the canal floor to the check structure is a quarter circle vertical ledge which induces settling sediments in the canal to be returned to the river via the sluice gates. Figure 1 shows a 3D view of the conceptual design for these structures. A preliminary design for both the Westside and Eastside Main Canal structures is included in Appendix 3 of this proposal.

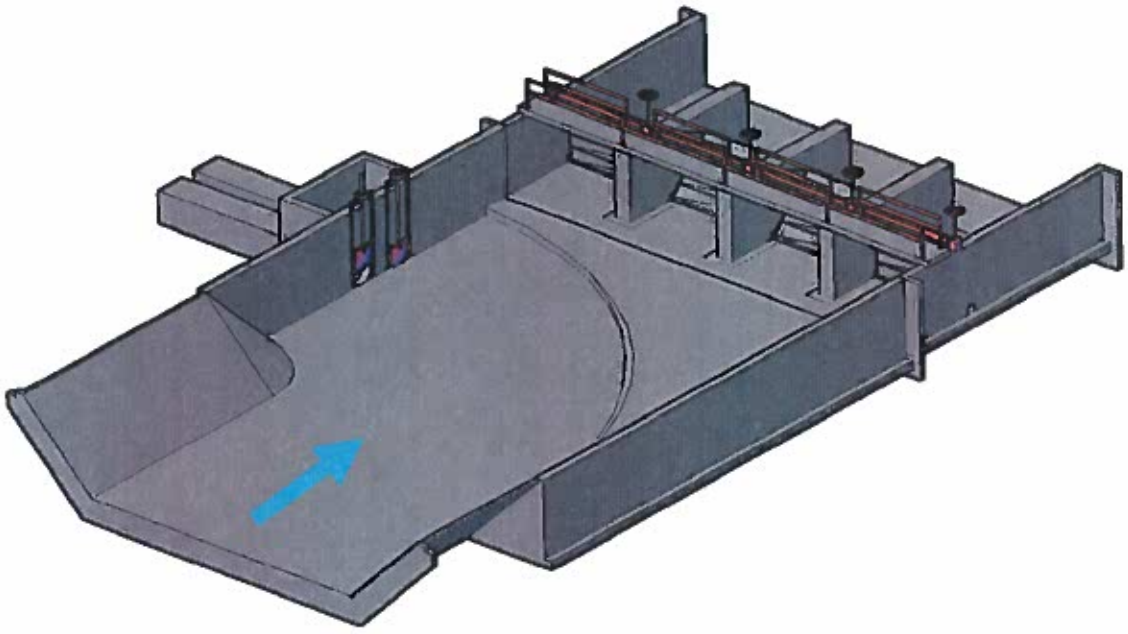


Figure 1. 3D view of proposed design for new Westside first check structure and sluiceway

This concept of a sluiceway with recessed upstream section was first implemented by the Bureau of Reclamation near the heading of EBID's Leasburg Main Canal. This location, approximately 2,950 feet downstream of the Leasburg dam heading is known as the Leasburg Canal Wasteway #1 or the "electric wasteway." In 2012, a check structure was installed immediately downstream of the electric wasteway in coordination with the Dona Ana Mutual Domestic Water Users Association. The installation of this structure served multiple purposes: provide improved sluicing capabilities of the wasteway, serve as the new heading for the Leasburg canal, therefore reducing repetitive operational demands on the Leasburg Dam heading gates, and to ensure consistent water surface elevation for a pump box to be installed in the future upstream of the check structure for a surface water treatment plant planned to be built nearby. Pictures of the new Leasburg "first check" and electric wasteway are shown as Figure 2 and 3. Since 2012, the improved check and sluiceway have proven helpful with reducing the amount of sediment entering the canal system.

Figure 2. Leasburg Canal "first check" and "electric wasteway"

Figure 3. Panoramic photograph of the Leasburg Canal from the new "first check" looking upstream

Proposed check and sluiceway design:

The proposed structures, one for the Westside and Eastside Main downstream of their Mesilla Dam headings respectively, include a check structure, similar to most other check structures throughout the irrigation district, and a recessed sluiceway upstream of the check structure. This design allows the new check structure to become the heading and the rated/meterable delivery point for the irrigation district's main canal. For the purposes of this proposal, these structures are referred to as the "first check" of each canal. The Westside Main Canal has a current design capacity of 600 cubic feet per second (cfs) and the Eastside Main Canal has a current design capacity of 350 cfs. Each of these canals are designed to serve tens of thousands of acres of land.

The sluicing culverts upstream of the check structure shown here entail two 36 inch "turn-out" style gates also known as an "Armco" or "Fresno Valve" style of circular sliding gate. A radial gate style for the sluiceway, similar to the Leasburg Dam electric wasteway, is also an ideal option (depending on negotiations with the IBWC pertaining to the distance that the sluicing structure can project out into the levee road). The sluice gate(s) are recessed such that the invert of the opening is flush with this upstream section and at least 1 foot below the check structure invert. The trapezoidal canal section upstream of the check structure is to have a slope of at least 0.001 which continues to a quarter circle ledge, just upstream of the check structure. This ledge directs the heavy bed load toward the sluice gates, and away from the heading gates on the check structure. The canal section upstream of the check structure transitions from a trapezoidal section to vertical wall rectangular section. A 3-D cross section view of the proposed design is shown in Figure 4.

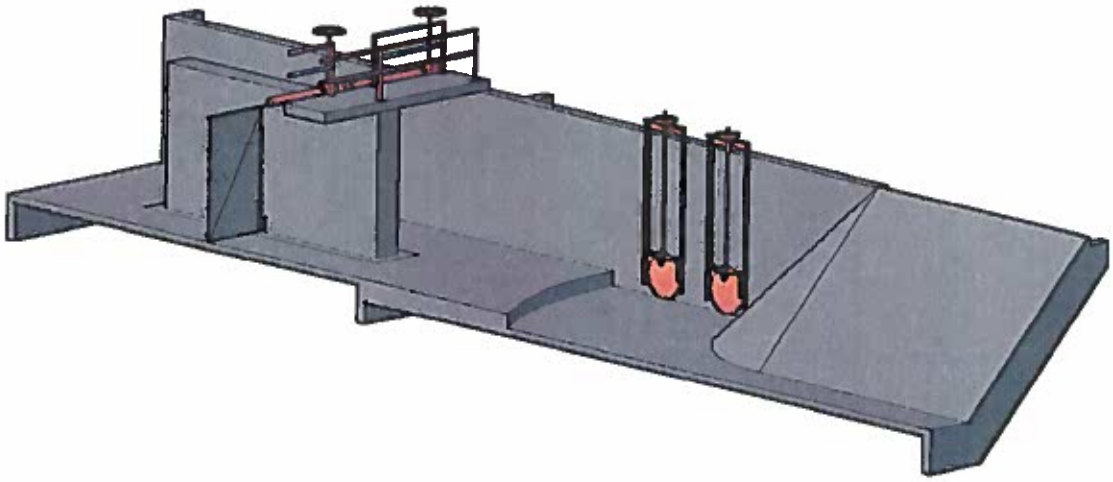


Figure 4. Section view of proposed Eastside Canal new first check

The locations chosen for the new "first checks" is based on the ability to route the sluiceway flows and sediment back to the Rio Grande. It is important to locate these check structures as far downstream as practical to allow settling time within the canal so that the maximum possible sediment is sluiced back to the river. The preferred locations are approximately 1700 feet and 600 feet downstream of the Mesilla Dam heading gates. The Westside first check location needs to be as far downstream as possible while avoiding crossing private property. The eastside orientation is more limited, and the best option is to obtain an easement through the neighboring pecan orchard at a location already used as a road. It is proposed that two 48" pipes or 36"x36" concrete box culverts are buried beneath the farm road ending in two concrete box culverts through the east side river levee. This arrangement of buried culverts does not impede the use of the road for its intended purpose. It is proposed that both sluiceway channels have at least a 0.001 ft/ft slope. To assist with evaluation of the proposed design, Table 1 and Table 2 below show design parameters for the respective structures.

The gate style selected for these structures is a moveable overflow weir which can be raised and lowered to adjust flows. This gate style can be calibrated as a rated metering structure as proven by the Bureau of Reclamation[2]. The equation for metering flows using this style of gate is shown as Equation 1. This equation is simply a manipulation of Bernoulli's equation with calibration coefficients for weir flows.

$$Q = C_a C_e \frac{2}{3}\sqrt{2g}(b_c + K_b)(h_1 + K_h)^{1.5}$$

K_b = 0.00835 and K_h = 0.003 (US units)

b_c = gate width (ft)

h_1 = head on gate (ft)

$$C_a = 1.0333 + 0.003848\theta - 0.000045\theta^2$$

Θ = gate angle in degrees

$$C_e = 0.002\frac{h_1}{p} + 0.59$$

p = upstream water depth below the crest (ft)

Equation 1. Rating equation for overshot (movable weir) style check gate

The designed maximum elevation for the gate is the high water mark of the Mesilla Dam which is also the top of the existing river gates. The overflow gates serve as a rated structure for accurate flow measurement from the fully vertical position to where the gate is tilted down to a 40 degree position. The gates must have sufficient capacity to pass the entire normal canal flow

[2] Bureau of Reclamation Water Measurement Manual: A Water Resources Technical Publication. Revised 2001. Washington DC: Government Printing Office. (Chapter 7, 13. Special Weirs, (e) Flow Measurement using an Overshot Gate)

while at the 40 degree position. Additional flow can be allowed to pass, in during emergencies by laying the gates down further. This increased water surface elevation for the portion of the canals upstream of the new first check to the dam heading gates requires the canal banks to be raised with compacted earthen material. The canal banks, and bottom of the structure walkway have a freeboard of at least 1.5 feet and the canal banks require a 3-4 inch gravel wearing surface to be added. Concrete lining upstream of the new check structures is included in the design to allow for reliable cleaning elevations and to reduce chances of canal banks breaching due to rodent activity.

The heading of the Del Rio Lateral currently diverts water from the Rio Grande, a few feet upstream of the Eastside Main Canal heading gates. The Del Rio Lateral then siphons under the Eastside Canal and heads south. Due to the proposed new placement of the Eastside Canal "first check," it will be a major improvement for this lateral to be simply diverted off the right/south bank of the Eastside Main Canal. The Del Rio Lateral heading is a 48" turnout gate which is pressurized by the water surface elevation of the proposed check structure.

The sluiceway channels have been designed for a flow of 400 cfs at the Westside Main Canal and 300 cfs for the Eastside Main Canal. This relatively large flow enables the irrigation district to flush a large amount of sediment and river flow without diverting more water than required for the irrigation system. In the future, a simple low-head hydropower station will be installed immediately upstream of each of the proposed check structures and sluiceways. The design flow of the sluiceway culverts is overdesigned to accommodate future hydropower implementation but no other accommodations for hydropower are requested. The raceway of the hydropower turbines will be routed to the culverts upstream of the river levee, preventing any additional work to the river levee. These future plans are mostly unrelated to this proposal but they must be considered in the present sluiceway flow design to be able to accommodate additional future flows.

The sluiceways channels/culvert are proposed to be two circular turnouts or a single radial gate into a concrete box, then two 3 foot x 3 foot concrete box culverts will extend to the levee and approximately 5 feet beyond the bottom toe of the river levee. It is important to mention that the concrete box at the beginning of the sluiceway channel need to be longer for a radial gate design to accommodate the pins and arms of the gate. If a box sized for a radial gate does not narrow the levee maintenance road/EBID canal maintenance road unacceptably, then a single radial gate is the preferred option for the sluiceway. From the end of the box culverts, a concrete channel prevents head cutting and erosion of the levees. The concrete channel is proposed to be 20 feet long and the downstream end of the proposed channel with an 8 foot cutoff wall to forestall head cutting erosion. An earthen channel takes the water to the main river channel from the end of the concrete channel. Energy dissipaters may be desirable within the concrete channel. Both the concrete channel and the earthen channel of the sluiceway beyond the levee are 5 feet deep and have a bottom width of 10 feet, with 2:1 side slopes. This channel design results in a 30 foot top width.

Sluiceway and check structure design parameters:

Table 1. Westside Canal new "first check" and sluiceway design parameters

Elevation of river high water mark	3826.53	feet (BOR datum)
Invert of canal heading gates at dam	3818.99	feet (BOR datum)
Canal current capacity	600	cfs
Minimum canal slope	0.001	ft/ft
Current canal top width	75	feet
Current canal bottom width	53	feet
Desired combined sluiceway capacity	400	cfs
EBID ROW width	120	feet
Proposed distance from heading	710	feet
High water mark below dam	3819.11	feet (BOR datum)
Distance to river channel	320	feet

Table 2. Eastside Canal new "first check" and sluiceway design parameters

Elevation of river high water mark	3826.53	feet (BOR datum)
Invert of canal heading gates at dam	3819.17	feet (BOR datum)
Canal current capacity	350	cfs
Minimum canal slope	0.001	ft/ft
Current canal top width	35	feet
Current canal bottom width	14.6	feet
Desired combined sluiceway capacity	300	cfs
EBID ROW width	110	feet
Proposed distance from heading	1640	feet
High water mark below dam	3819.11	feet (BOR datum)
Distance to river channel	650	feet
Invert Del Rio Lateral Heading	3822.06	feet (BOR datum)

EBID owns the Westside and Eastside Main Canals through Quitclaim Deed from the Bureau of Reclamation since 1996. EBID's property right starts at the canal headings at the Mesilla Dam. This right of way (ROW), conflicts slightly with the needs of the IBWC levee along the west river levee immediately downstream of the dam. Regardless, the uses are compatible with EBID's needs and the levee is not compromised by implementation of these proposed projects.

The need to raise both banks of both canals for adequate freeboard has minimal impact upon the IBWC's river levee as it only calls for raising the canal bank/levee for a 600 foot section.

Both banks have a gravel wearing surface installed and the earth work for both banks of the Westside canal must comply with IBWC levee construction standards. Raising the banks on the Eastside Canal does not overlap with the IBWC levees, but requires a gravel wearing surface above and beyond the freeboard elevations to avoid potential erosion. EBIDs ROW for the Westside Canal is 120 feet, a measurement that is shown by plat in Appendix 4. This 120 feet width consists of 55 feet from centerline to the left/east edge and 65 feet from the centerline of the canal to right/west edge. The Eastside canal entails 110 feet. These ROWs provide adequate width for the proposed structures and maintenance roads. The plats provided to EBID by the Bureau of Reclamation as part of the transfer are provided in Appendix 4.

Mesilla Dam Gate Automation

Dam gate automation concept overview:

Mesilla Dam was built in 1905 by the US Reclamation Service, and it has been the core of the Rio Grande Project ever since. Diversions into the Eastside and Westside canals serve lands in both New Mexico and Texas, and the Westside Canal is by far the largest diversion in the Project. This diversion dam is a barrage-type structure, with 13 radial gates, each 21.5 feet wide, spanning the width of the Rio Grande. The gates are numbered from one on the east end to 13 on the west. The first two gates at each extreme end have inverts that are two feet lower than the other nine gates. Underflow gates were used instead of ogee structures like those at Percha and Leasburg dam because by the time water reaches Mesilla, lateral inflows from sediment-laden storm water has loaded the channel with sediment. The gates are intended to keep the sediment in the river and out of the canal systems. The basic structure of the dam has been maintained, but remains largely unchanged from its original design. The gates were historically operated by a "mule," a portable engine that would be rolled along the dam and hooked up to each gate to be raised or lowered.

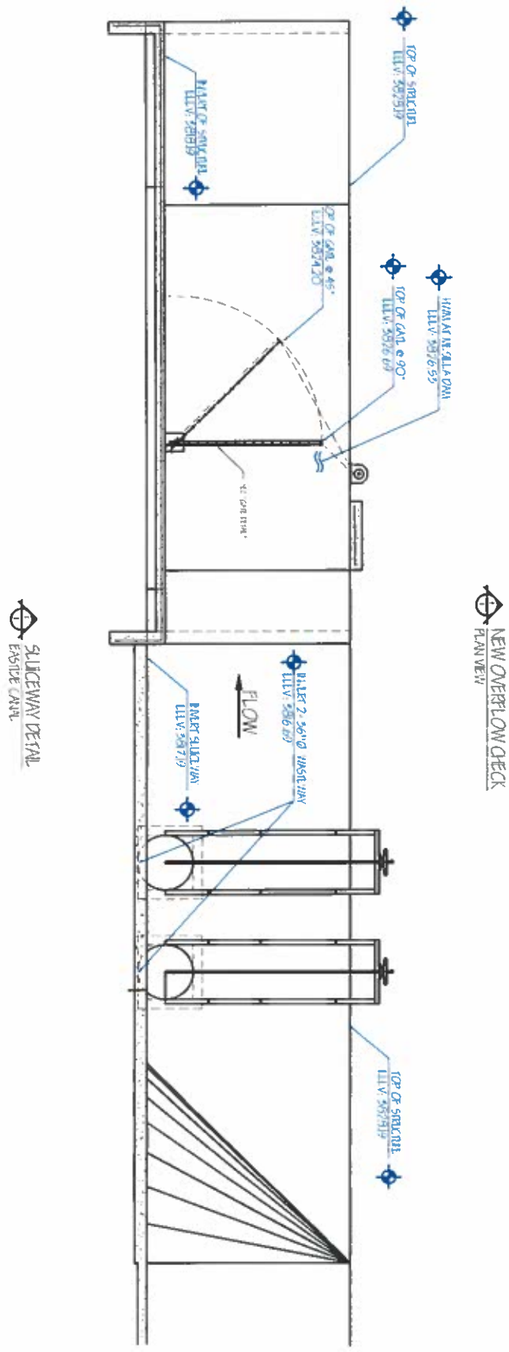
Automated gate operators were installed on two gates of the Mesilla Dam in 1994 to allow for automatic and programmable upstream head and flow control. The automated gates have proven effective for EBID and for regular river operations. As shown in Figure 9, gates number 2 and 12, the second from the outmost gates were previously selected for automation. These gates have lower inverts than the middle nine gates, producing optimal sluicing capabilities. Since that time, those two gates are the most consistently operated and therefore, sediment buildup takes place near the middle gates annually.

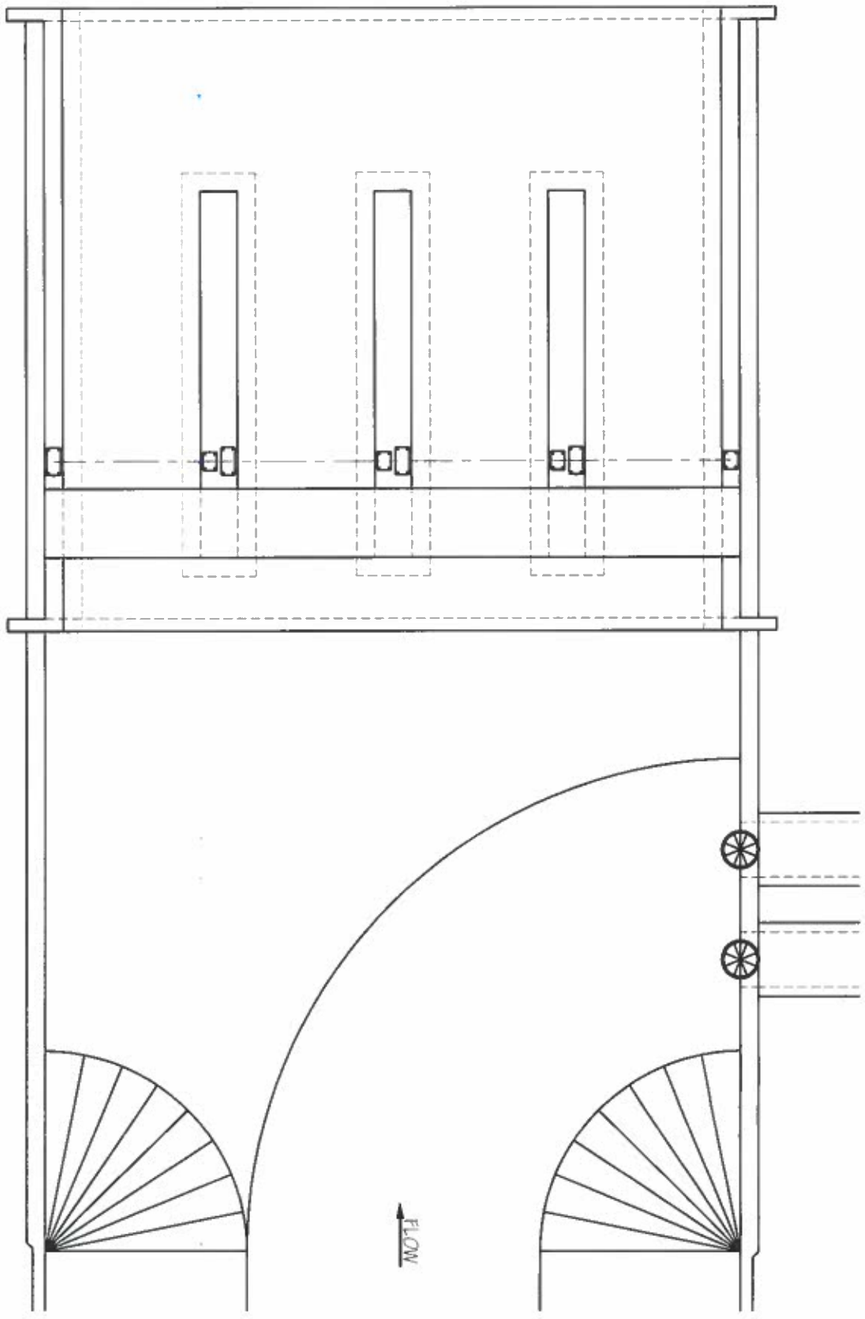
It is proposed by EBID that two more gates be automated to better distribute the sluicing and sediment transport past the dam during automatic control operations. Gates 5 and 9, numbered from east to west, are proposed to have automated functions similarly to gates 2 and 12. These gates will aid in sluicing sediment beyond the dam during times of automatic control. An electric motor and counterbalance weights must be installed onto the gates. Automation is achieved with radio telemetry units similar to the other automated gates which are compatible with other SCADA controls throughout EBID's system. EBID has ample experience installing these automating controls and prefers to take the lead on the programing and automation controls.

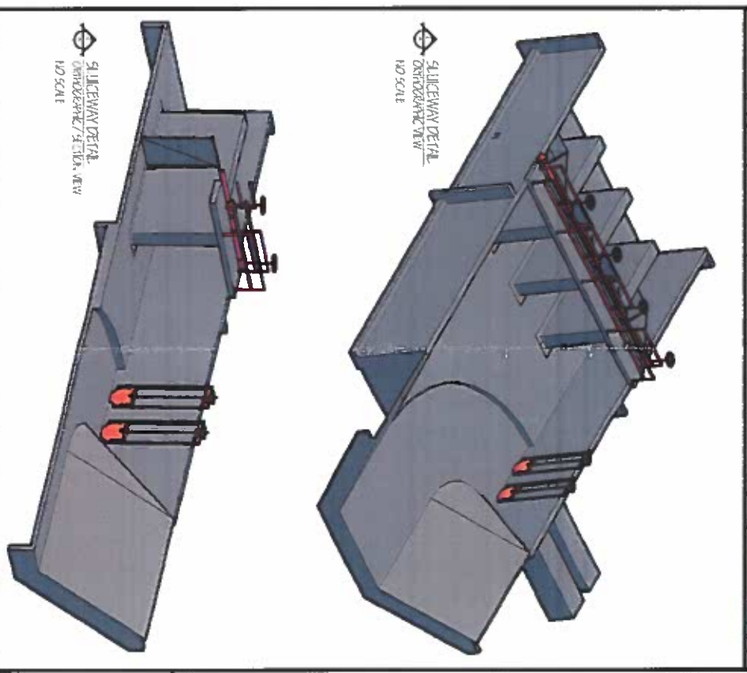
In principle, two of the proposed automated gates are active in controlling the upstream state at any one time, but the active gate duties are rotated to minimize wear on any one gate operator and to balance the sediment sluicing across the width of the dam.

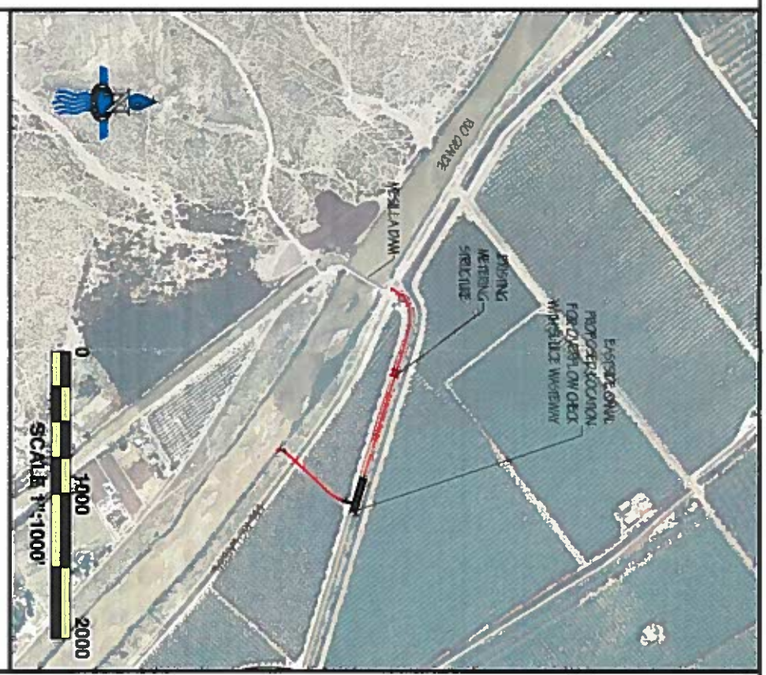
Figure 9. Photograph of Mesilla Dam showing gates currently automated and proposed for automation

Appendix 3: Sluiceway and check structure design









EBID

ELEPHANT BUTTE IRRIGATION DISTRICT

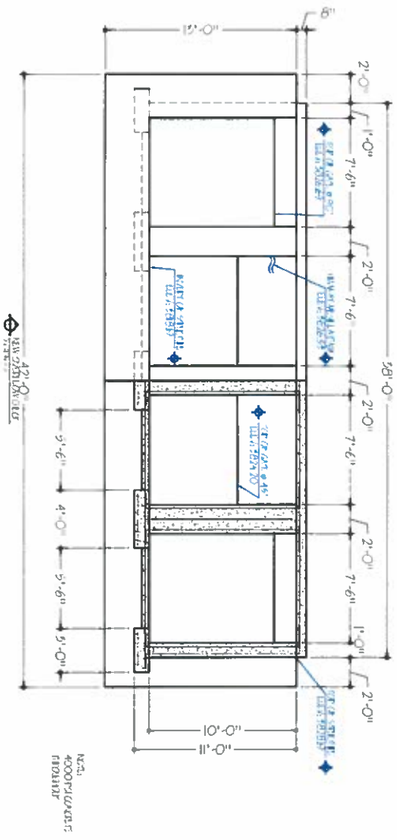
ENG. JOB #	2015-025
DWG FILE	2015-025 Eastside Riverside Overflow.dwg
DESIGNED	Z. LEWIS
DRAWN	Chris Morales
LAYOUT	A
PRINT DATE	

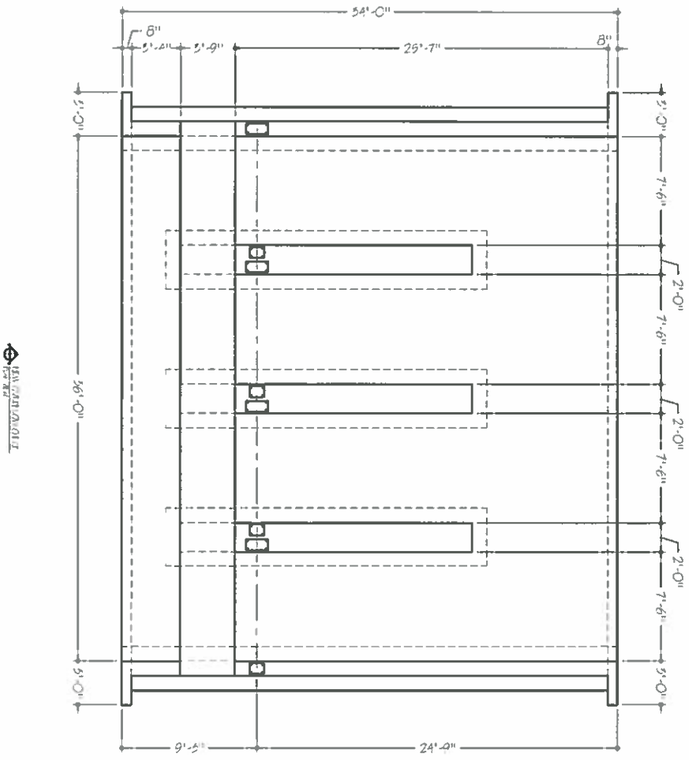
PROPOSED OVERFLOW CHECK
AND BYPASS
EASTSIDE CANAL

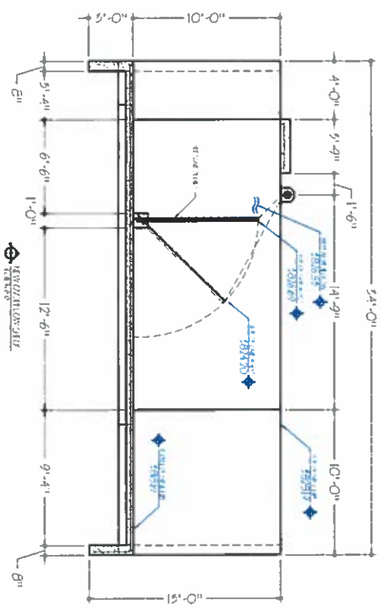
REVISIONS	
DATE	REMARKS

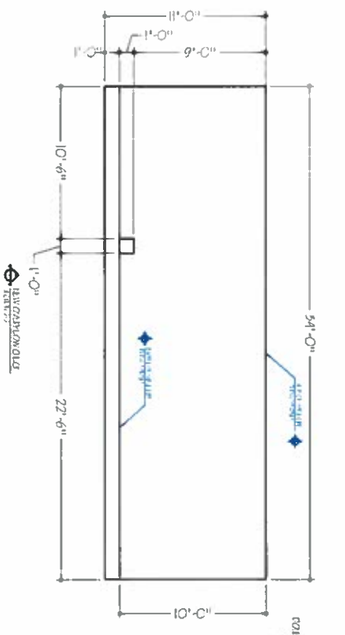
E1

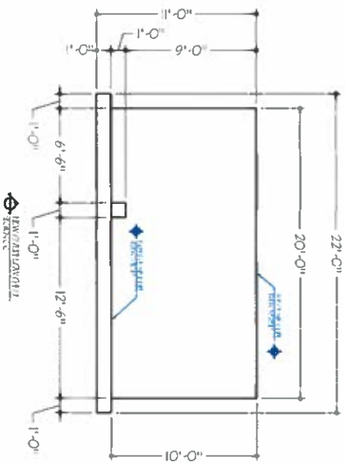
SHEET 1 OF 3

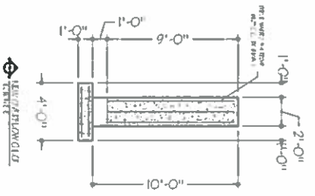


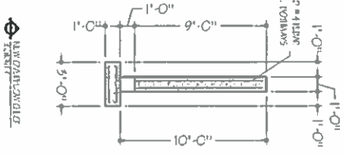


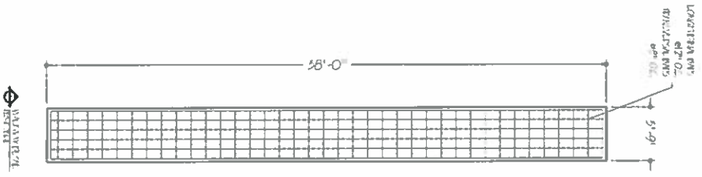


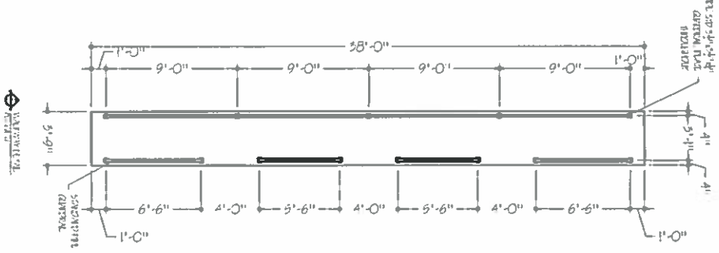












EBID

ELEPHANT BUTTE IRRIGATION DISTRICT

ENG. JOB #	(((((-(((
DWG FILE	2013-025 Eastside Overchute.dwg
DESIGNED	---------
DRAWN	Chris Morales
LAYOUT	A
PRINT DATE	Wednesday, October 31, 2012

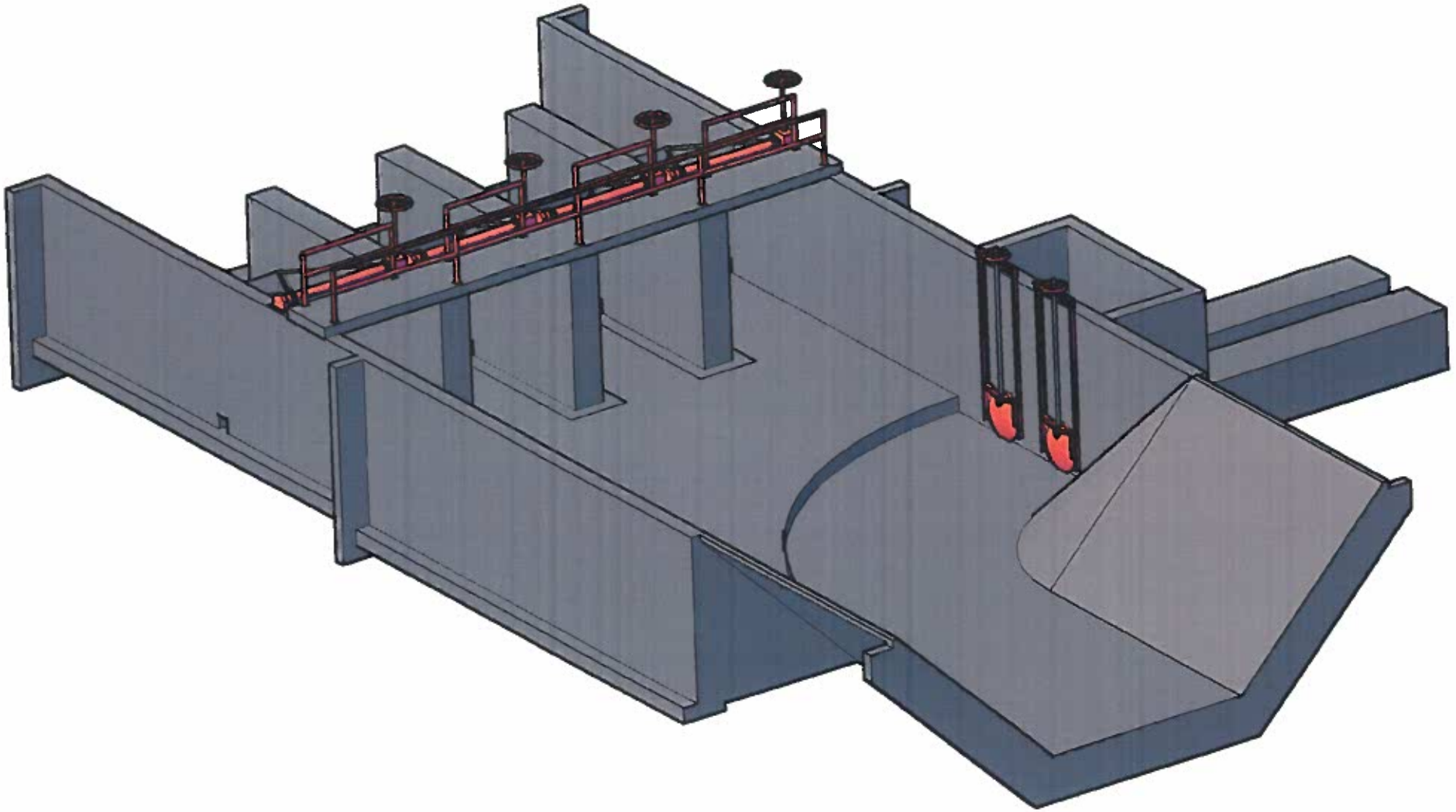
PROPOSED OVERFLOW CHECK
AND BYPASS
EASTSIDE CANAL

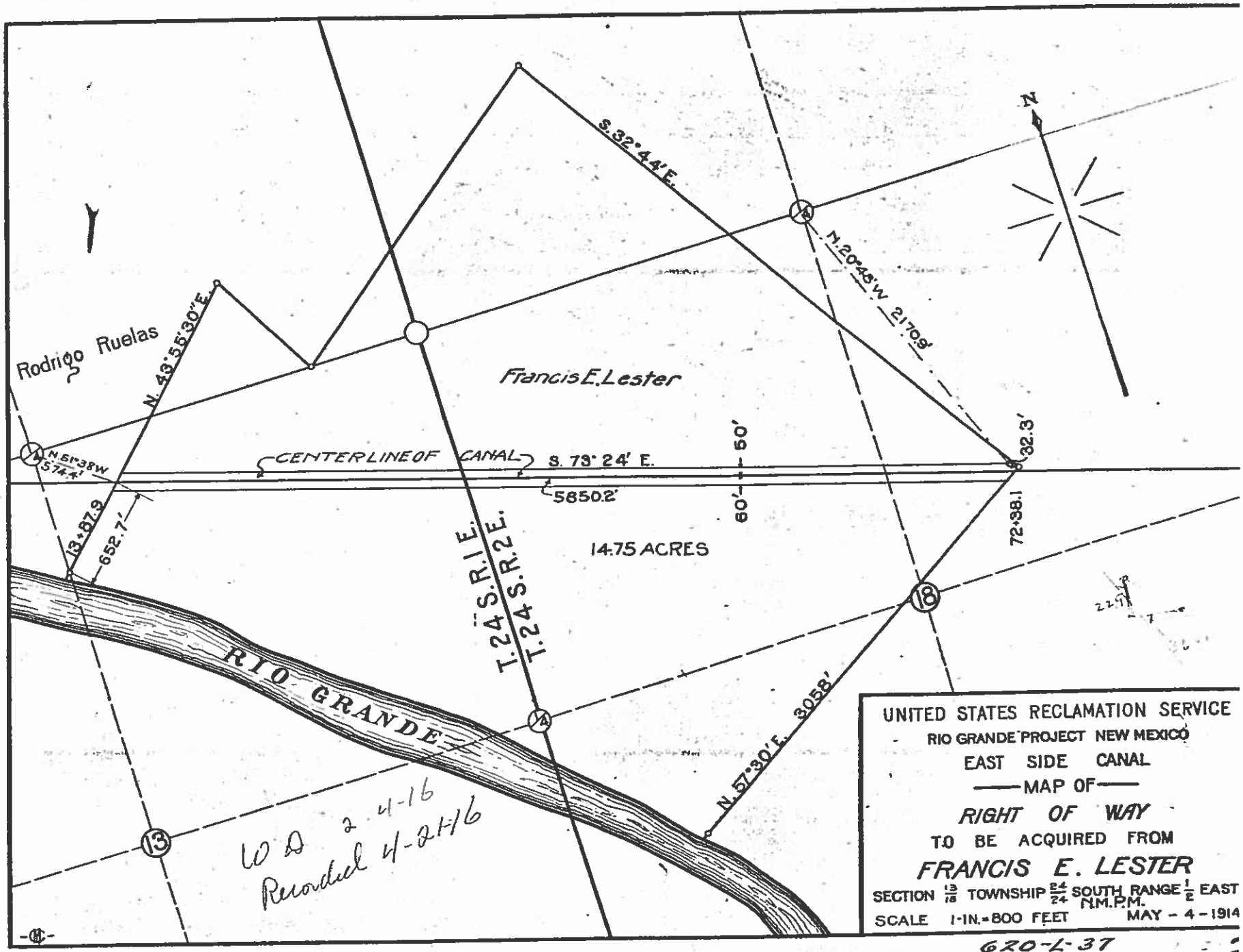
REVISIONS

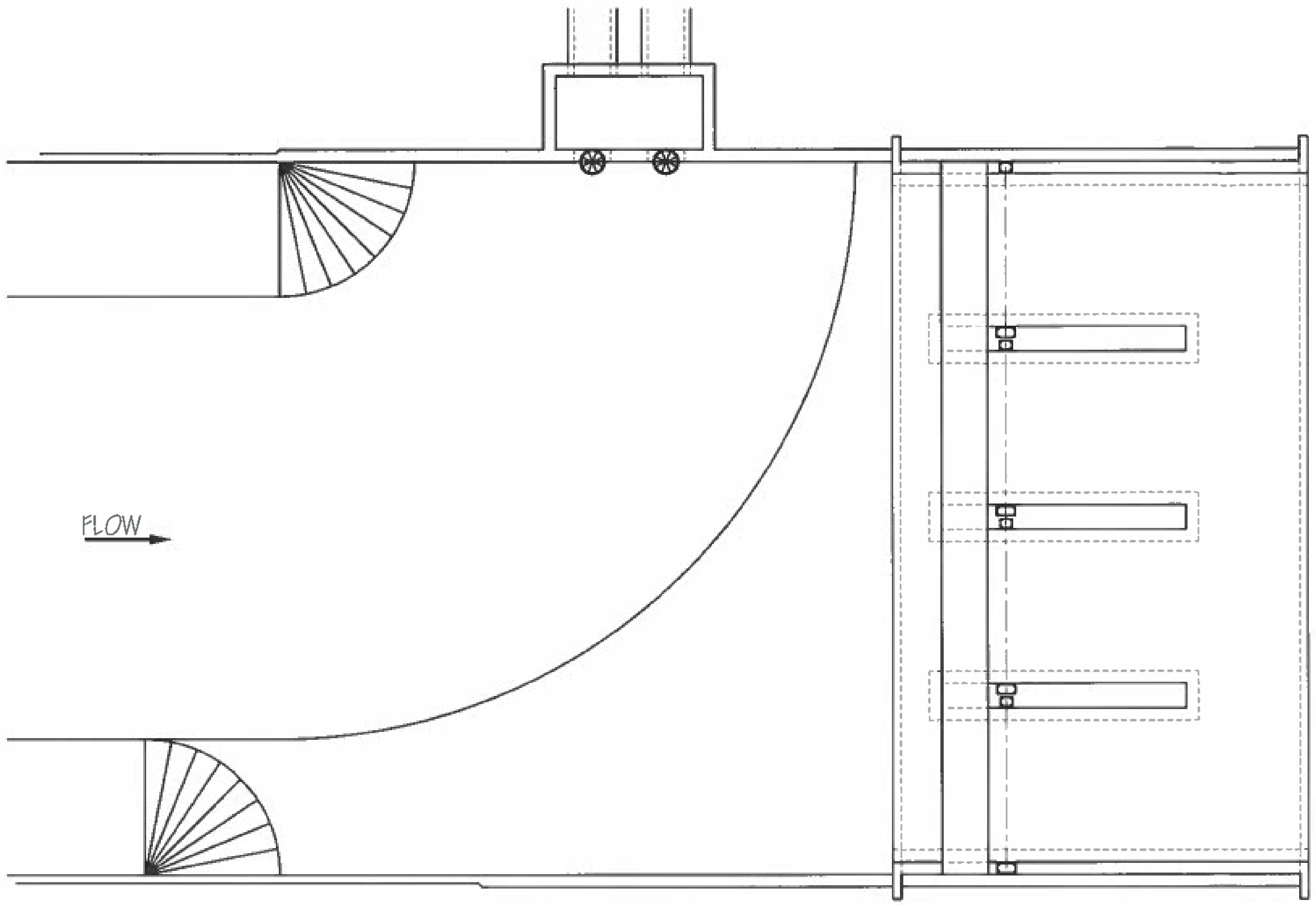
DATE	REMARKS

E2

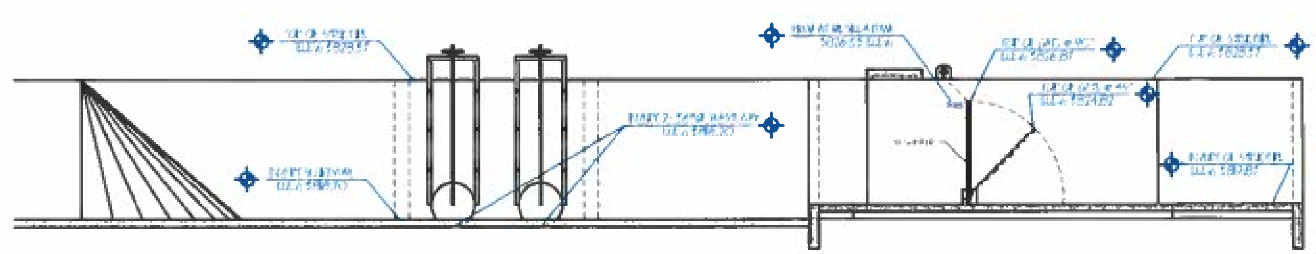
SHEET 2 OF 3



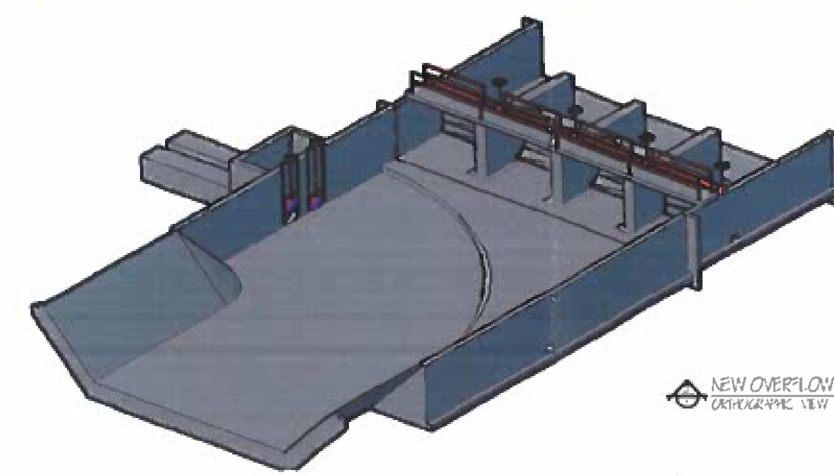

Rodrigo Ruelas
Francis E. Lester
N. 43°56'30"E.
S. 32°44'E.
N. 20°48'W. 2170.9'
N. 51°38'W. 574.1'
CENTER LINE OF CANAL
S. 73°24' E.
5850.2'
50'
60'
32.3'
72+38.1
13+87.9
652.7'
14.75 ACRES
RIO GRANDE
T. 24 S. R. 1 E.
T. 24 S. R. 2 E.
N. 57°30'E. 3058'
22.5°
LOD 2-4-16
Recorded 4-21-16
UNITED STATES RECLAMATION SERVICE
RIO GRANDE PROJECT NEW MEXICO
EAST SIDE CANAL
MAP OF
RIGHT OF WAY
TO BE ACQUIRED FROM
FRANCIS E. LESTER
SECTION 13/18 TOWNSHIP 24/24 SOUTH RANGE 1/2 EAST N.M.P.M.
SCALE 1-IN.=800 FEET
MAY - 4 - 1914
620-L-37



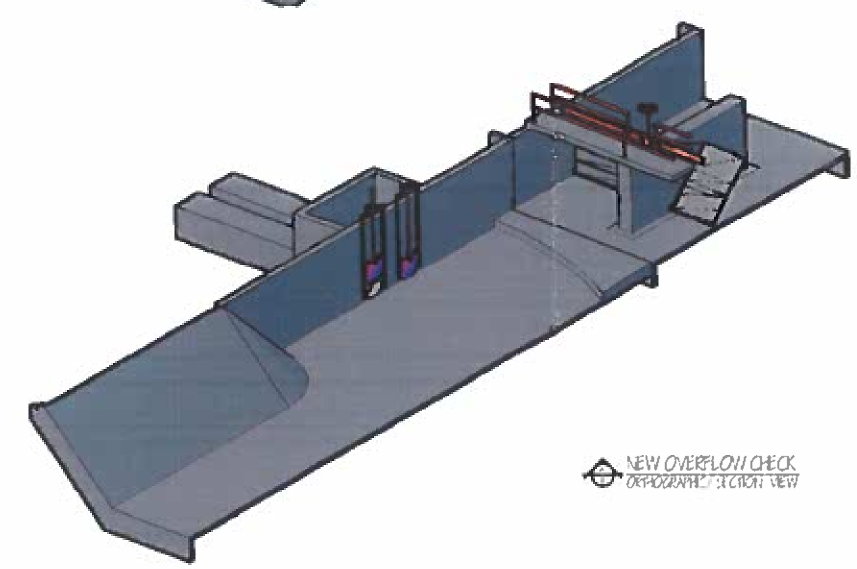
NEW OVERFLOW CHECK
PLAN VIEW



SLUICEWAY DETAIL
WESTSIDE CANAL



NEW OVERFLOW CHECK
ORTHOGRAPHIC VIEW



NEW OVERFLOW CHECK
ORTHOGRAPHIC SECTION VIEW

ELEPHANT BUTTE IRRIGATION DISTRICT

W1

SHEET 1 OF 3

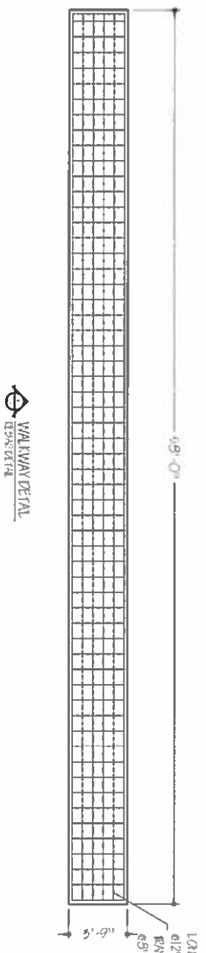
REVISIONS

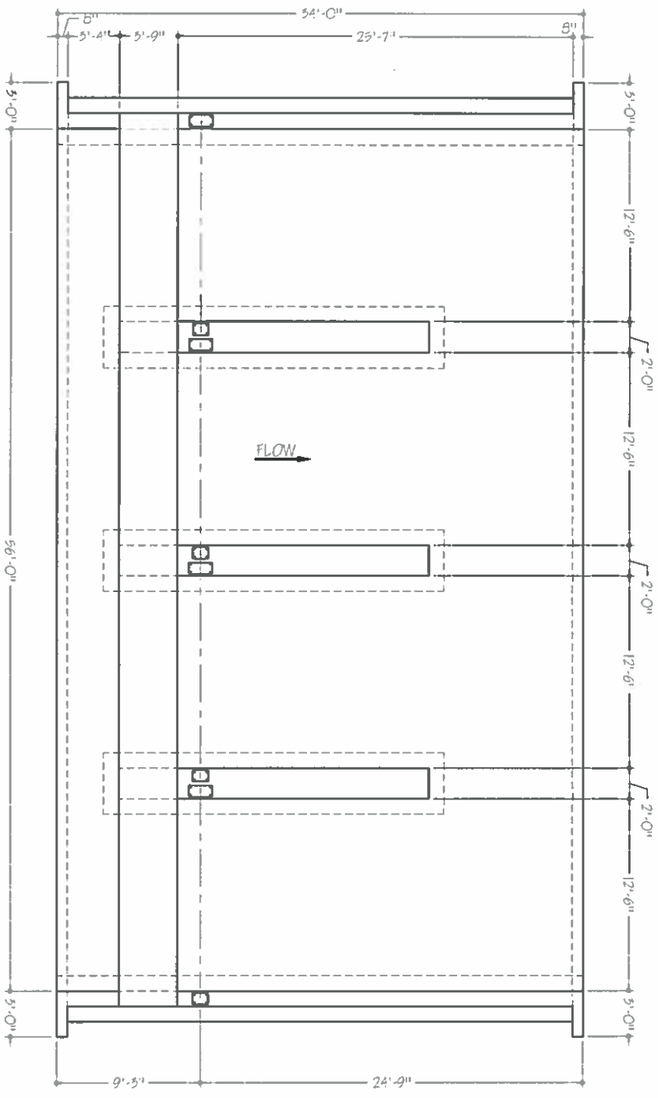
DATE	REMARKS

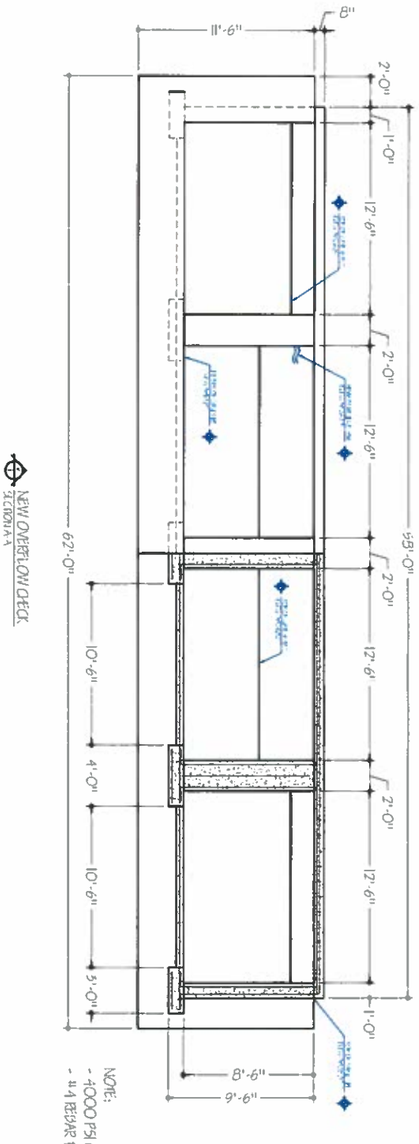
PROPOSED OVERFLOW CHECK AND BYPASS
WESTSIDE CANAL

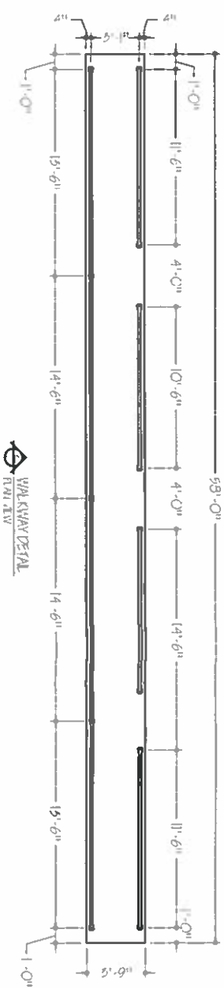
ENG. JOB #
DWG FILE
DESIGNED
DRAWN
LAYOUT
PRINT DATE

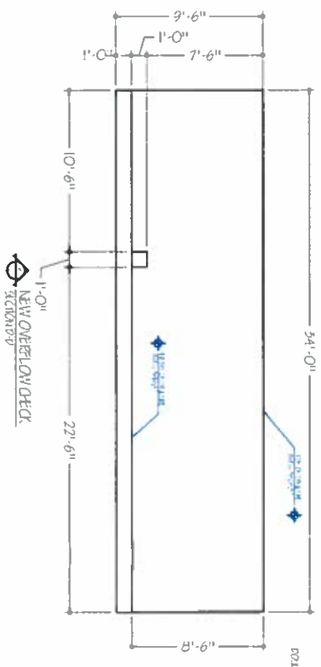
EBID

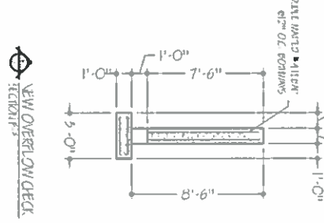


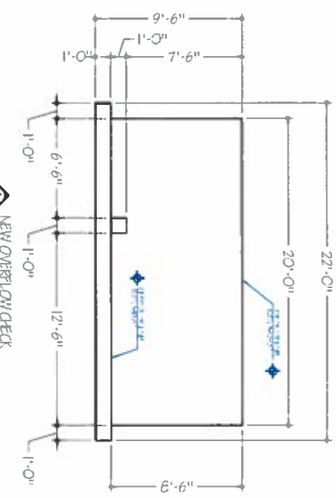


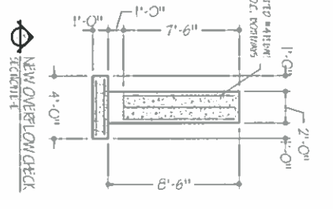


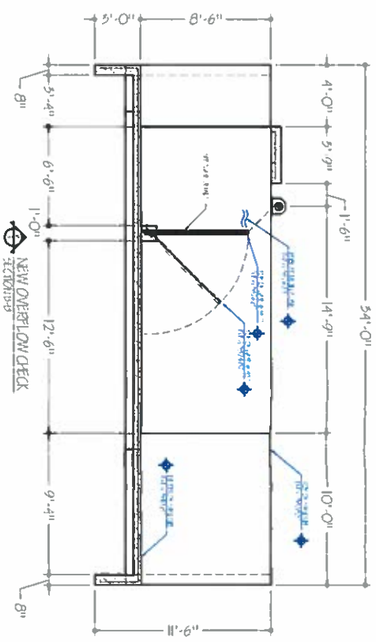












EBID

ELEPHANT BUTTE IRRIGATION DISTRICT

ENG. JOB #	2015-025
DWG FILE	2015-025 Levee Overflow Check.dwg
DESIGNED	.....
DRAWN	Cruz Morales
LAYOUT	A
PRINT DATE	

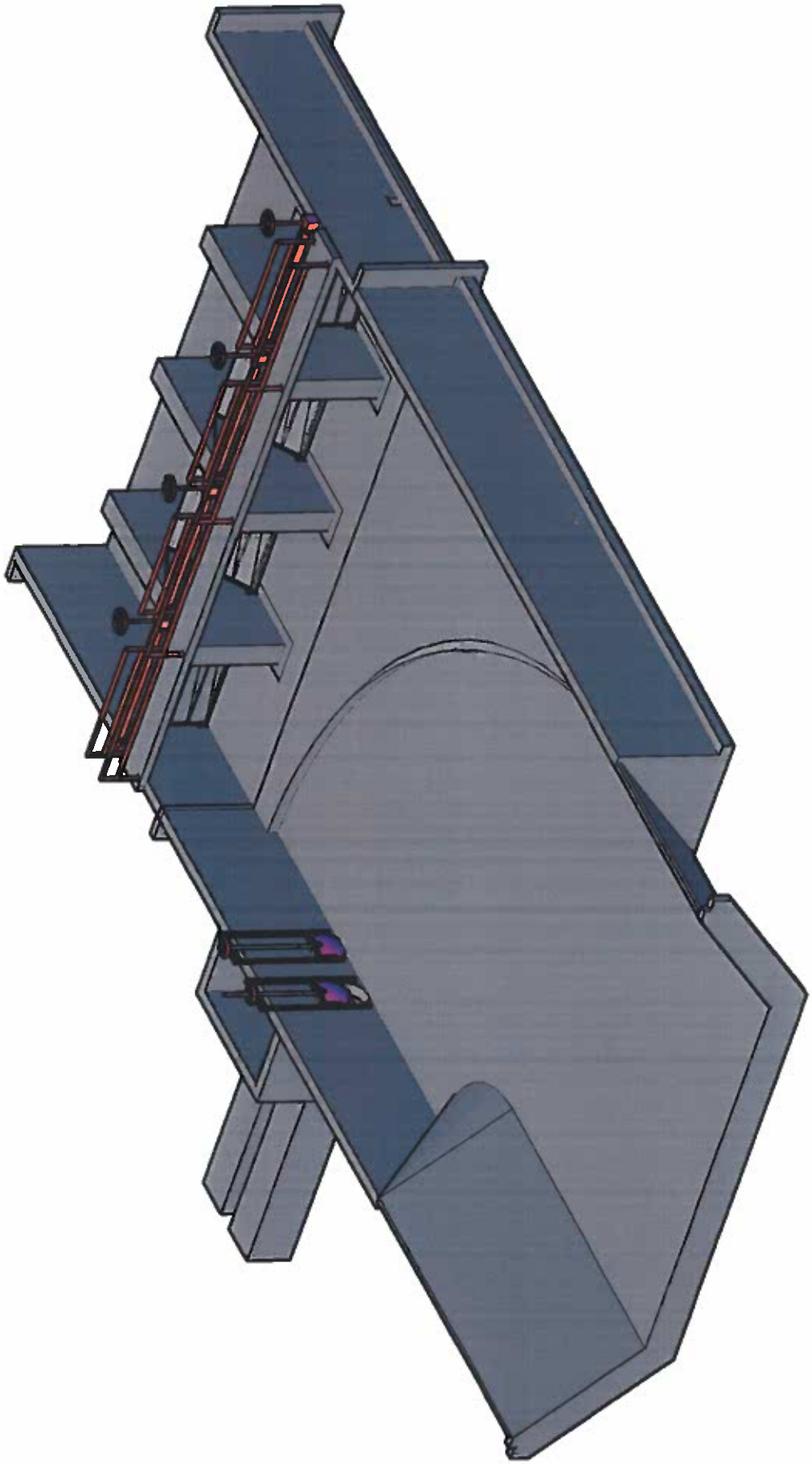
PROPOSED OVERFLOW CHECK
AND BYPASS
WESTSIDE CANAL

REVISIONS

DATE	REMARKS

W2

SHEET 2 OF 3



Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project:
Final Report

APPENDIX L

Comparative Water-surface Elevation Profile Plots for Modeled Alternatives and Predicted Change from Baseline Conditions

October 20, 2015

Contract No. IBM09D0006
Order No. IBM14T0016

Appendix L

Comparative Water-surface Elevation Profile Plots for Modeled Alternatives and Predicted Change from Baseline Conditions

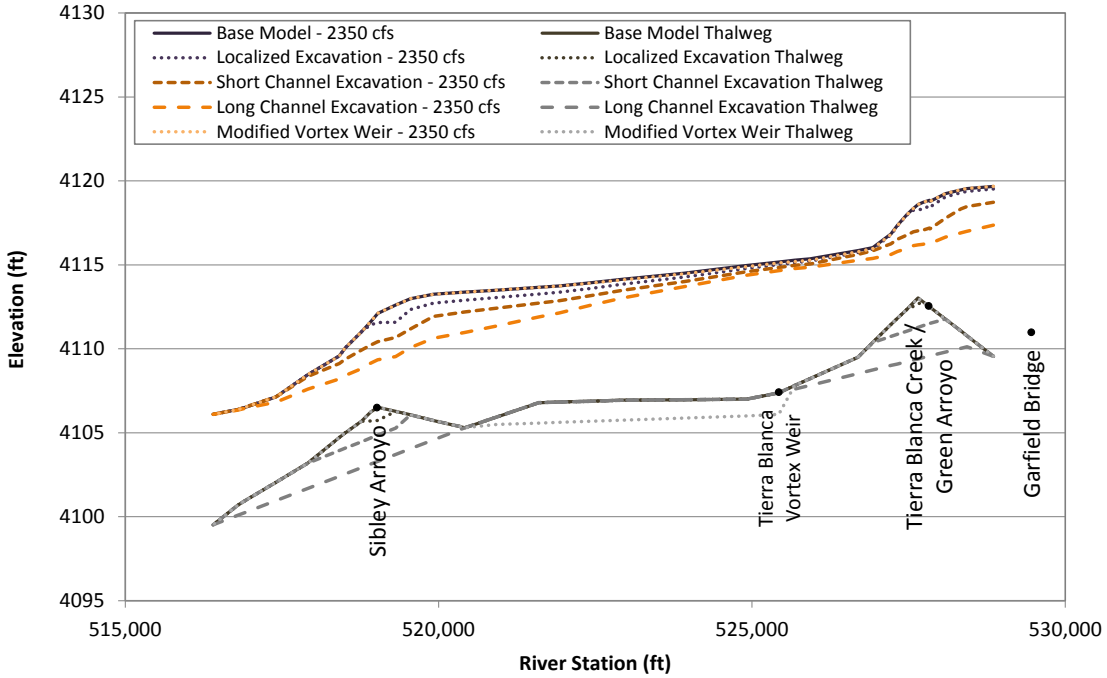


Figure L.1. Predicted water-surface profiles at 2,350 cfs at Problem Location 1 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

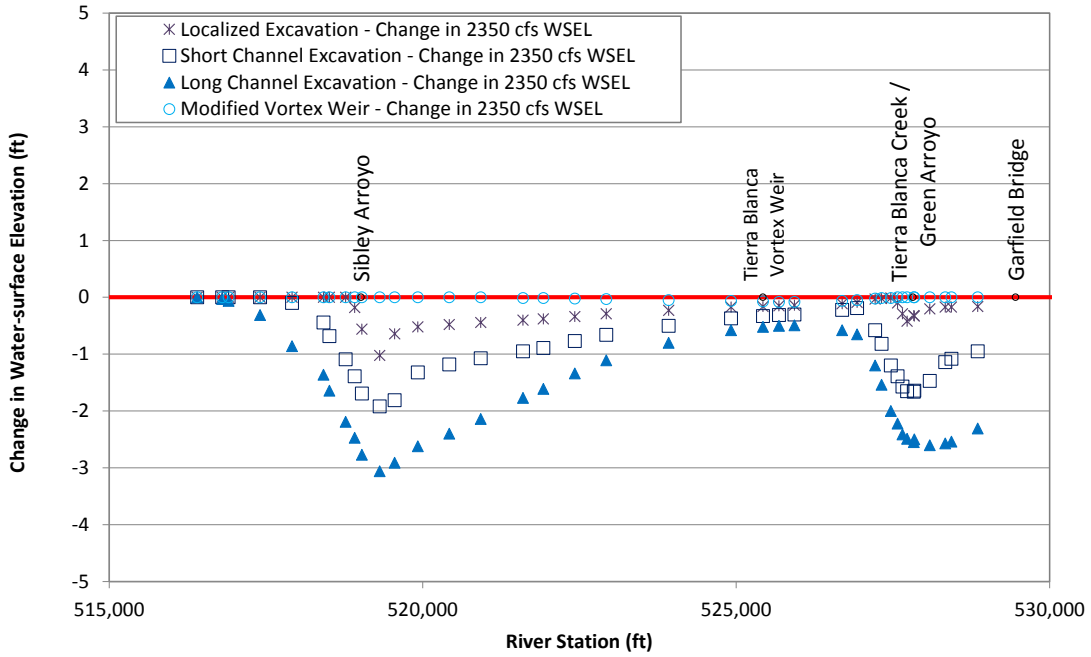


Figure L.2. Predicted change in water-surface elevation at 2,350 cfs at Problem Location 1 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

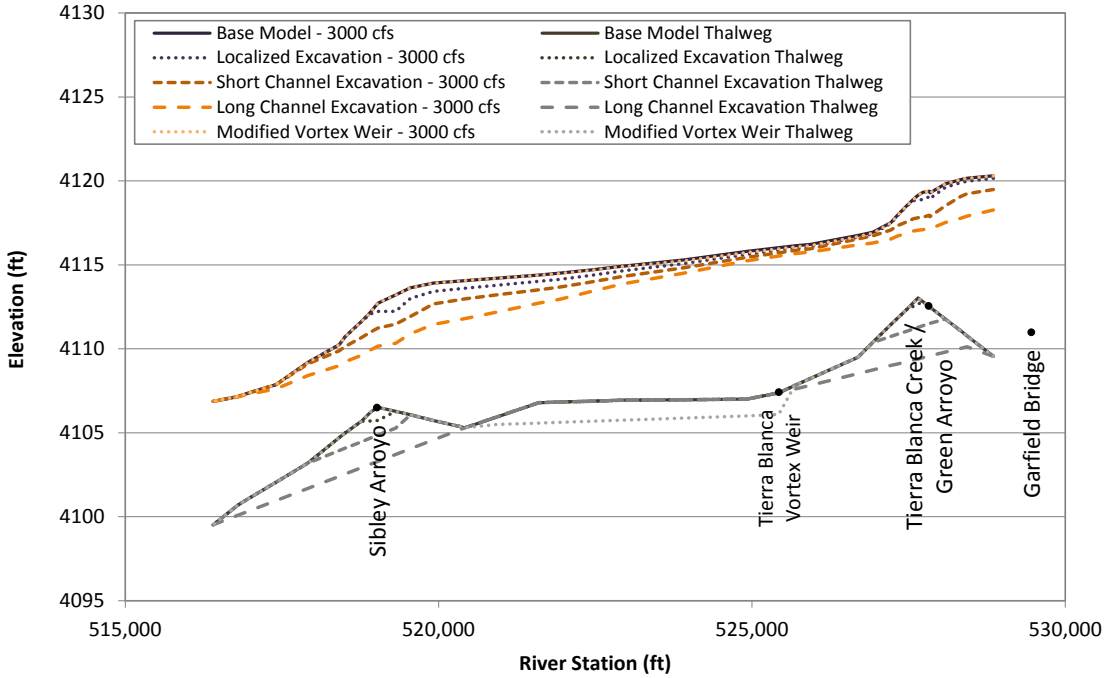


Figure L.3. Predicted water-surface profiles at 3,000 cfs at Problem Location 1 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

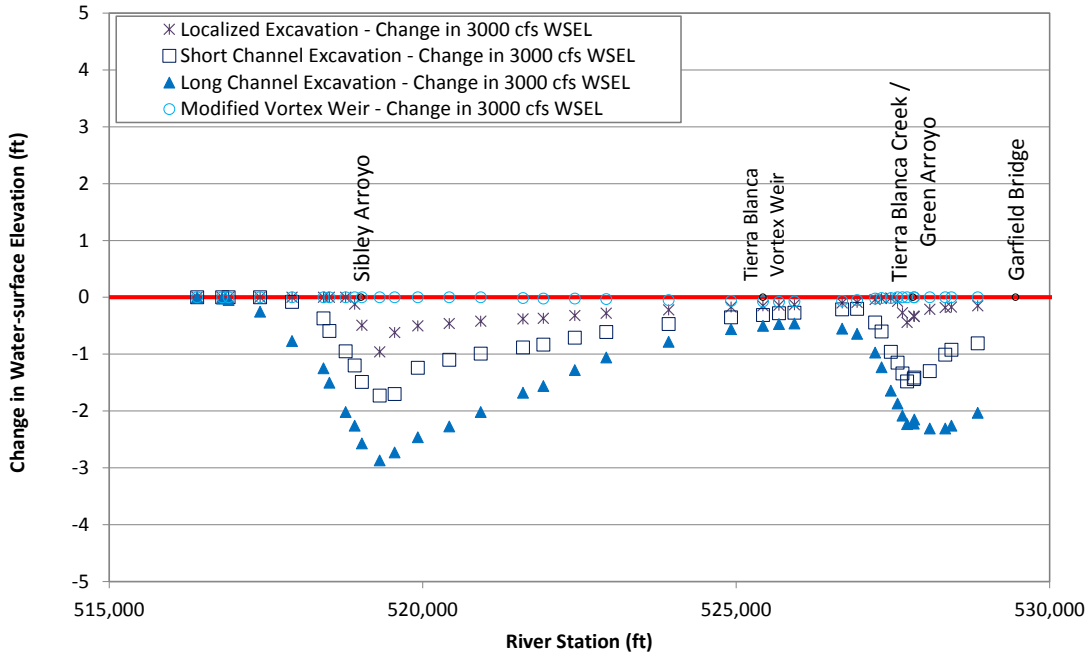


Figure L.4. Predicted change in water-surface elevation at 3,000 cfs at Problem Location 1 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

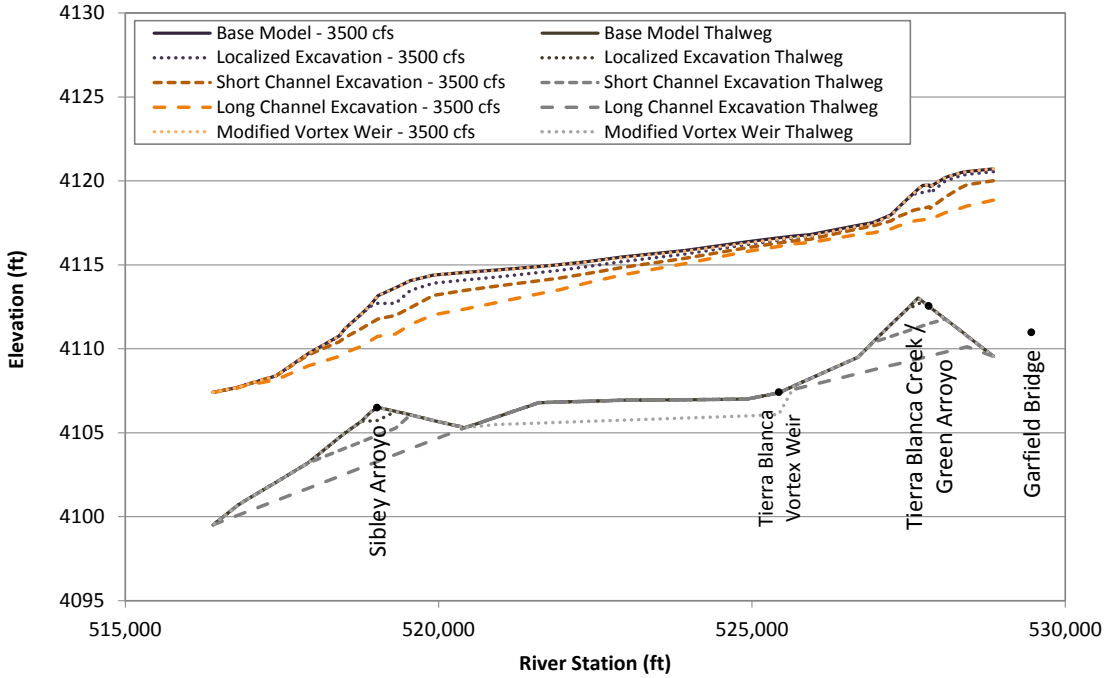


Figure L.5. Predicted water-surface profiles at 3,500 cfs at Problem Location 1 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

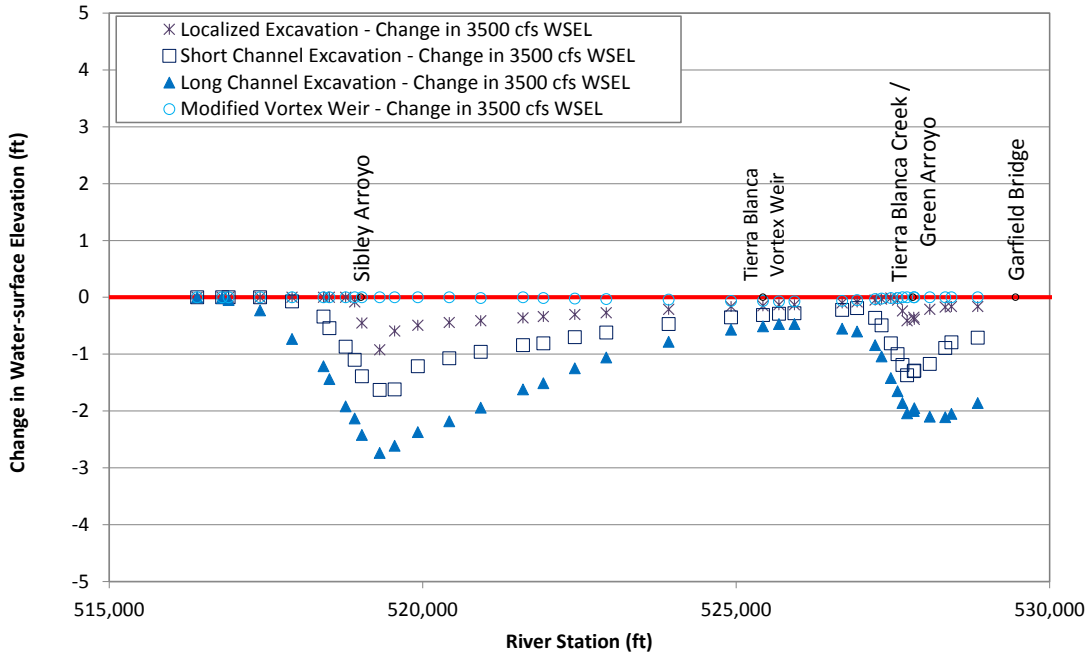


Figure L.6. Predicted change in water-surface elevation at 3,500 cfs at Problem Location 1 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

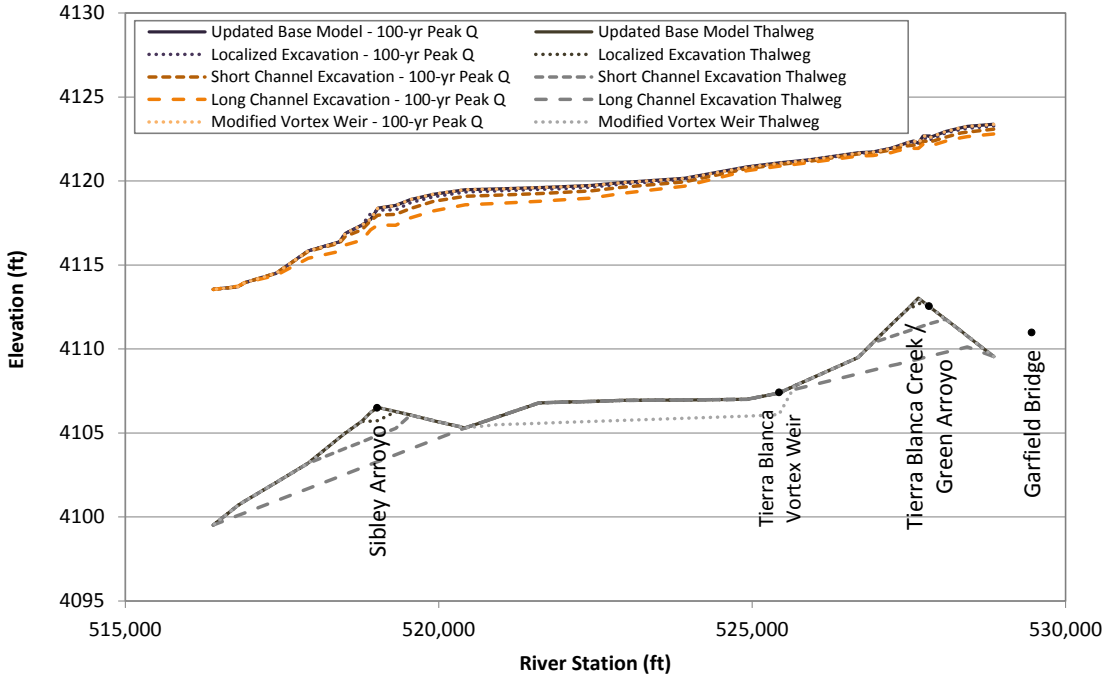


Figure L.7. Predicted water-surface profiles at the routed 100-year peak flow at Problem Location 1 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

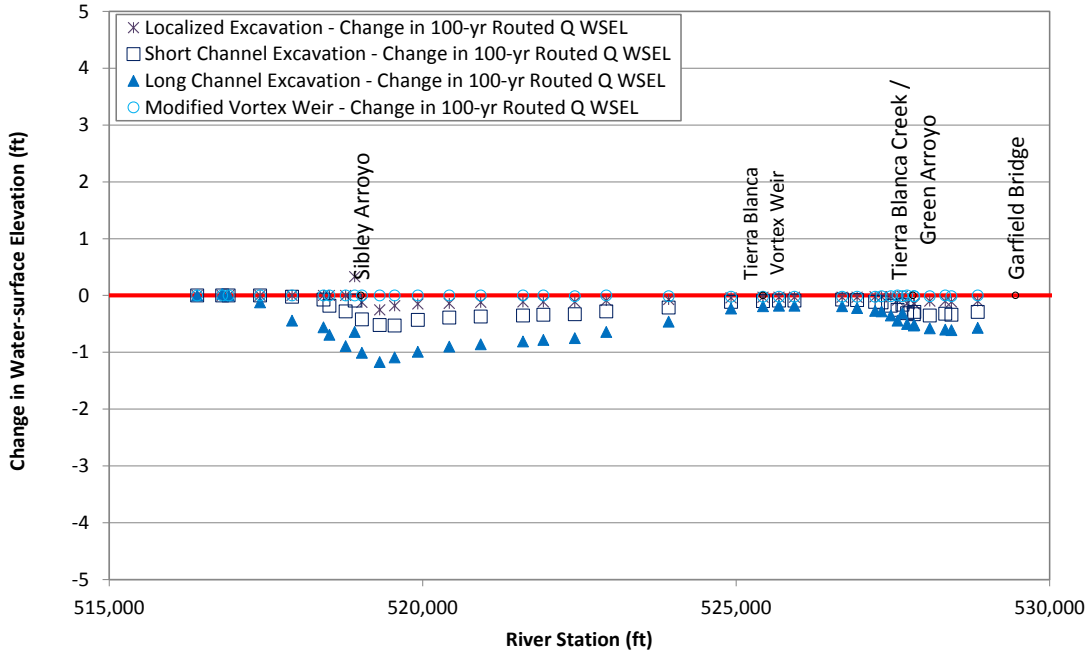


Figure L.8. Predicted change in water-surface elevation at the routed 100-year peak flow at Problem Location 1 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

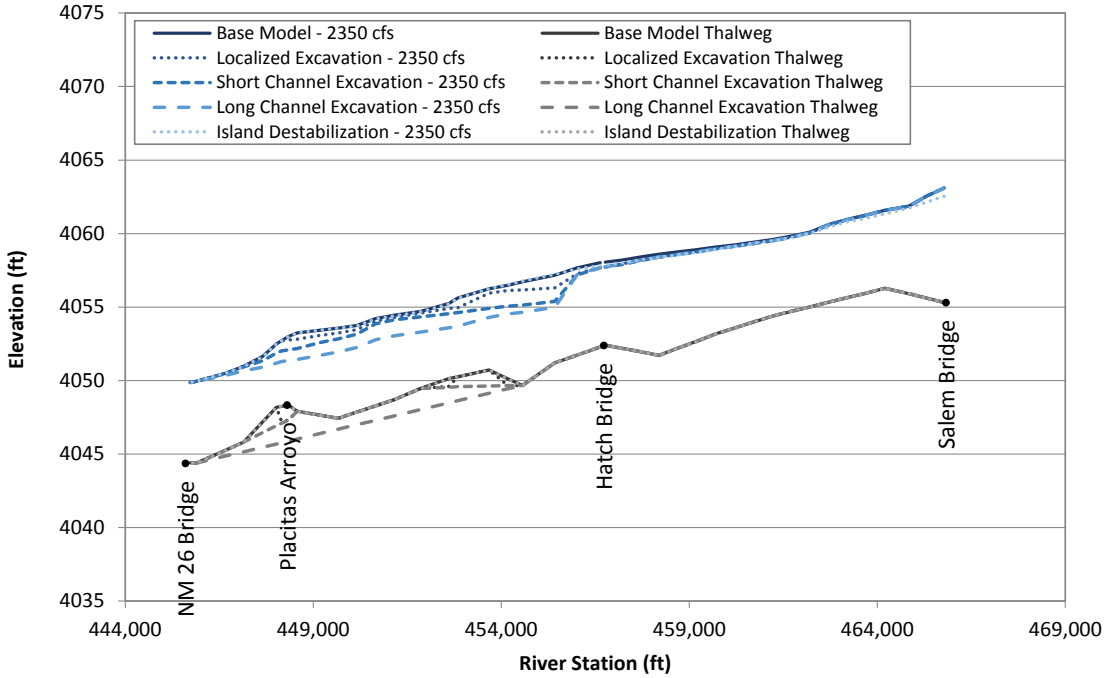


Figure L.9. Predicted water-surface profiles at 2,350 cfs at Problem Location 2 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

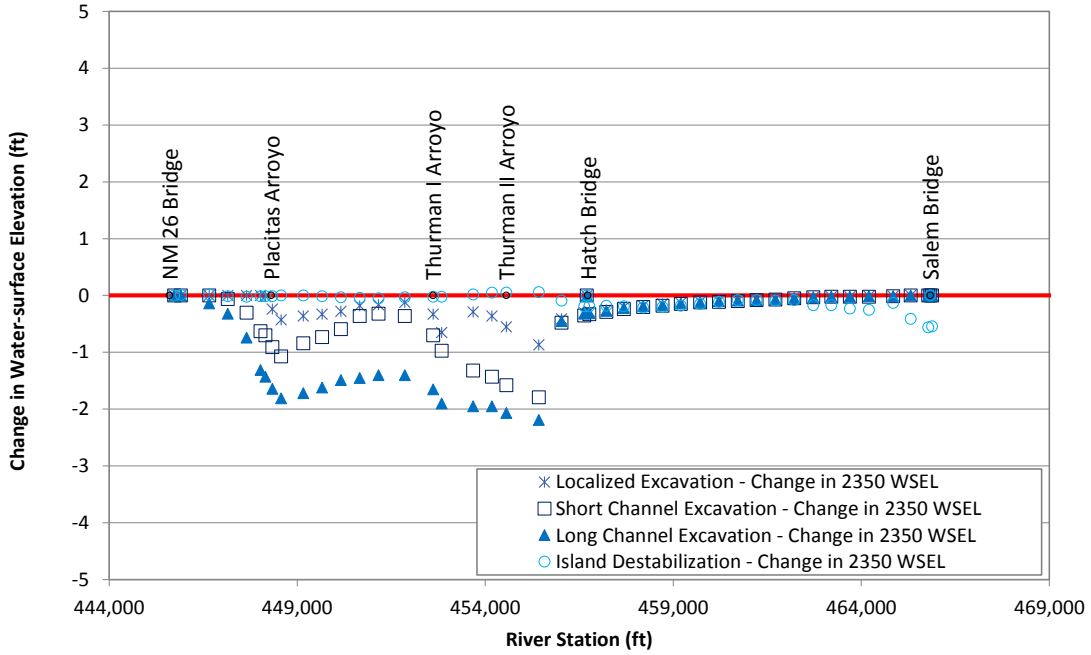


Figure L.10. Predicted change in water-surface elevation at 2,350 cfs at Problem Location 2 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

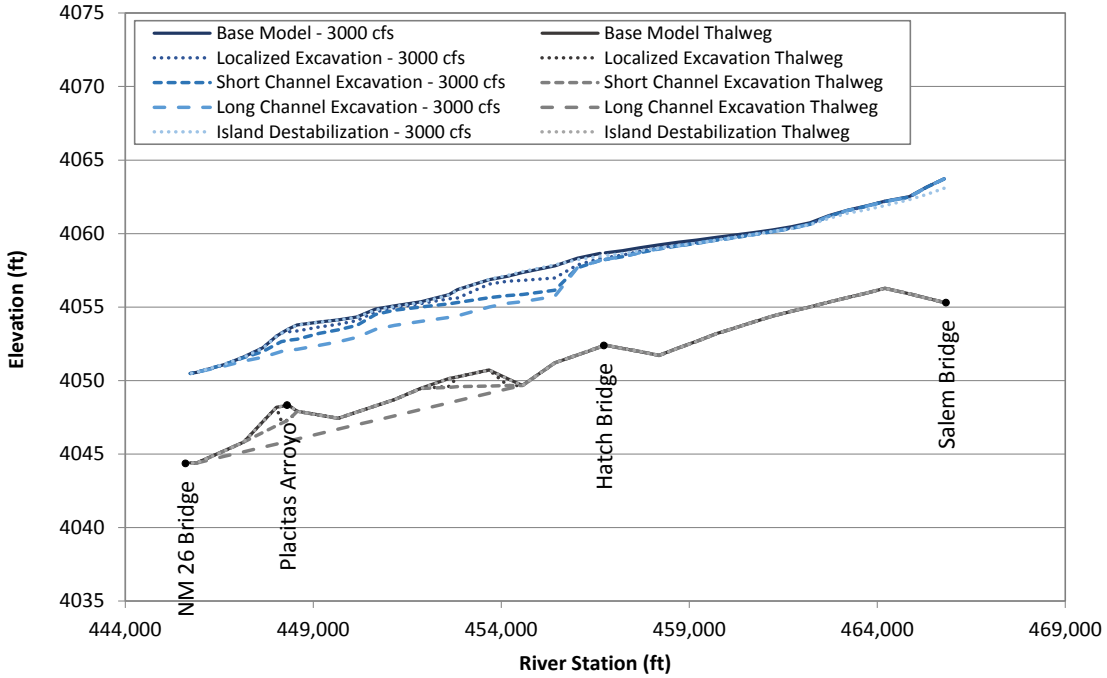


Figure L.11. Predicted water-surface profiles at 3,000 cfs at Problem Location 2 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

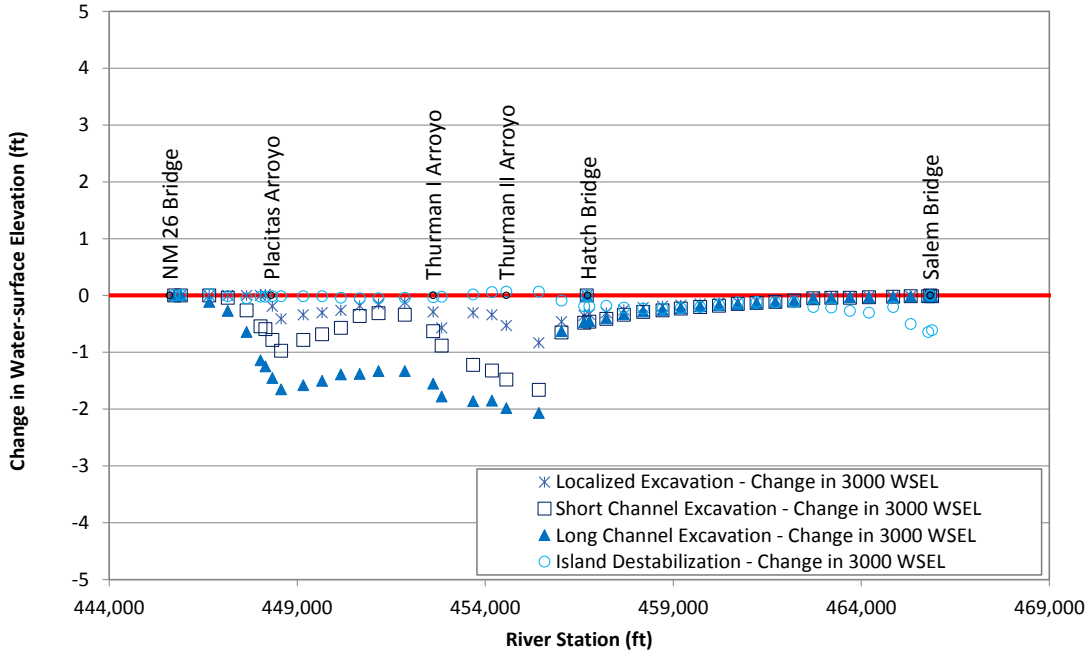


Figure L.12. Predicted change in water-surface elevation at 3,000 cfs at Problem Location 2 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

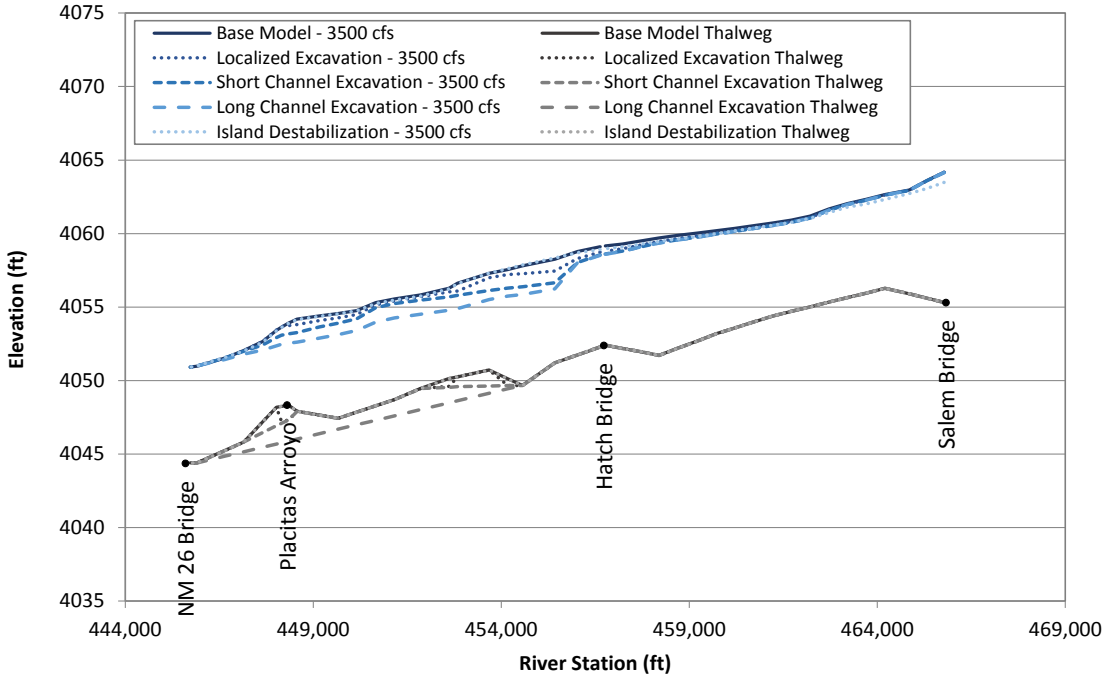


Figure L.13. Predicted water-surface profiles at 3,500 cfs at Problem Location 2 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

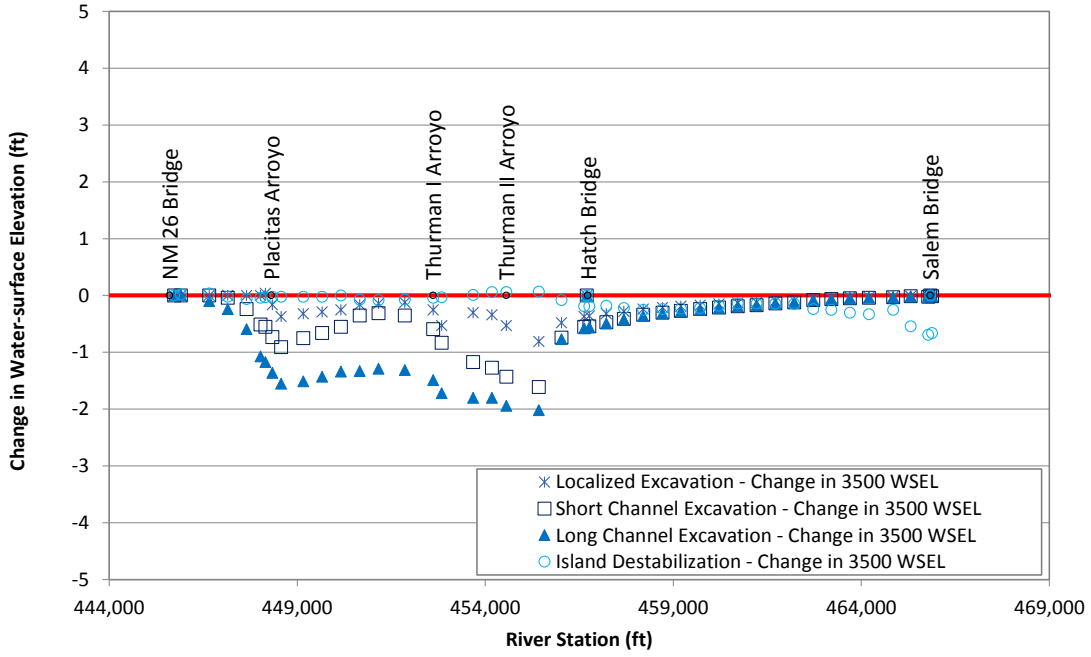


Figure L.14. Predicted change in water-surface elevation at 3,500 cfs at Problem Location 2 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

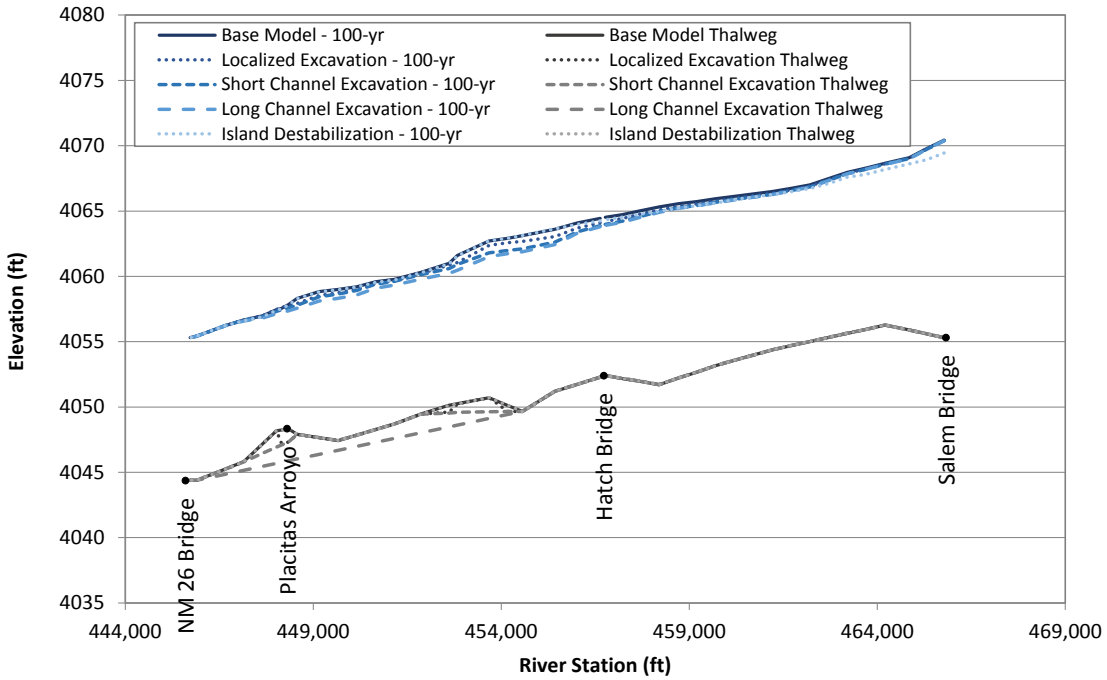


Figure L.15. Predicted water-surface profiles at the routed 100-year peak flow at Problem Location 2 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

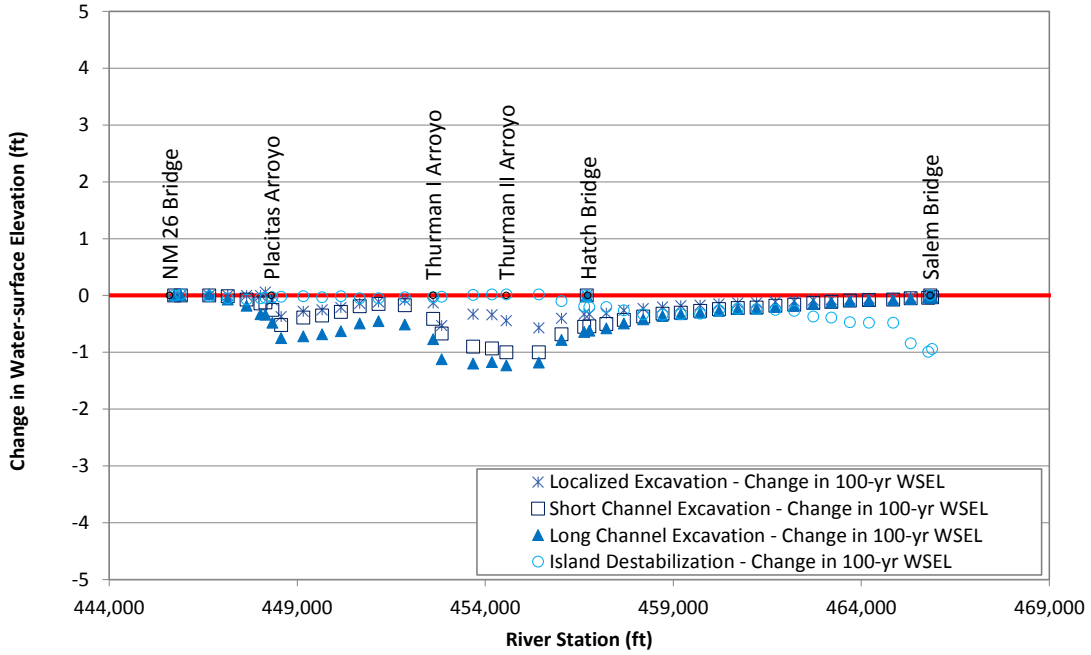


Figure L.16. Predicted change in water-surface elevation at the routed 100-year peak flow at Problem Location 2 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

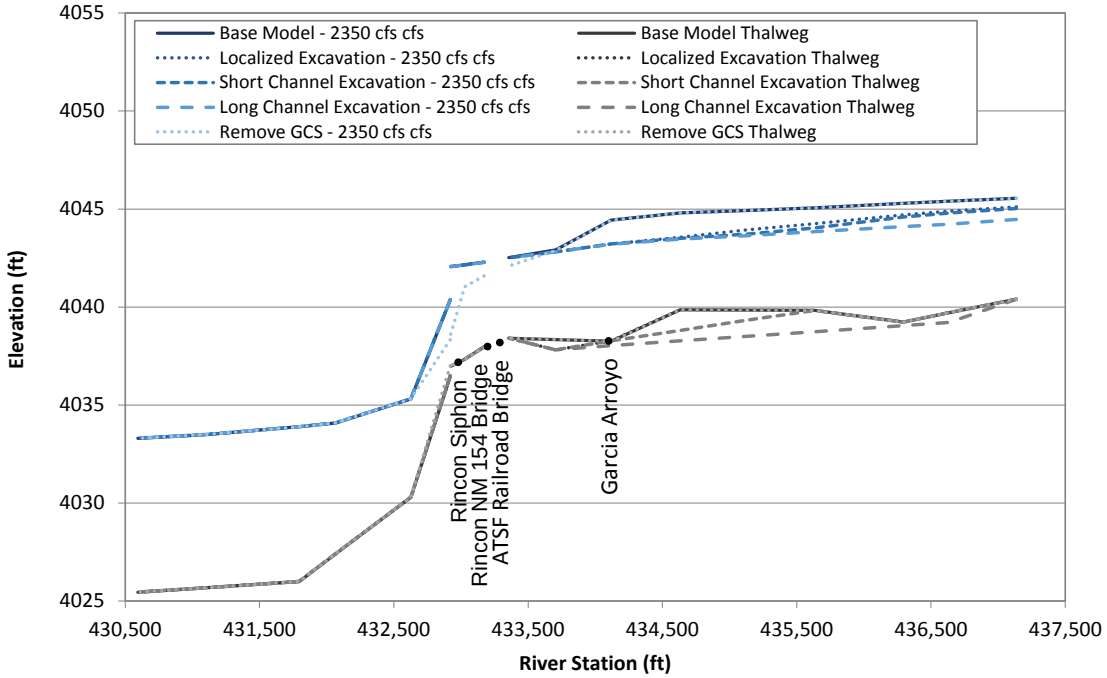


Figure L.17. Predicted water-surface profiles at 2,350 cfs at Problem Location 3 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

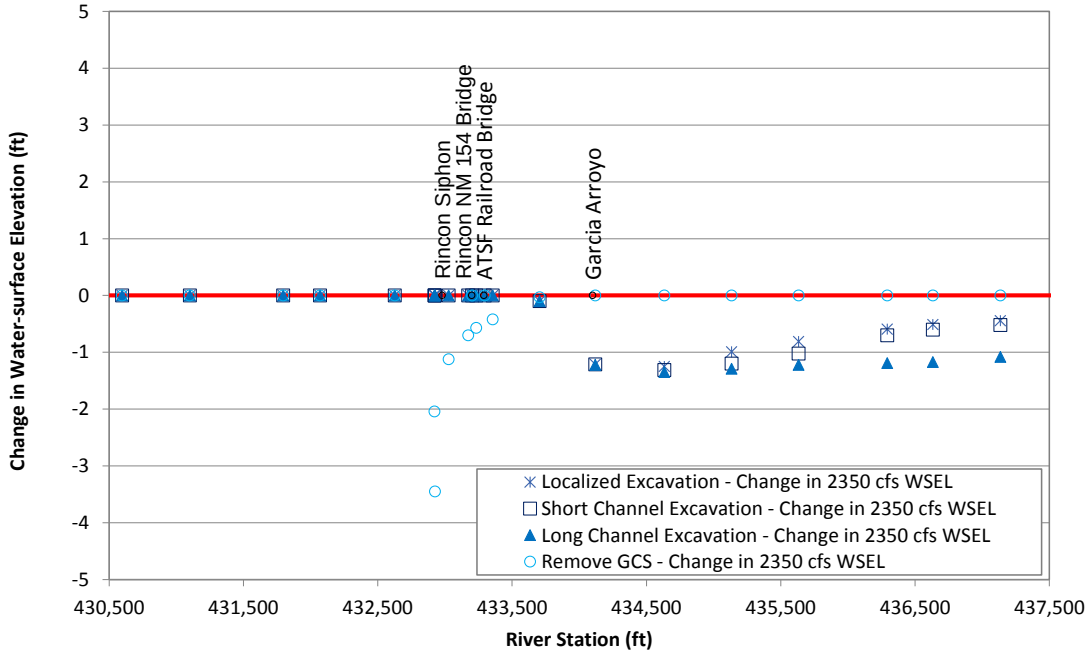


Figure L.18. Predicted change in water-surface elevation at 2,350 cfs at Problem Location 3 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

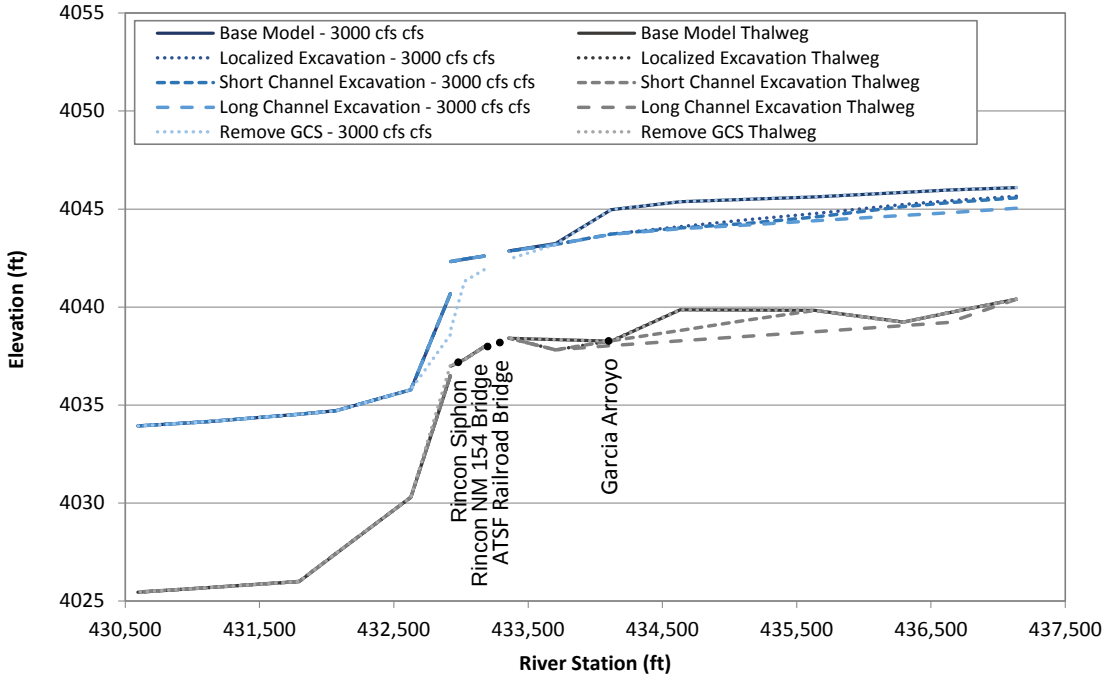


Figure L.19. Predicted water-surface profiles at 3,000 cfs at Problem Location 3 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

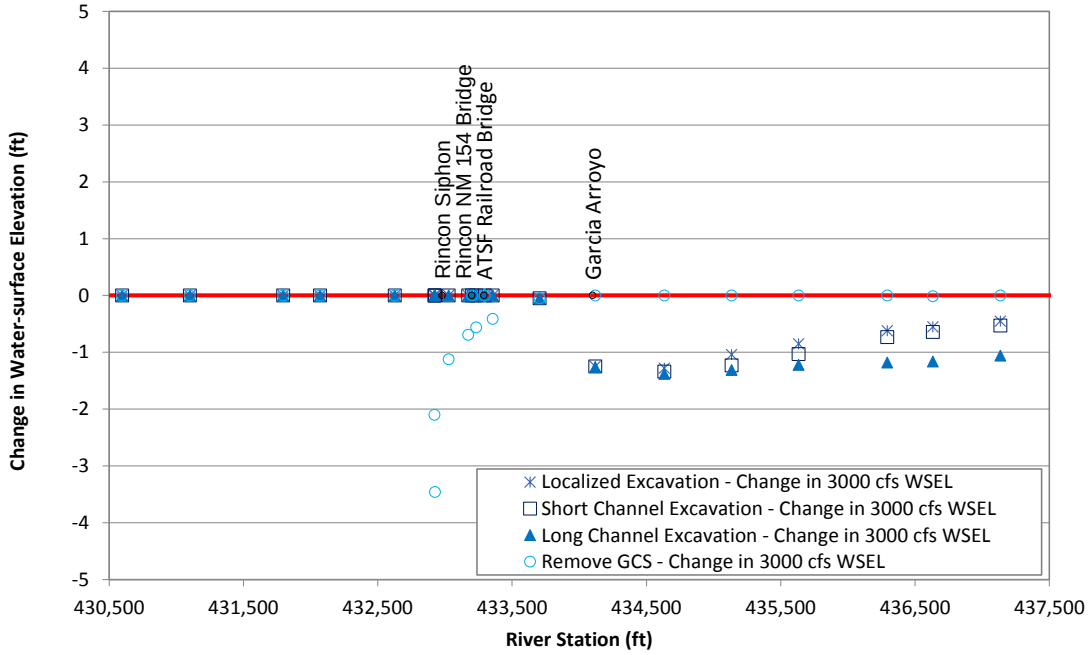


Figure L.20. Predicted change in water-surface elevation at 3,000 cfs at Problem Location 3 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

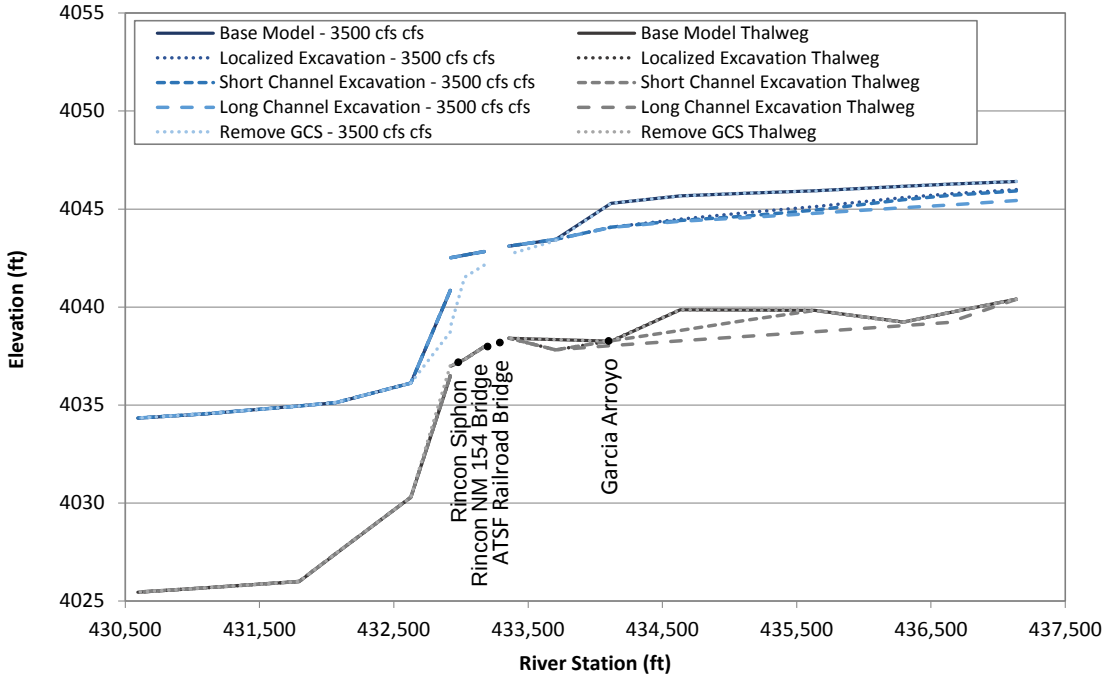


Figure L.21. Predicted water-surface profiles at 3,500 cfs at Problem Location 3 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

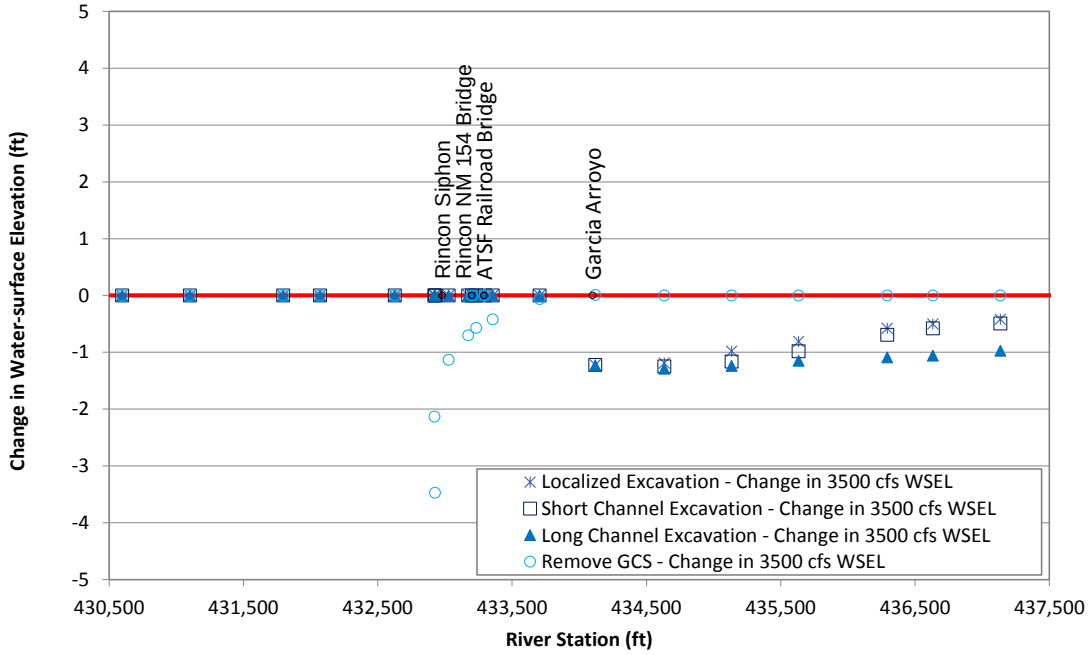


Figure L.22. Predicted change in water-surface elevation at 3,500 cfs at Problem Location 3 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

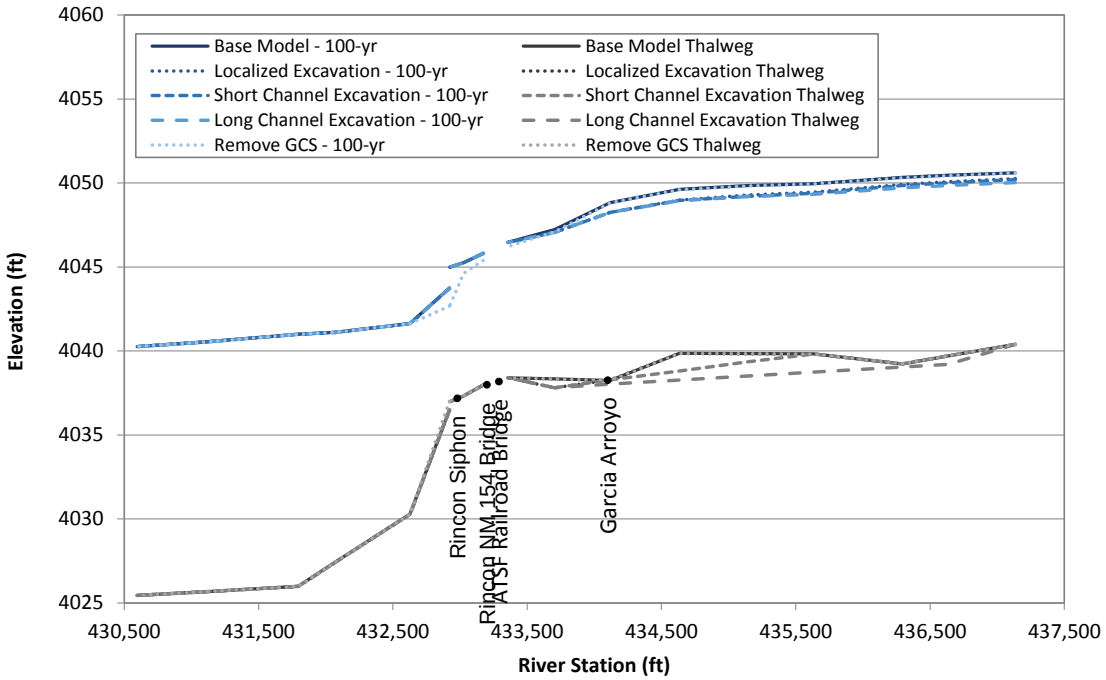


Figure L.23. Predicted water-surface profiles at the routed 100-year peak flow at Problem Location 3 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

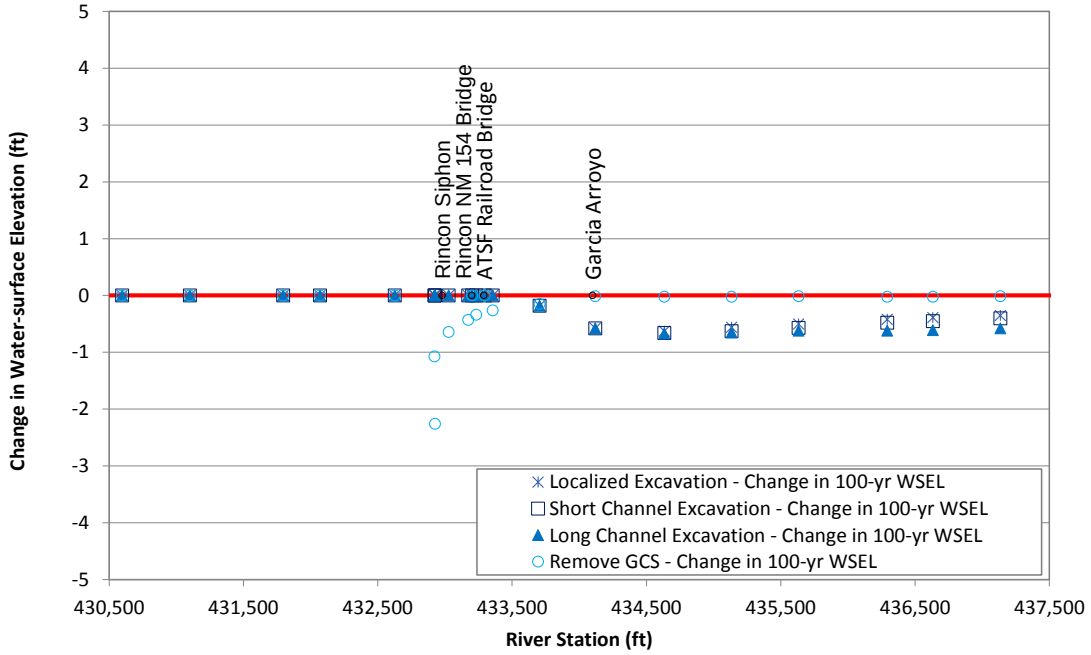


Figure L.24. Predicted change in water-surface elevation at the routed 100-year peak flow at Problem Location 3 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

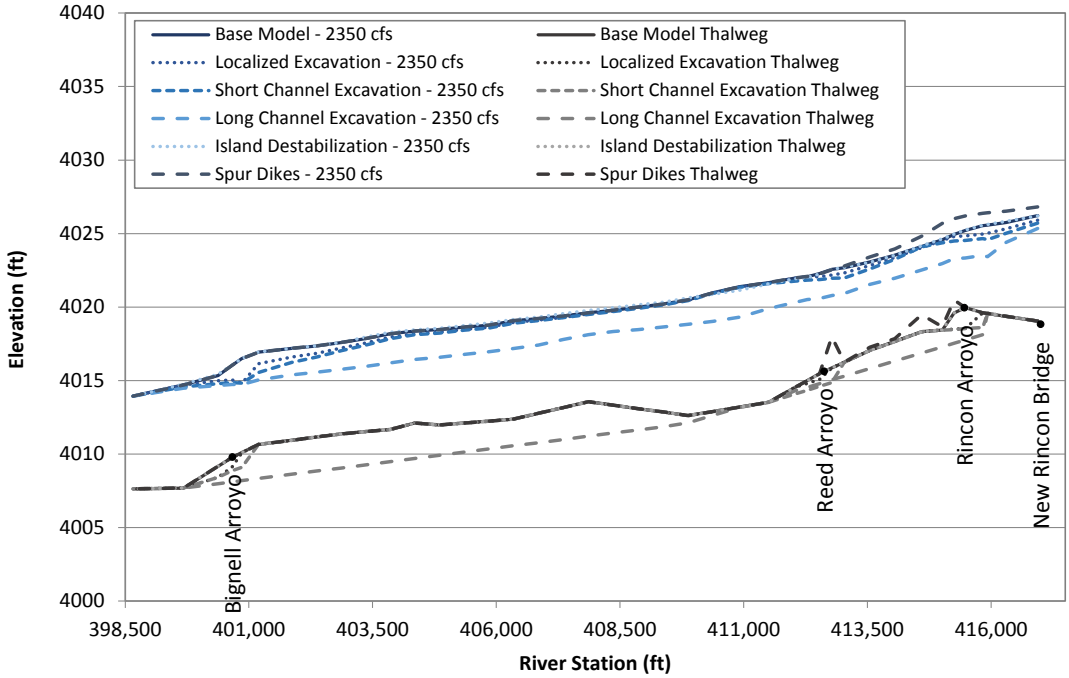


Figure L.25. Predicted water-surface profiles at 2,350 cfs at Problem Location 4 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

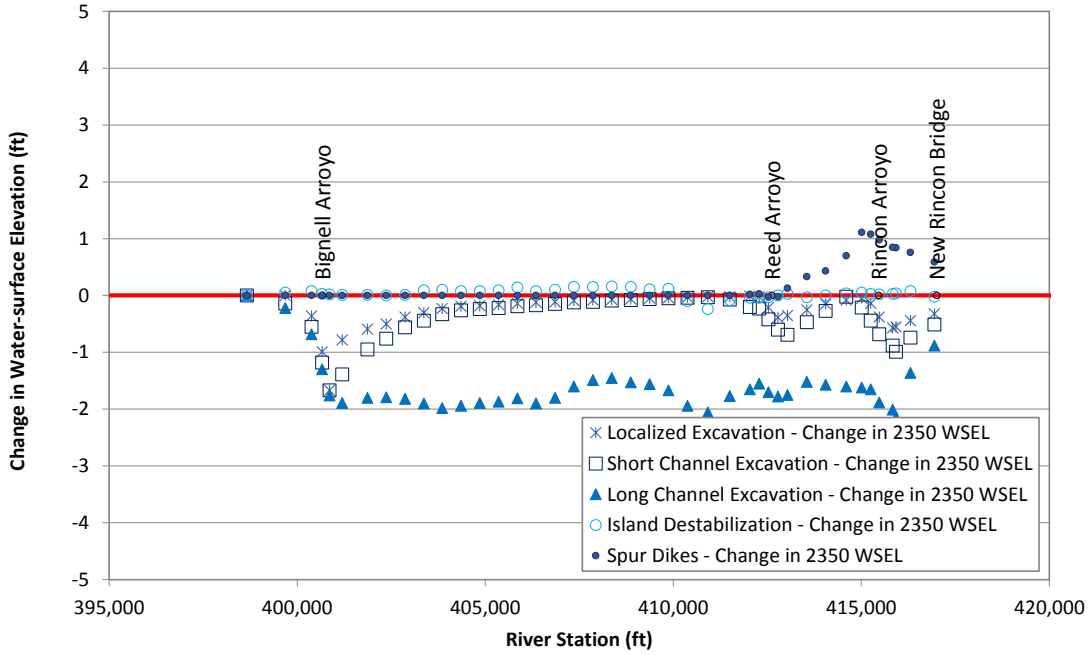


Figure L.26. Predicted change in water-surface elevation at 2,350 cfs at Problem Location 4 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

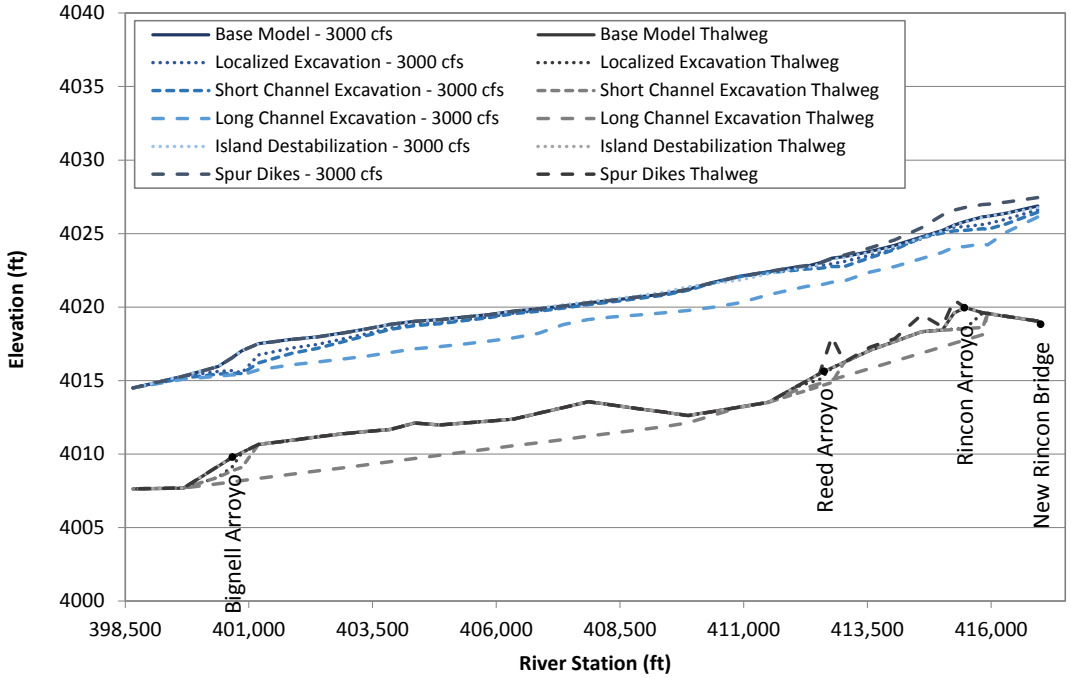


Figure L.27. Predicted water-surface profiles at 3,000 cfs at Problem Location 4 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

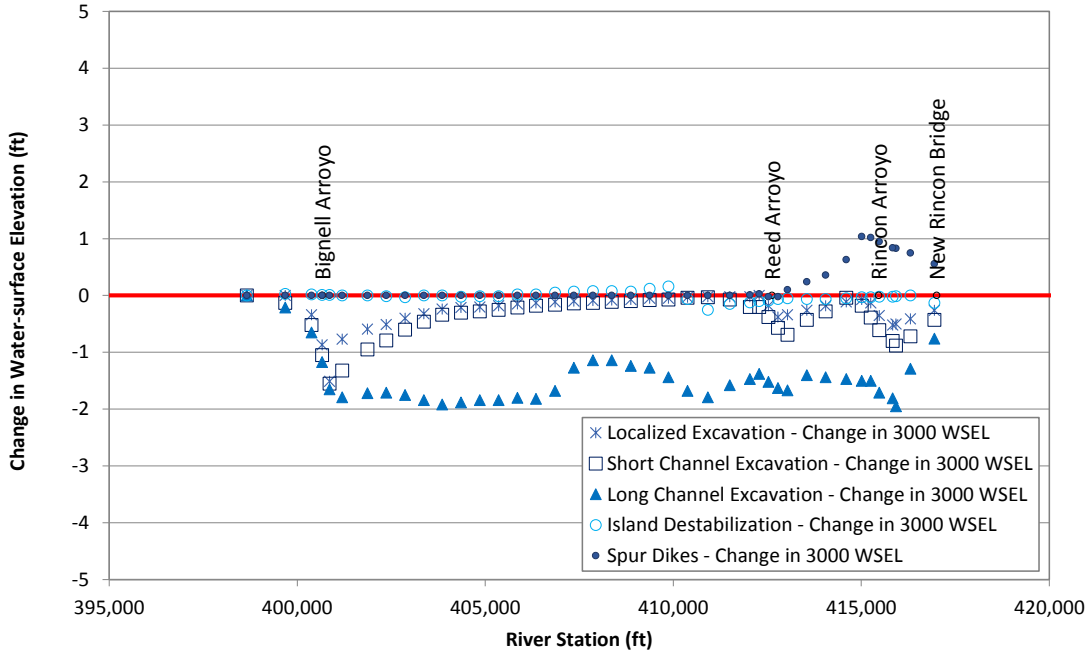


Figure L.28. Predicted change in water-surface elevation at 3,000 cfs at Problem Location 4 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

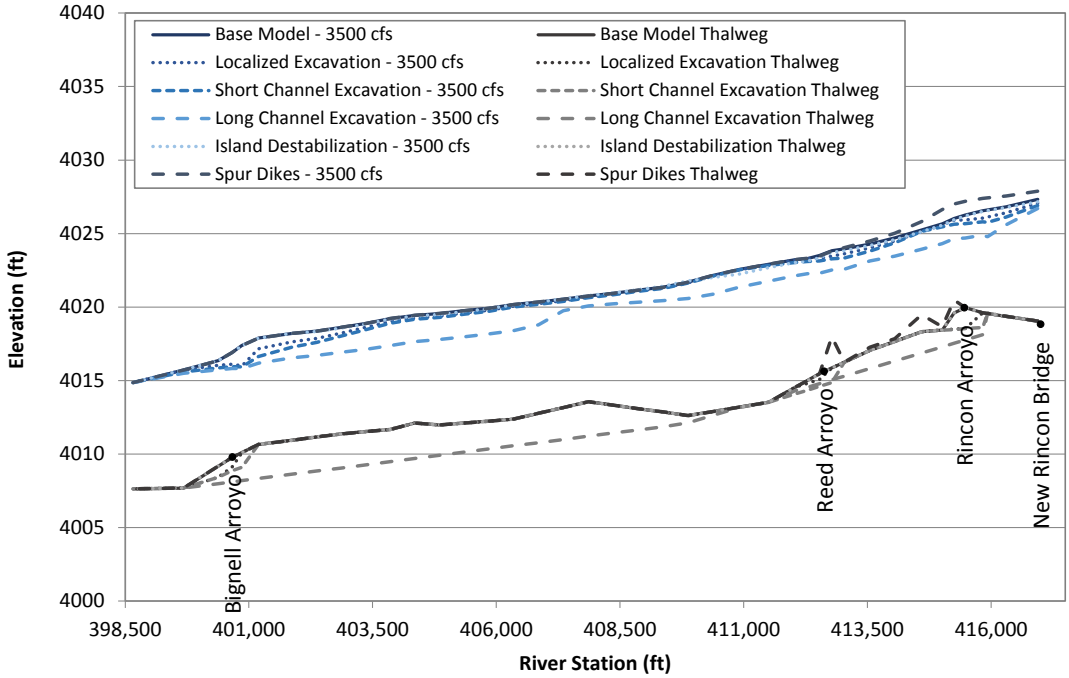


Figure L.29. Predicted water-surface profiles at 3,500 cfs at Problem Location 4 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

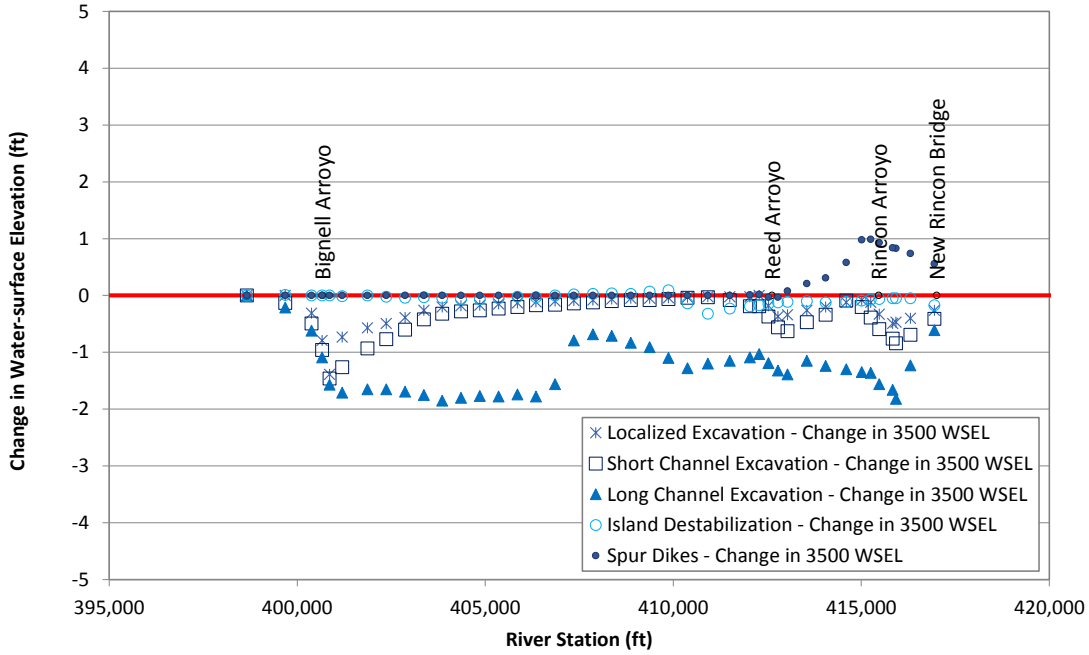


Figure L.30. Predicted change in water-surface elevation at 3,500 cfs at Problem Location 4 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

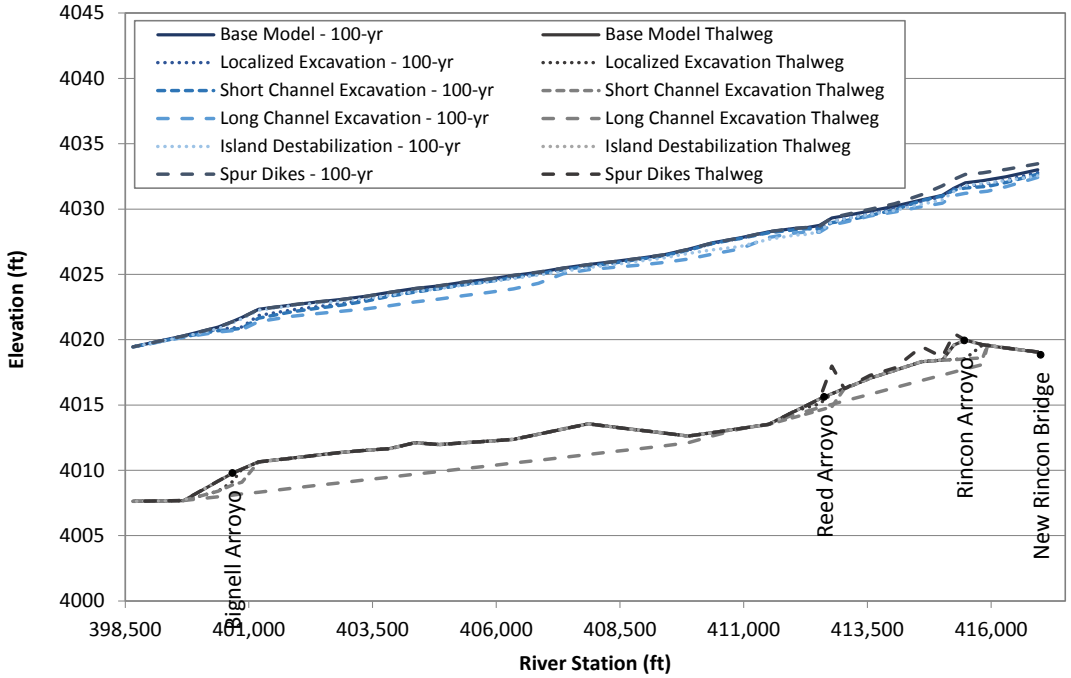


Figure L.31. Predicted water-surface profiles at the routed 100-year peak flow at Problem Location 4 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

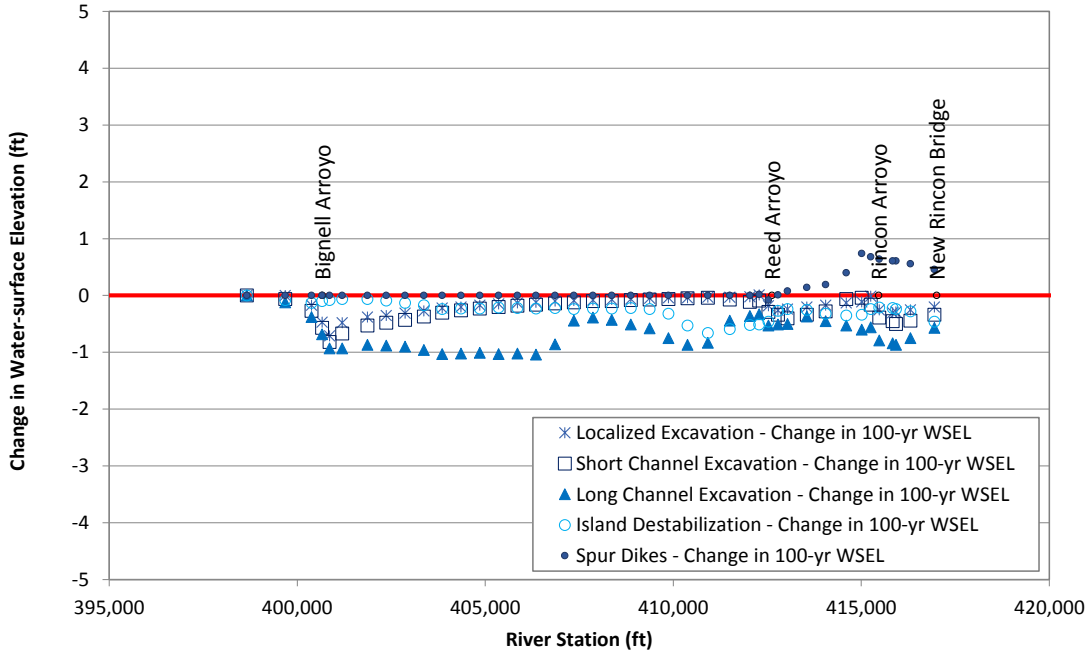


Figure L.32. Predicted change in water-surface elevation at the routed 100-year peak flow at Problem Location 4 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

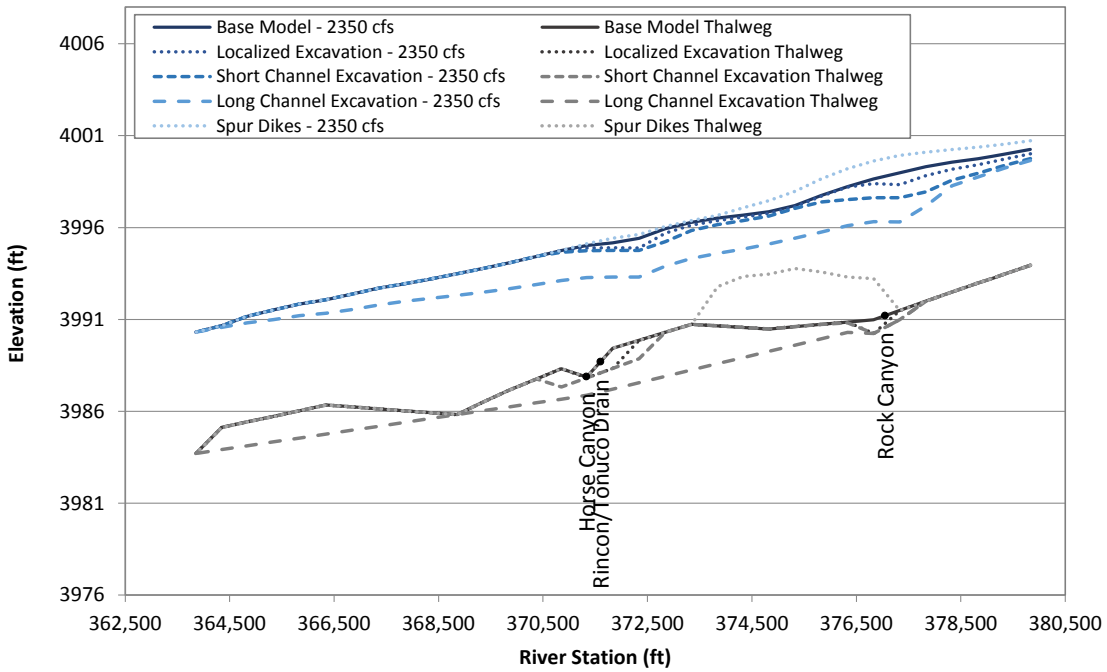


Figure L.33. Predicted water-surface profiles at 2,350 cfs at Problem Location 5 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

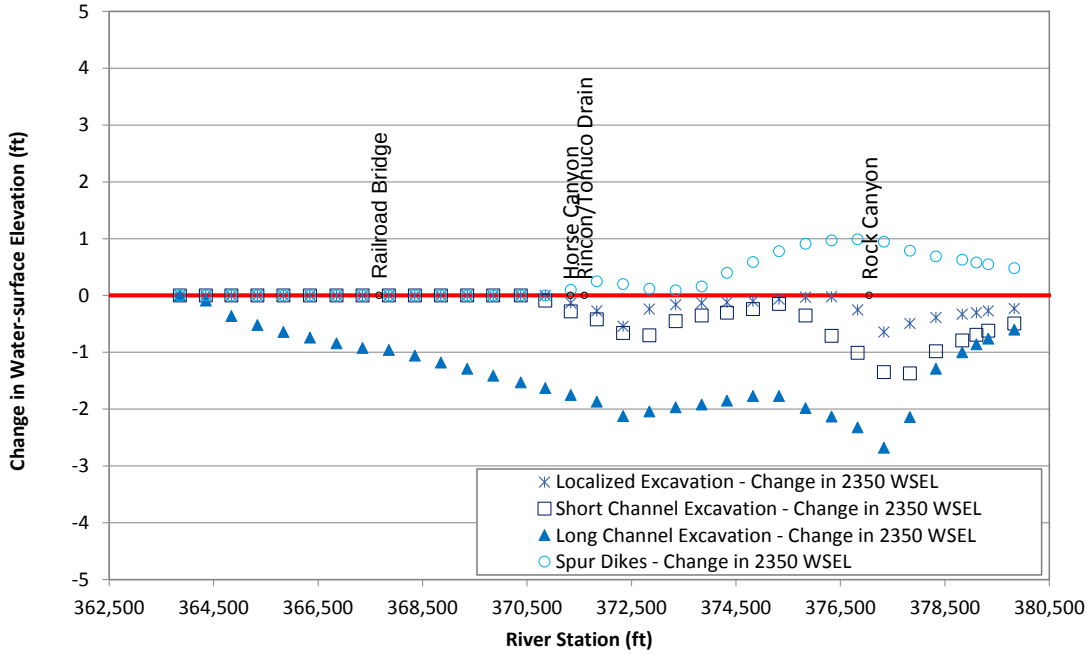


Figure L.34. Predicted change in water-surface elevation at 2,350 cfs at Problem Location 5 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

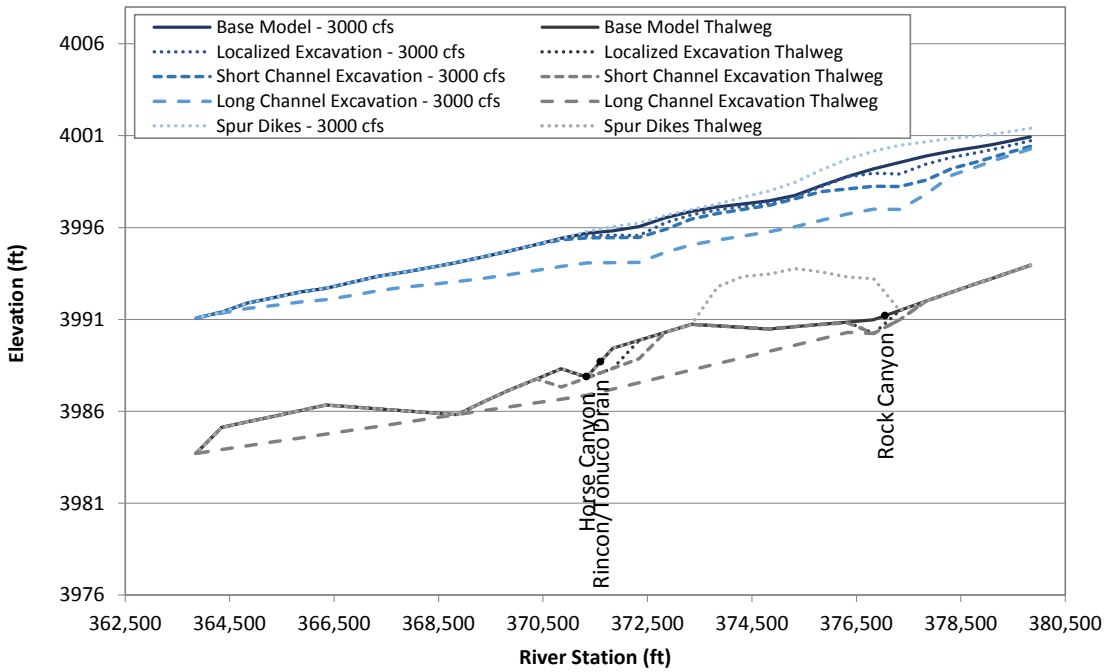


Figure L.35. Predicted water-surface profiles at 3,000 cfs at Problem Location 5 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

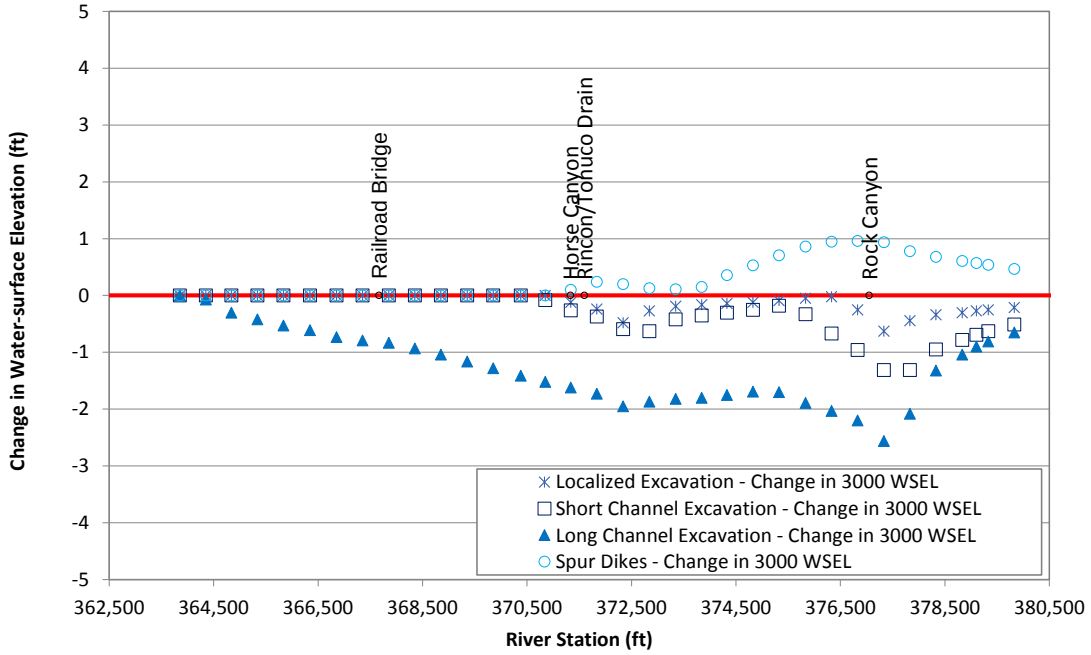


Figure L.36. Predicted change in water-surface elevation at 3,000 cfs at Problem Location 5 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

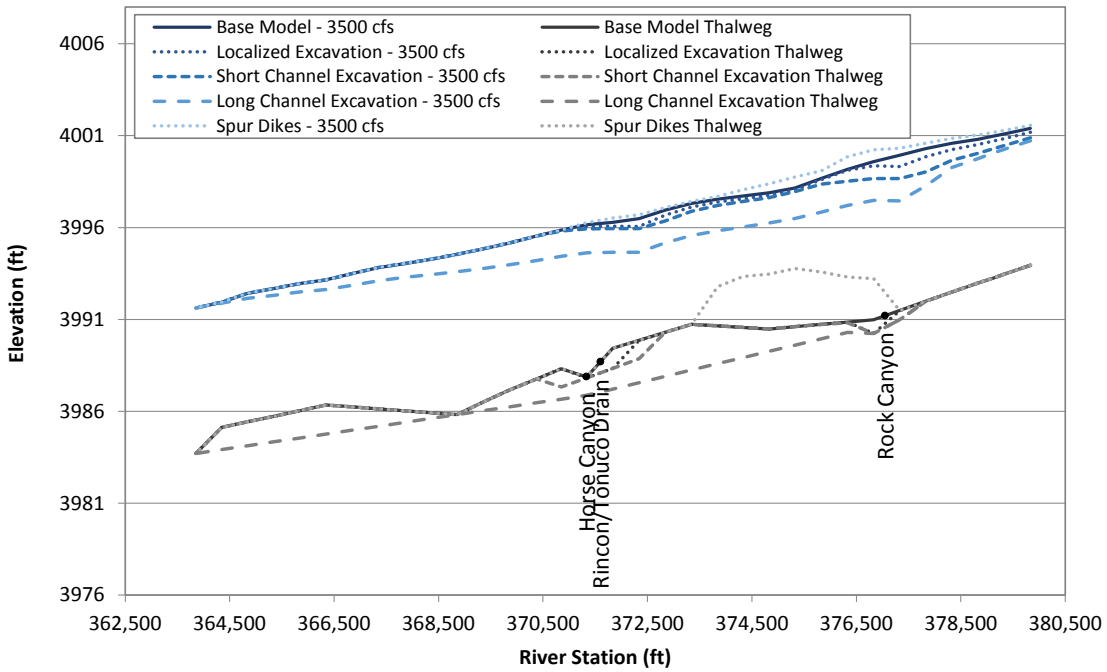


Figure L.37. Predicted water-surface profiles at 3,500 cfs at Problem Location 5 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

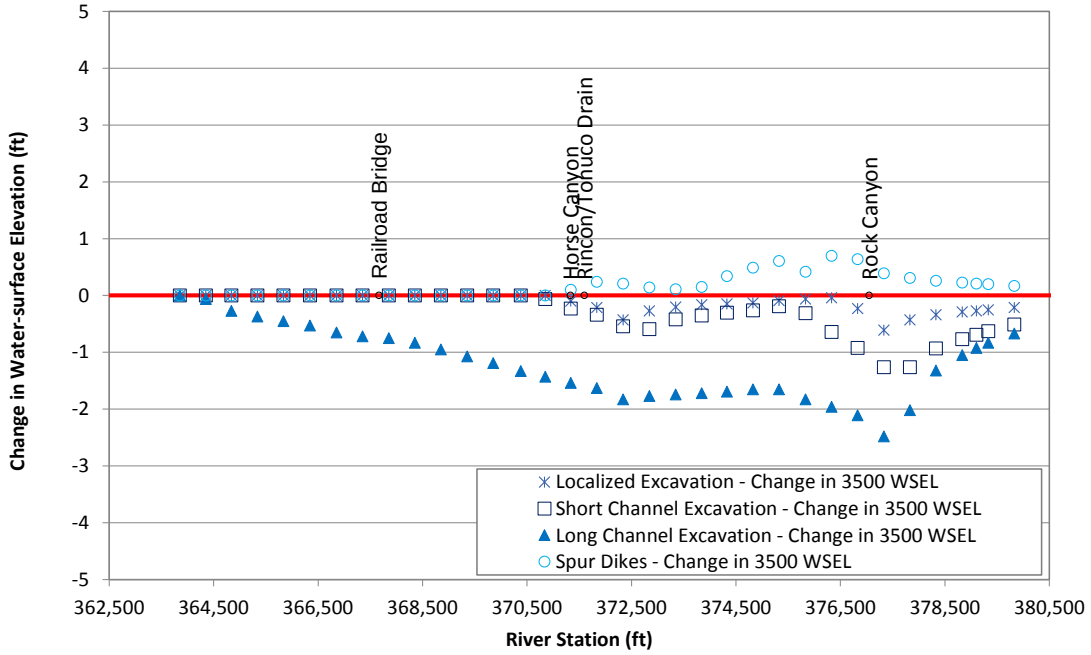


Figure L.38. Predicted change in water-surface elevation at 3,500 cfs at Problem Location 5 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

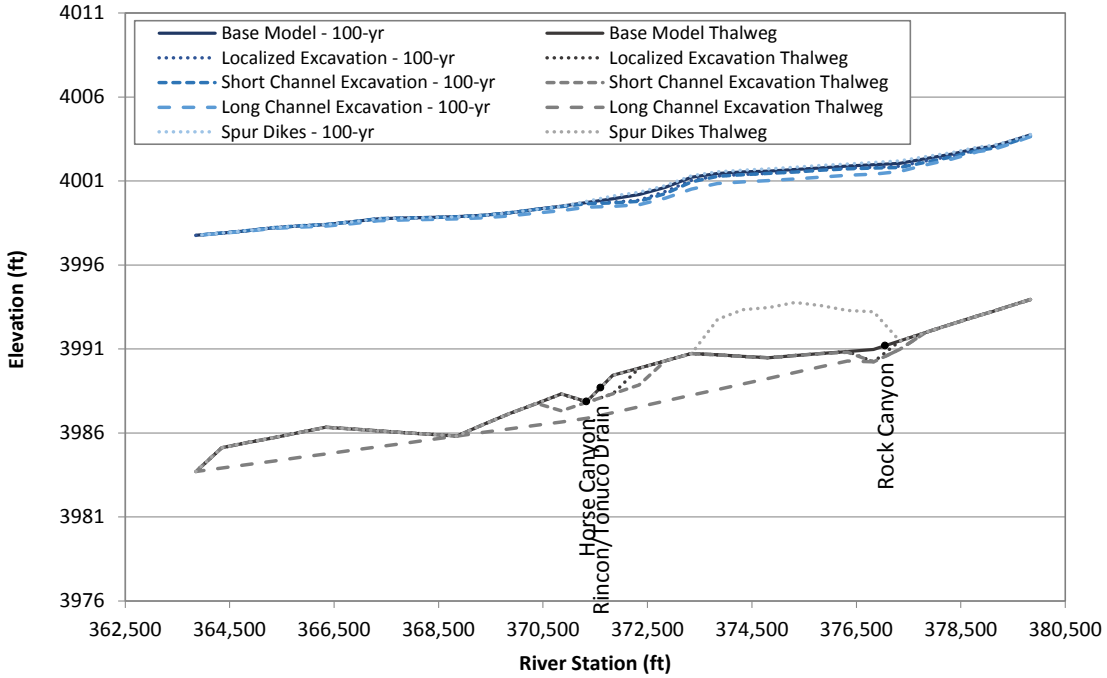


Figure L.39. Predicted water-surface profiles at the routed 100-year peak flow at Problem Location 5 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

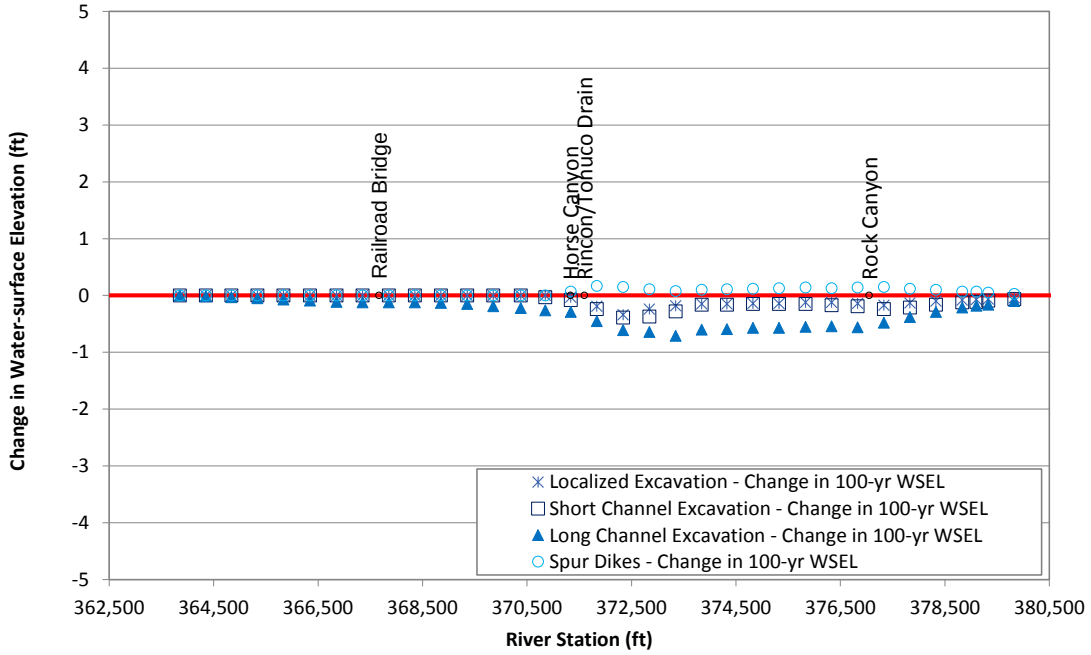


Figure L.40. Predicted change in water-surface elevation at the routed 100-year peak flow at Problem Location 5 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

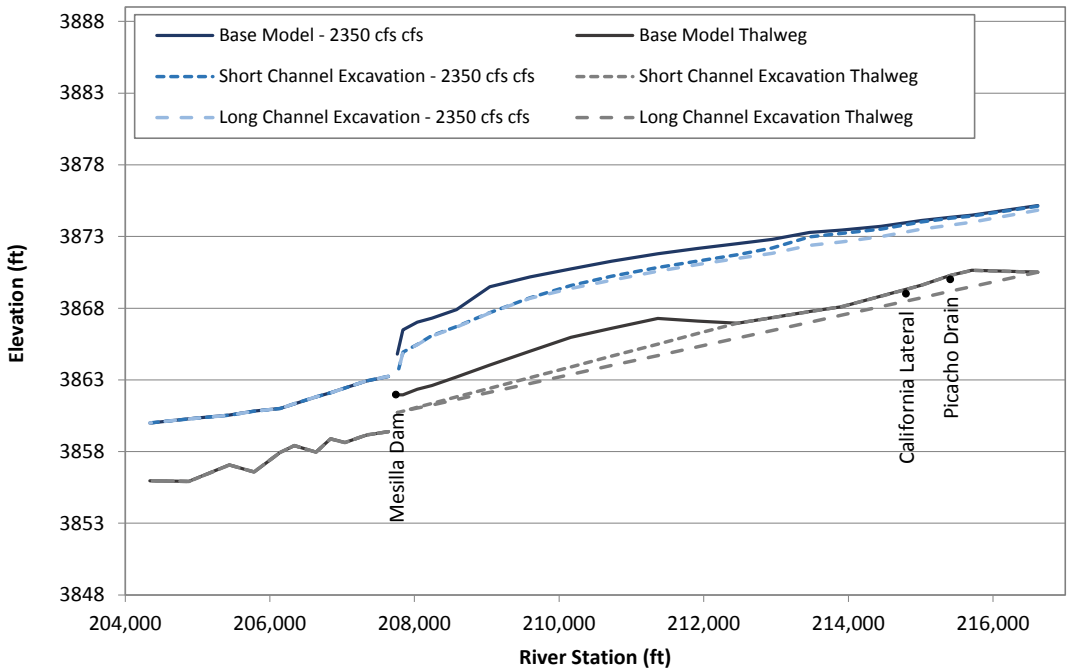


Figure L.41. Predicted water-surface profiles at 2,350 cfs at Problem Location 6 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

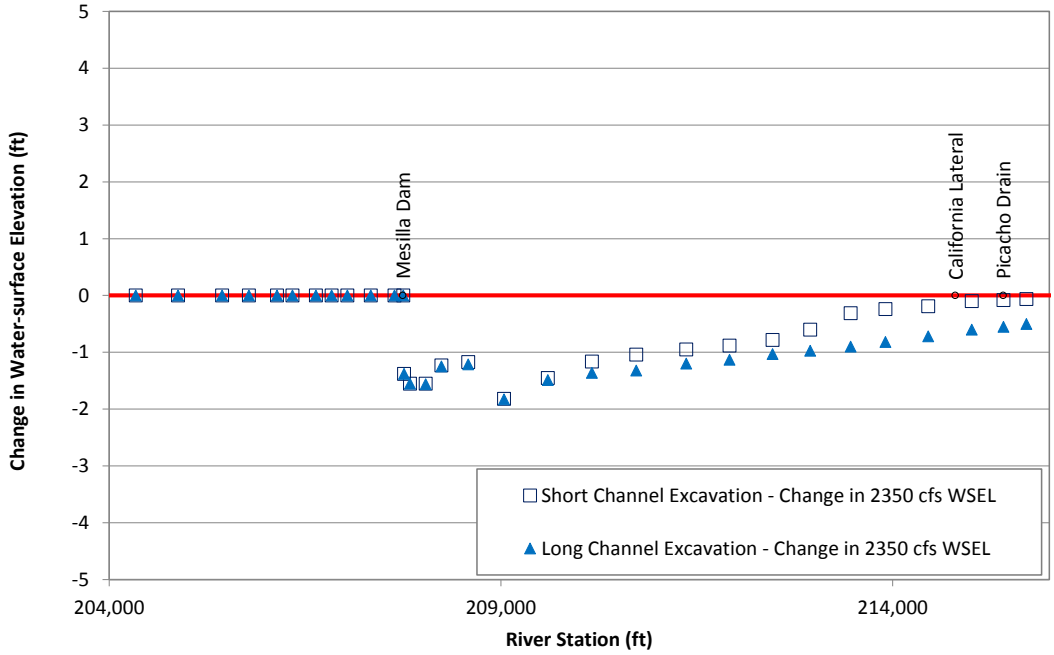


Figure L.42. Predicted change in water-surface elevation at 2,350 cfs at Problem Location 6 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

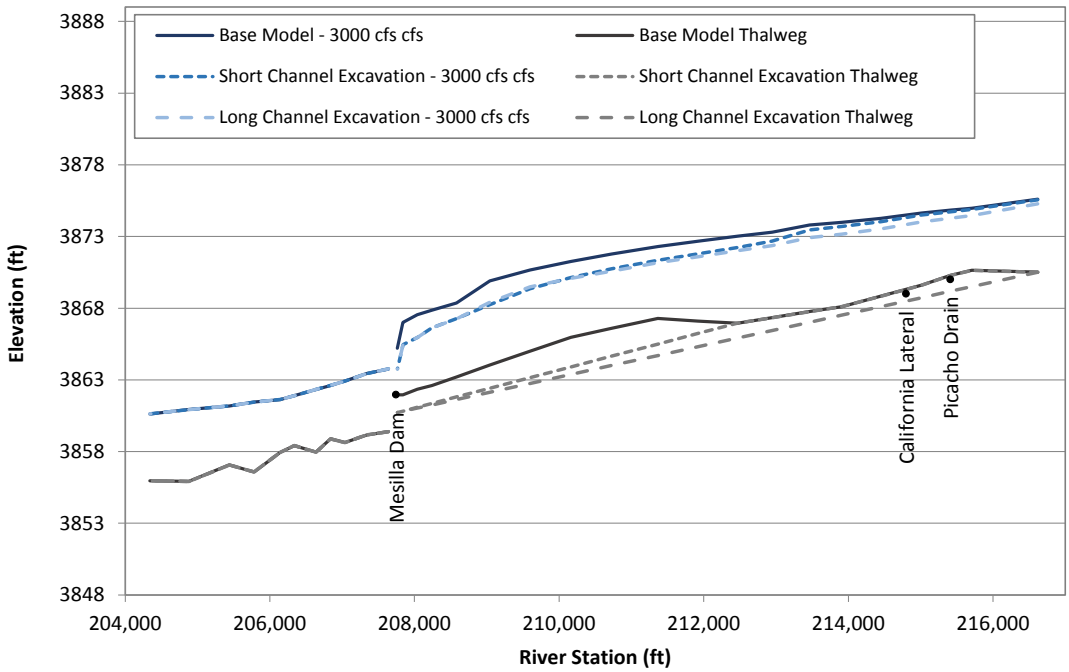


Figure L.43. Predicted water-surface profiles at 3,000 cfs at Problem Location 6 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

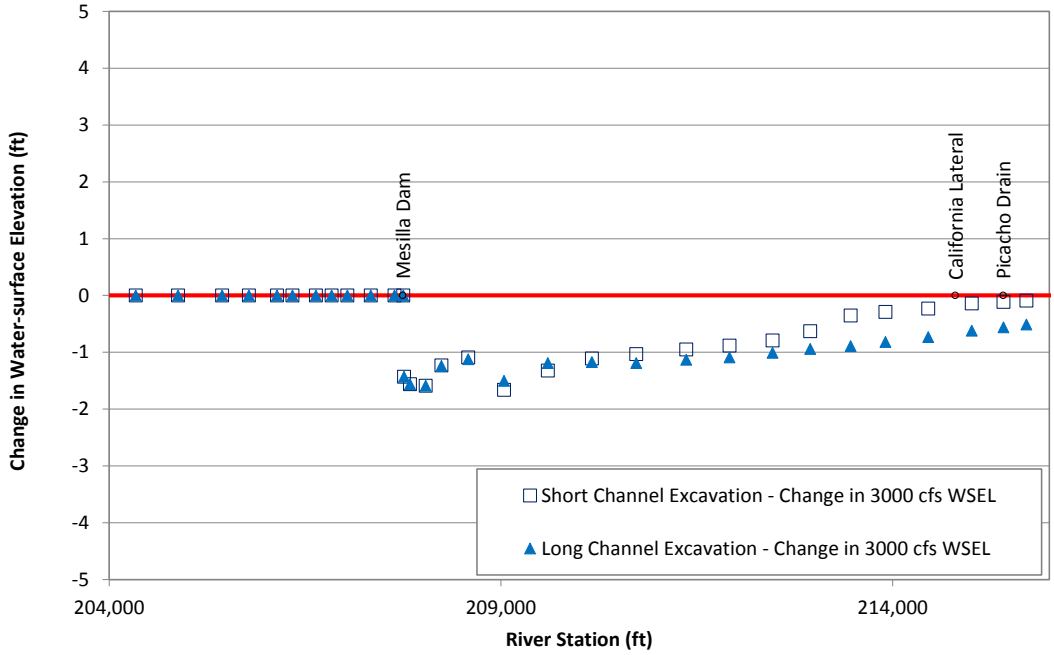


Figure L.44. Predicted change in water-surface elevation at 3,000 cfs at Problem Location 6 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

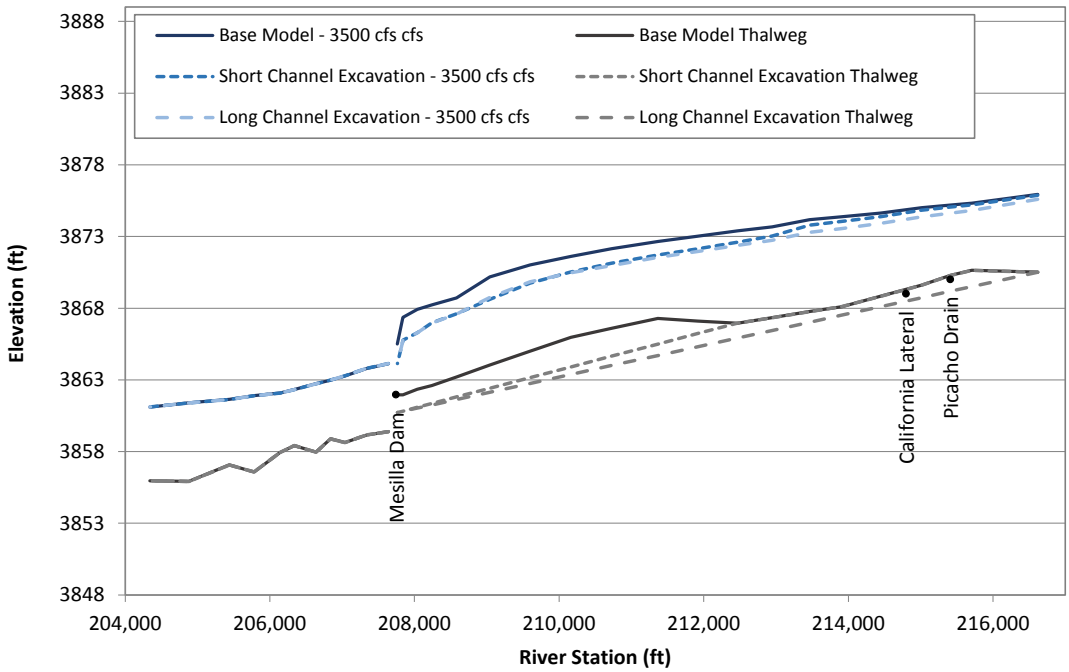


Figure L.45. Predicted water-surface profiles at 3,500 cfs at Problem Location 6 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

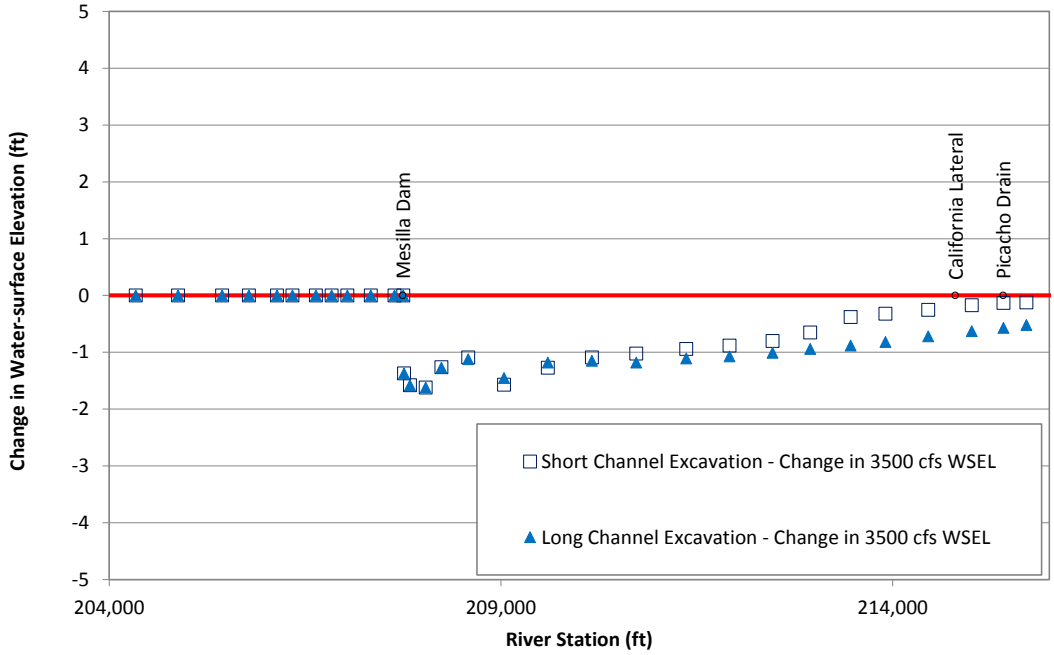


Figure L.46. Predicted change in water-surface elevation at 3,500 cfs at Problem Location 6 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

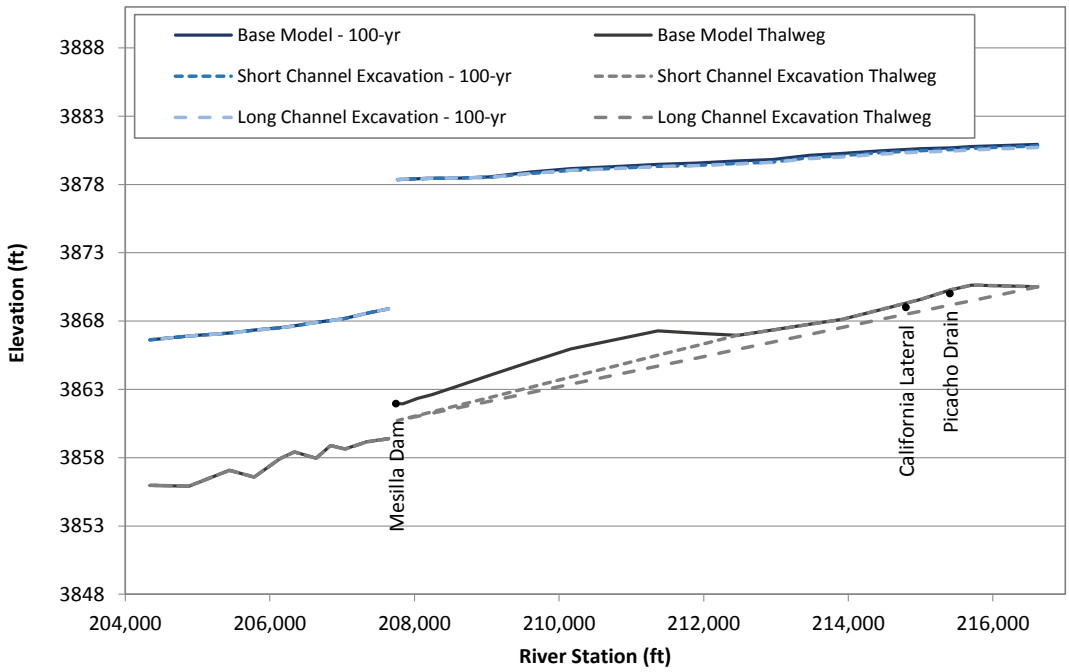


Figure L.47. Predicted water-surface profiles at the routed 100-year peak flow at Problem Location 6 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

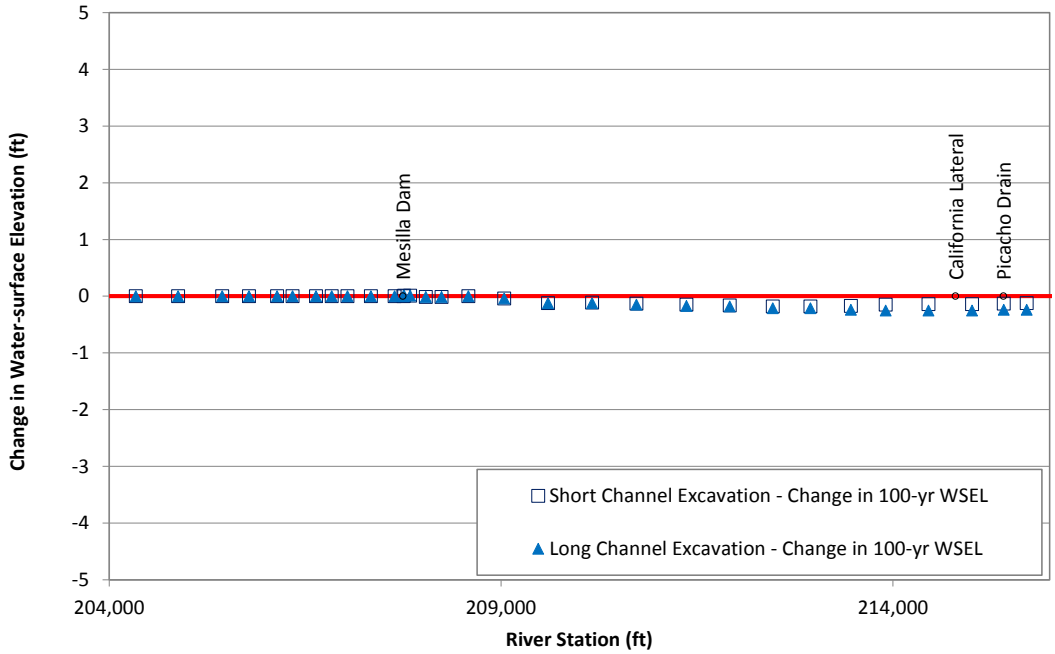


Figure L.48. Predicted change in water-surface elevation at the routed 100-year peak flow at Problem Location 6 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

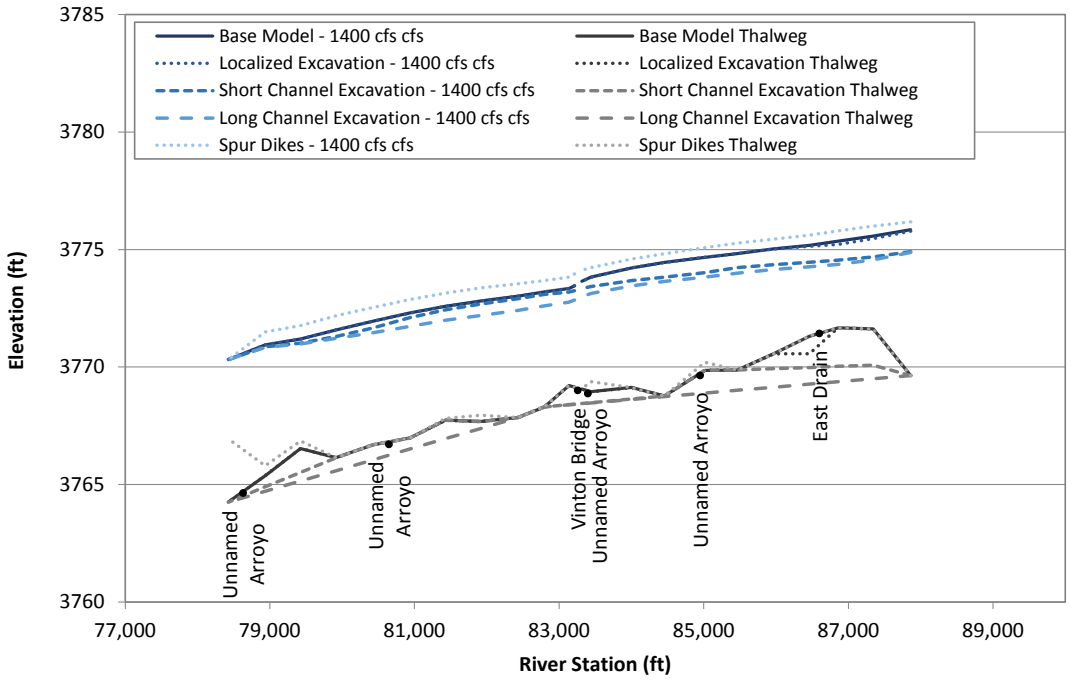


Figure L.49. Predicted water-surface profiles at 1,400 cfs at Problem Location 7 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

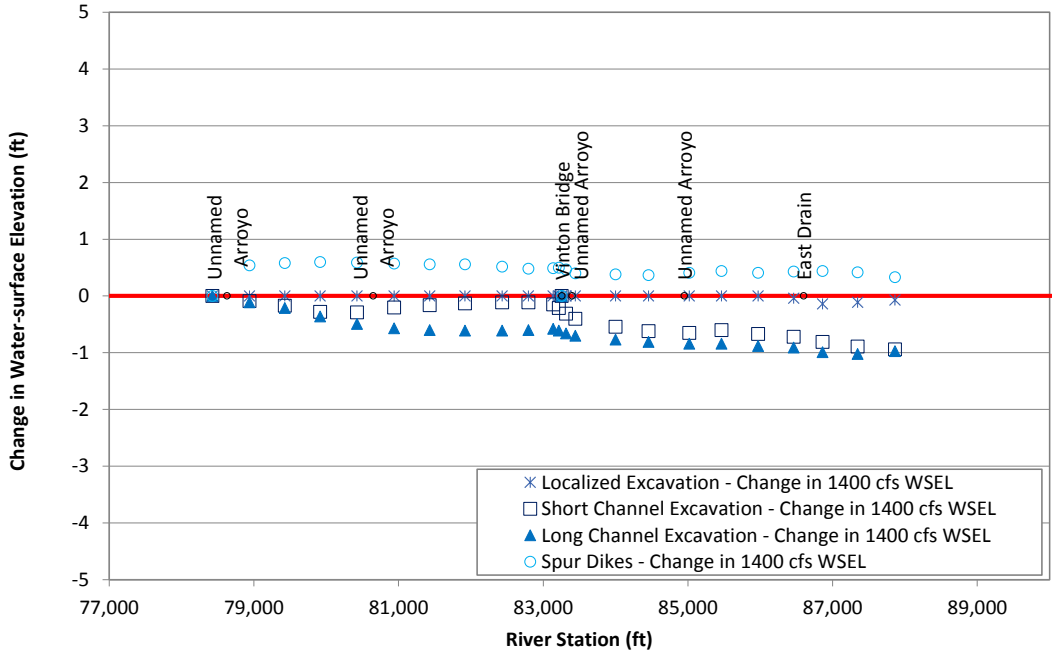


Figure L.50. Predicted change in water-surface elevation at 1,400 cfs at Problem Location 7 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

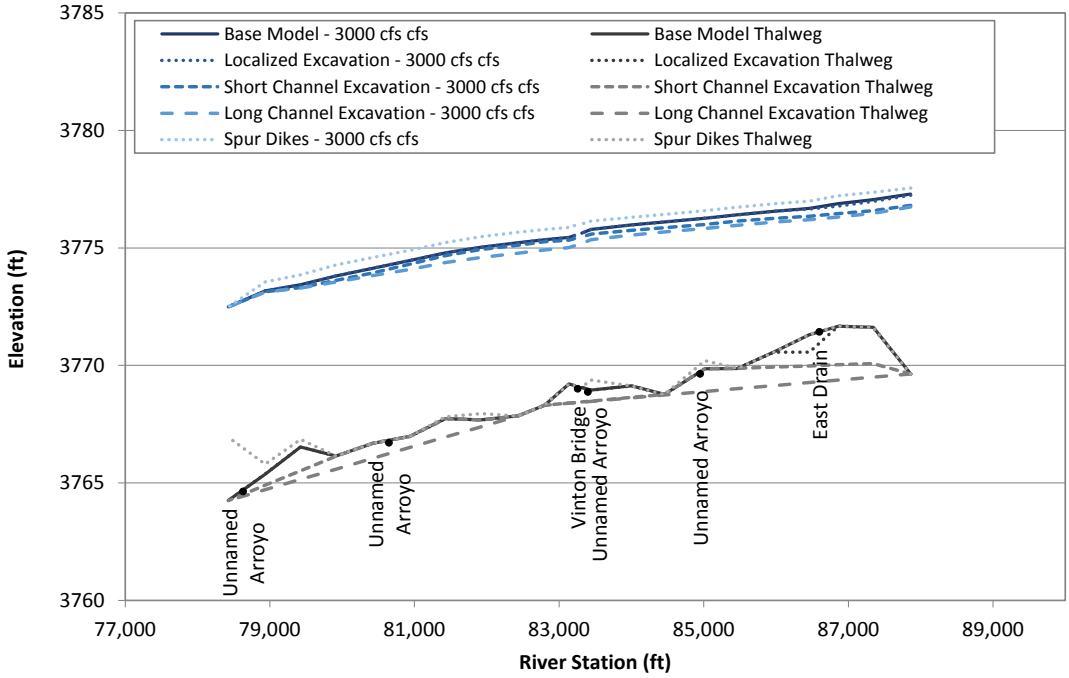


Figure L.51. Predicted water-surface profiles at 3,000 cfs at Problem Location 7 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

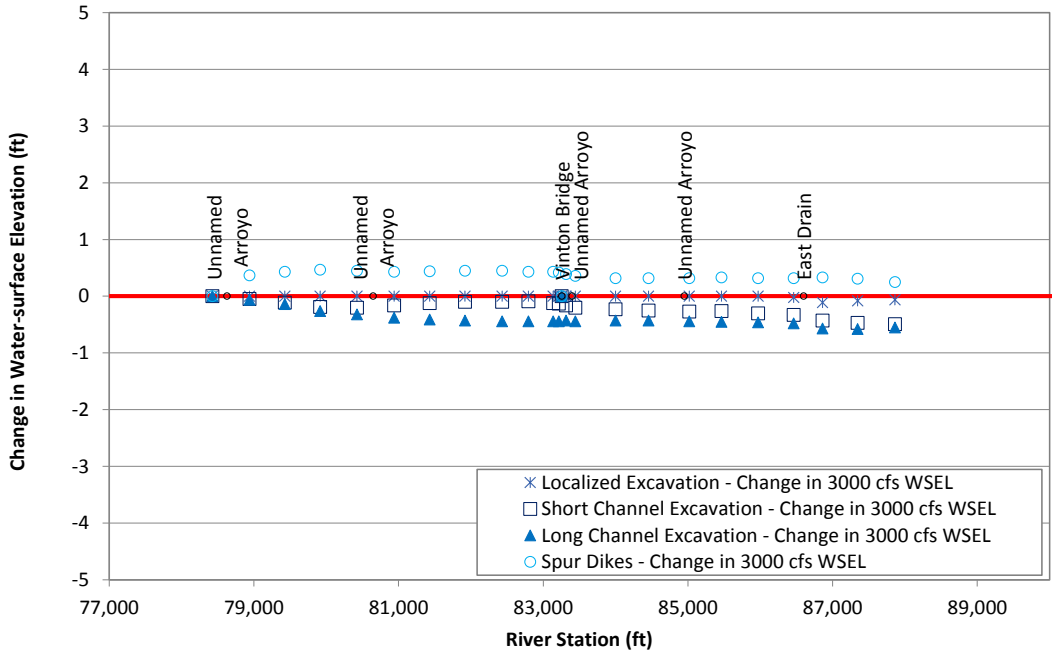


Figure L.52. Predicted change in water-surface elevation at 3,000 cfs at Problem Location 7 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

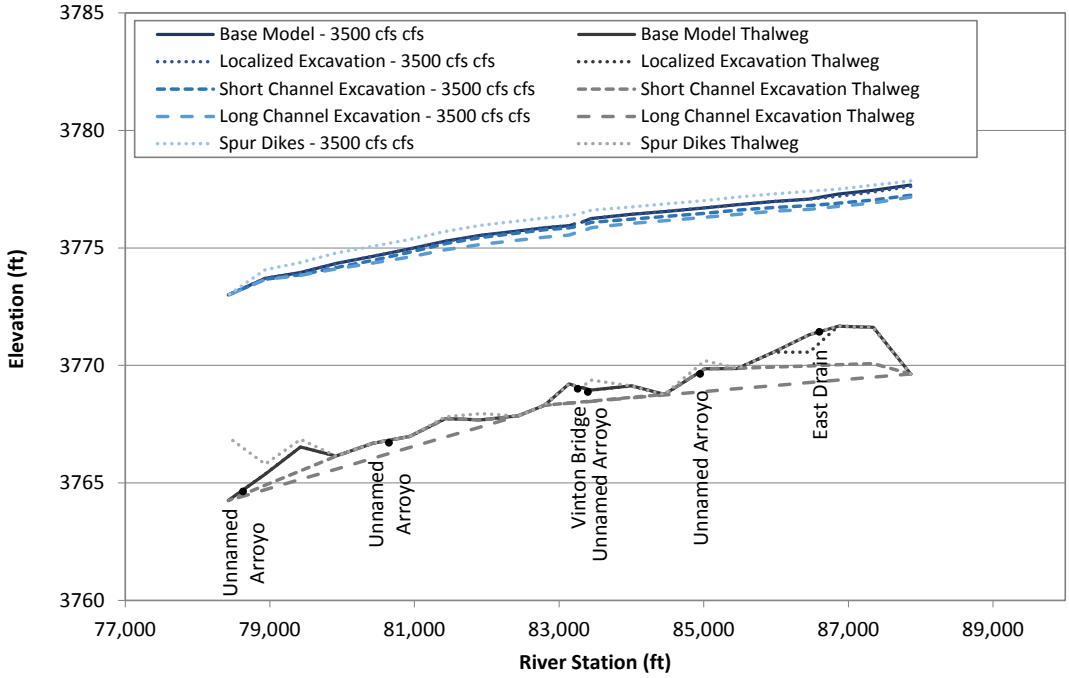


Figure L.53. Predicted water-surface profiles at 3,500 cfs at Problem Location 7 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

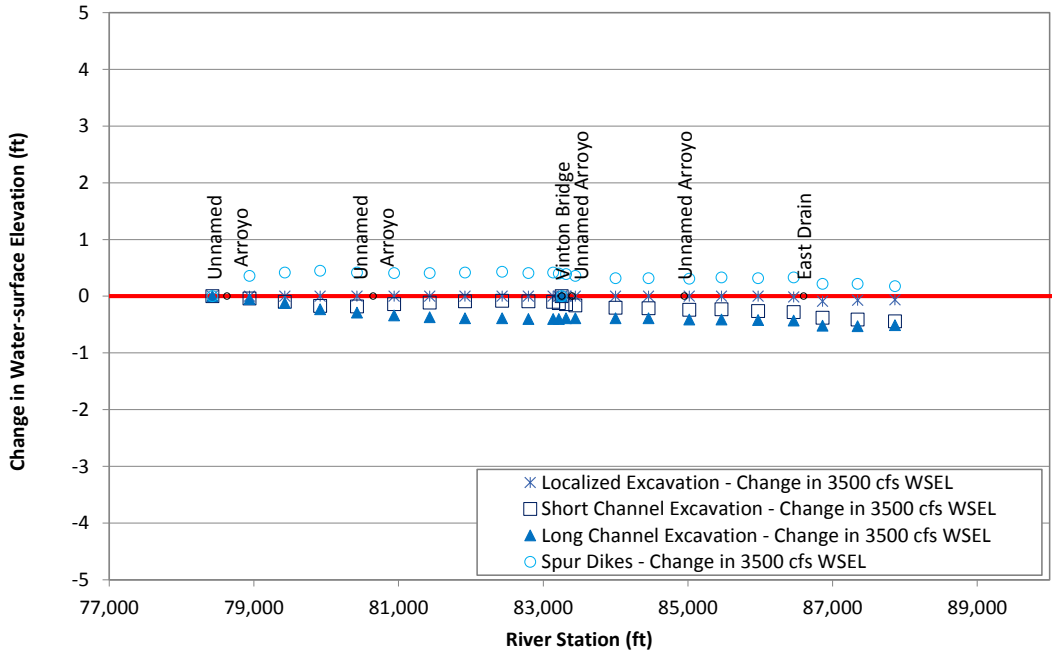


Figure L.54. Predicted change in water-surface elevation at 3,500 cfs at Problem Location 7 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

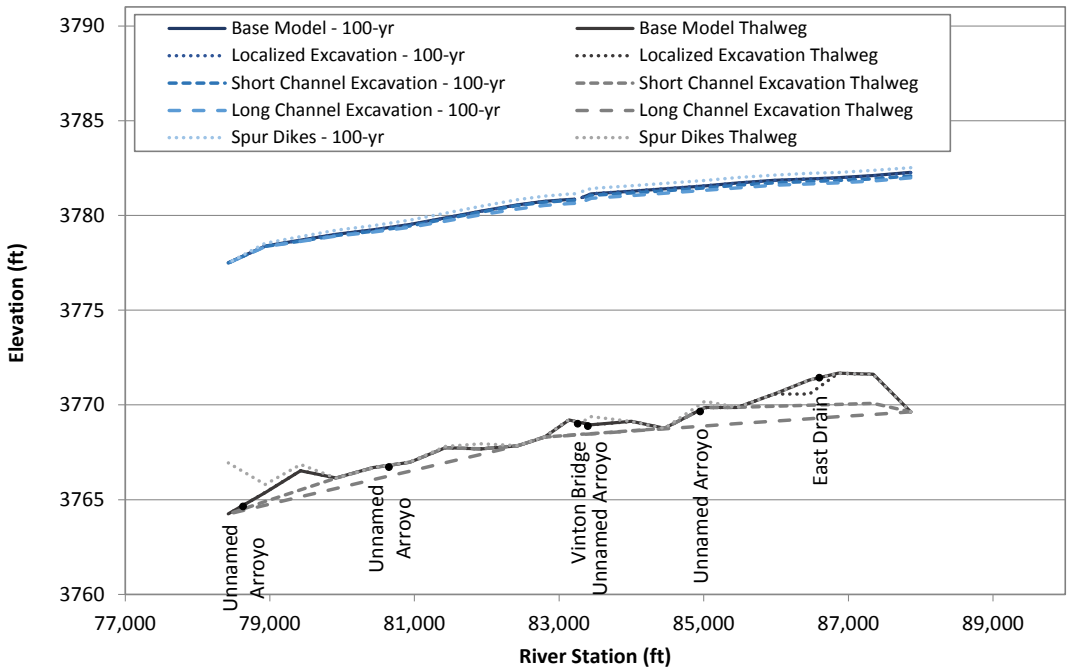


Figure L.55. Predicted water-surface profiles at the routed 100-year peak flow at Problem Location 7 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

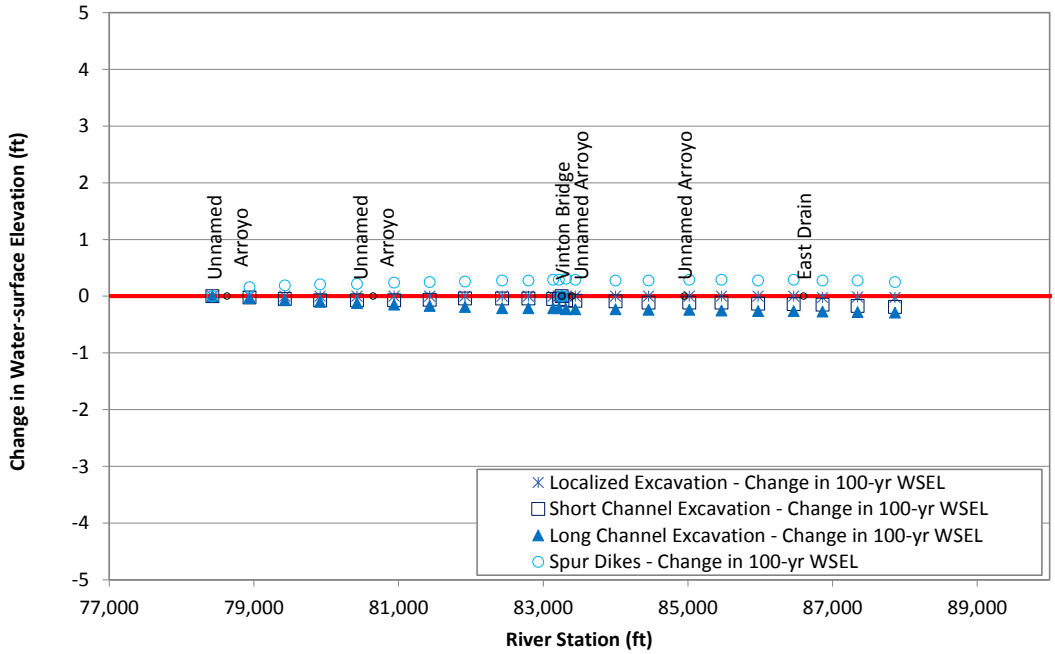


Figure L.56. Predicted change in water-surface elevation at the routed 100-year peak flow at Problem Location 7 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

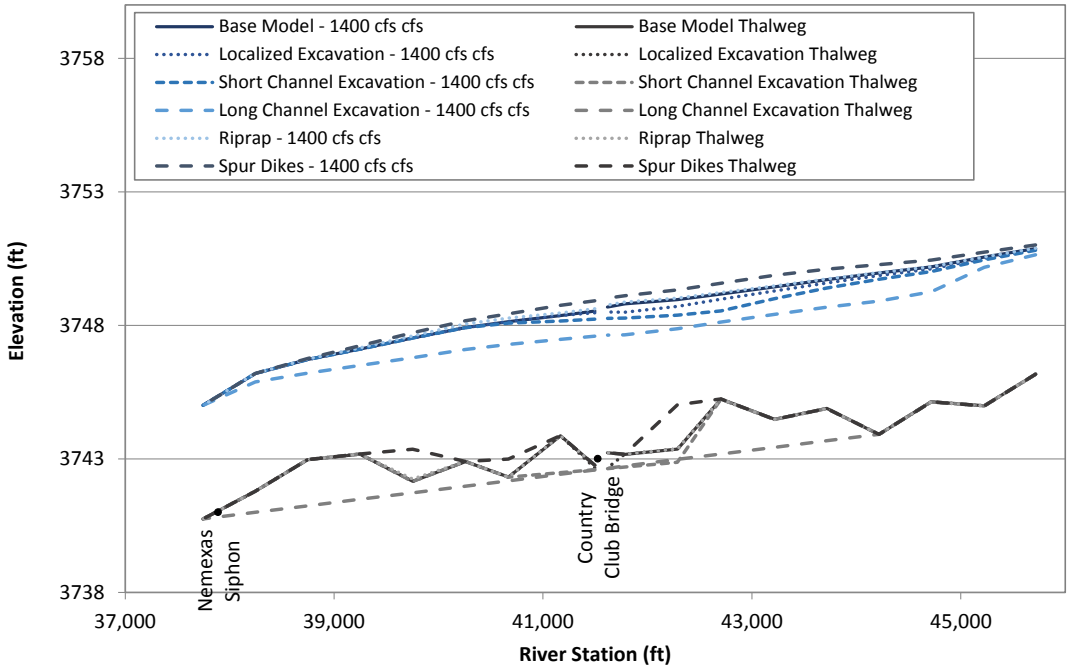


Figure L.57. Predicted water-surface profiles at 1,400 cfs at Problem Location 8 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

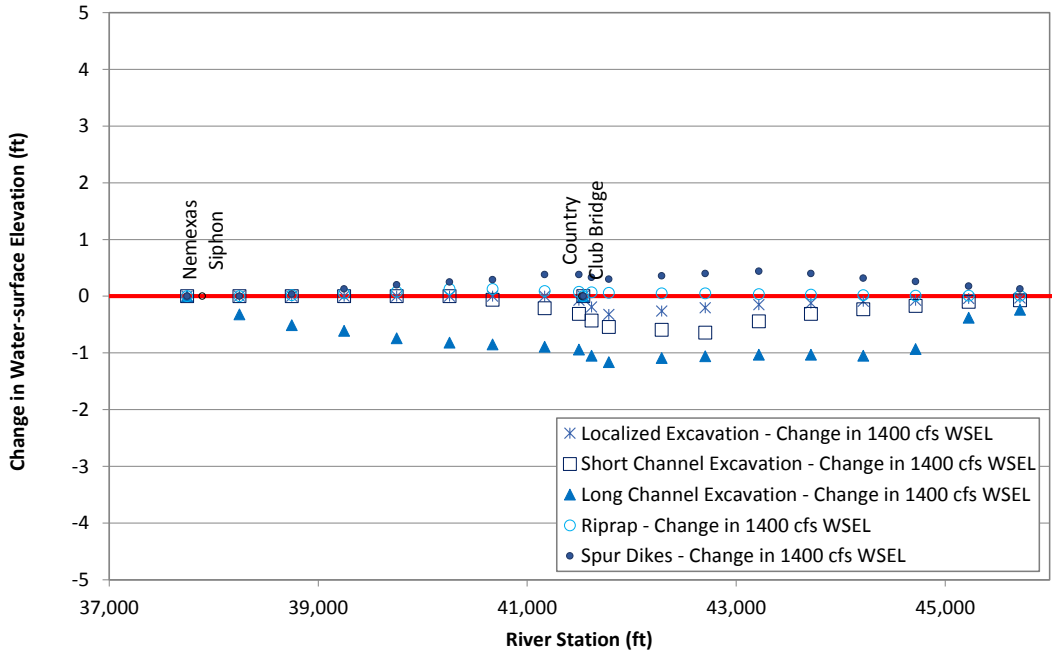


Figure L.58. Predicted change in water-surface elevation at 1,400 cfs at Problem Location 8 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

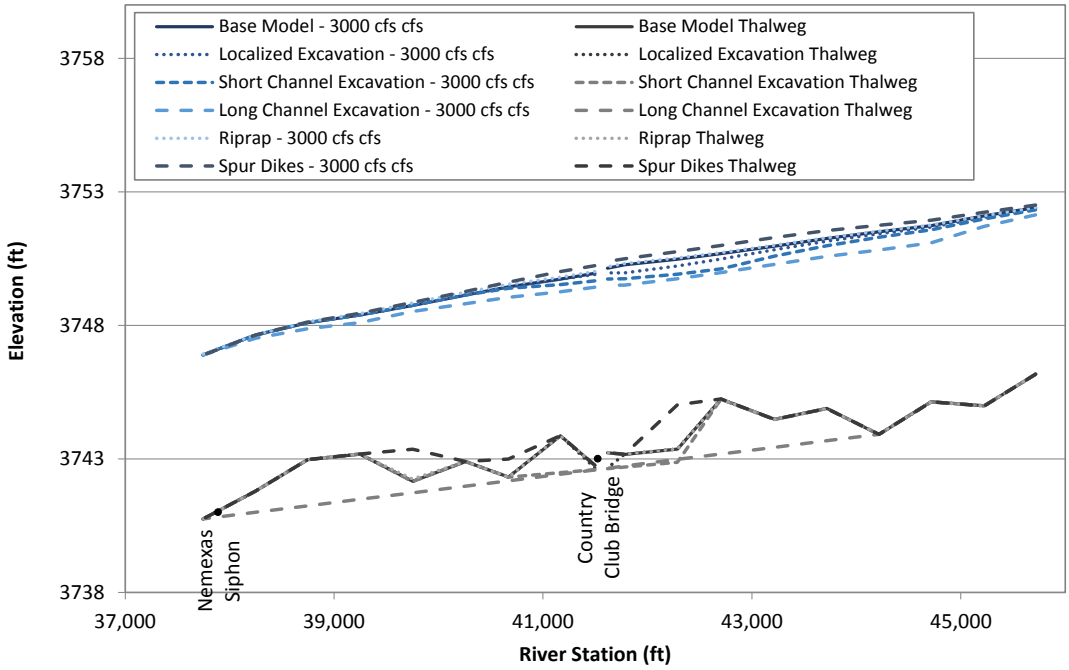


Figure L.59. Predicted water-surface profiles at 3,000 cfs at Problem Location 8 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

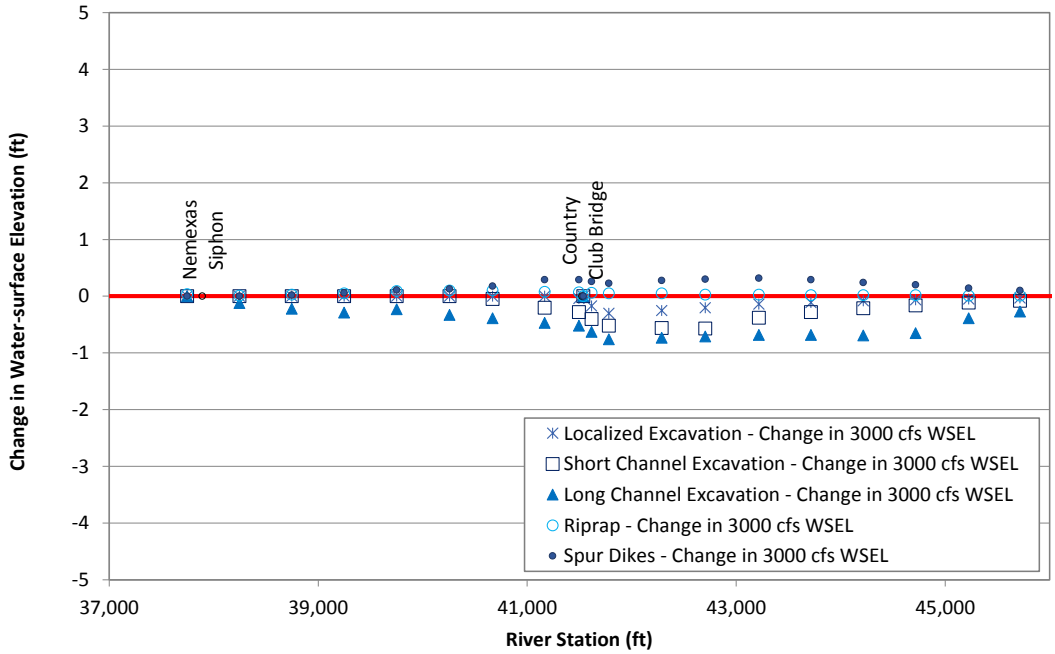


Figure L.60. Predicted change in water-surface elevation at 3,000 cfs at Problem Location 8 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

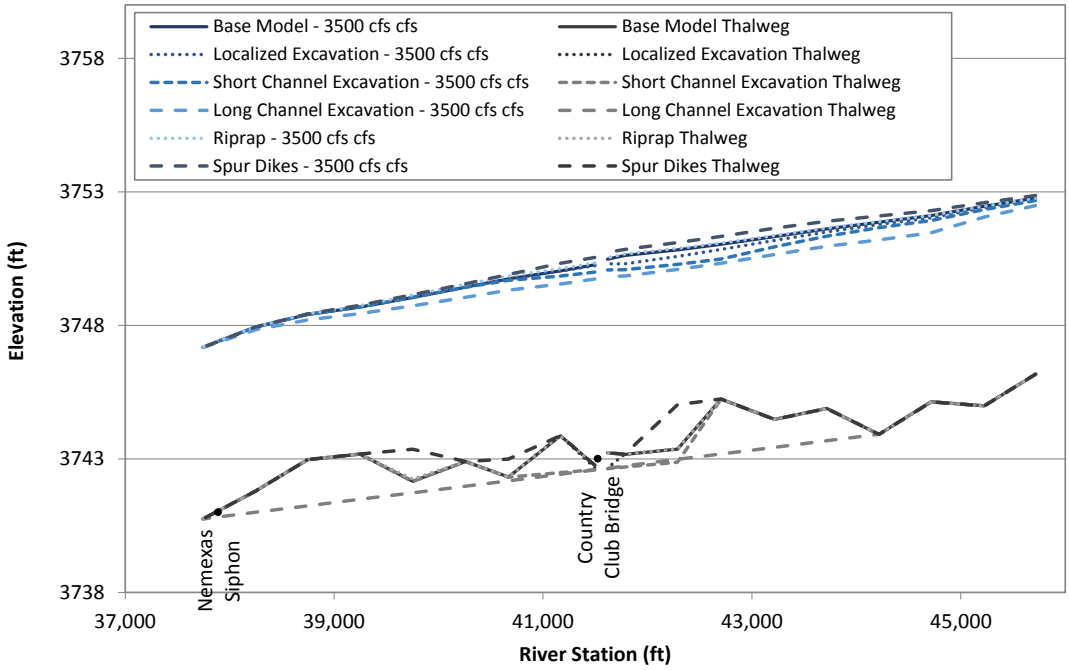


Figure L.61. Predicted water-surface profiles at 3,500 cfs at Problem Location 8 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

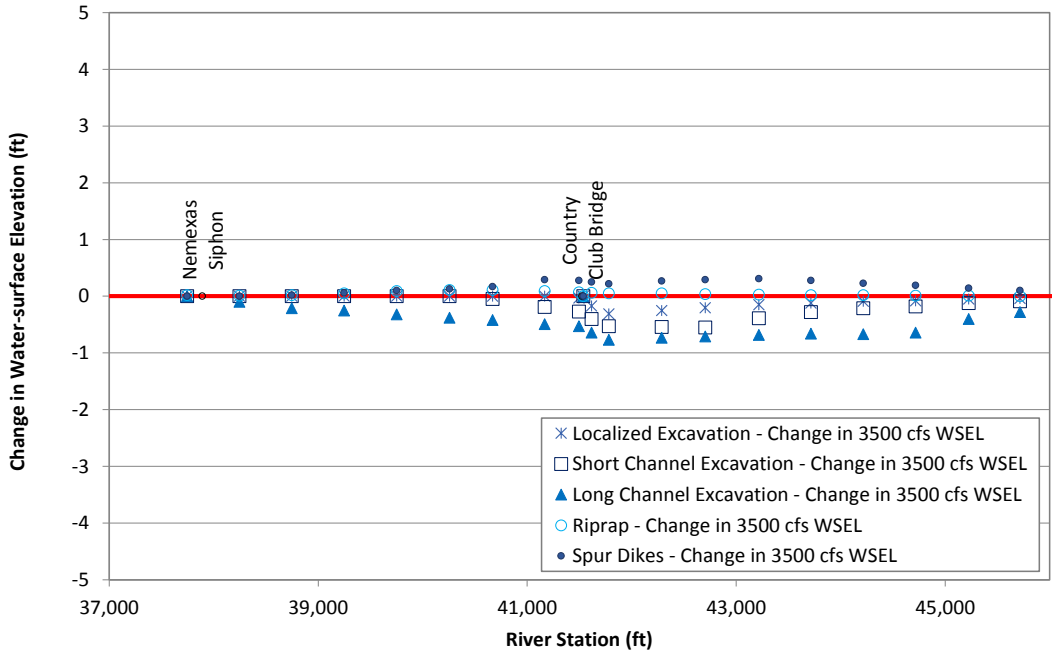


Figure L.62. Predicted change in water-surface elevation at 3,500 cfs at Problem Location 8 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

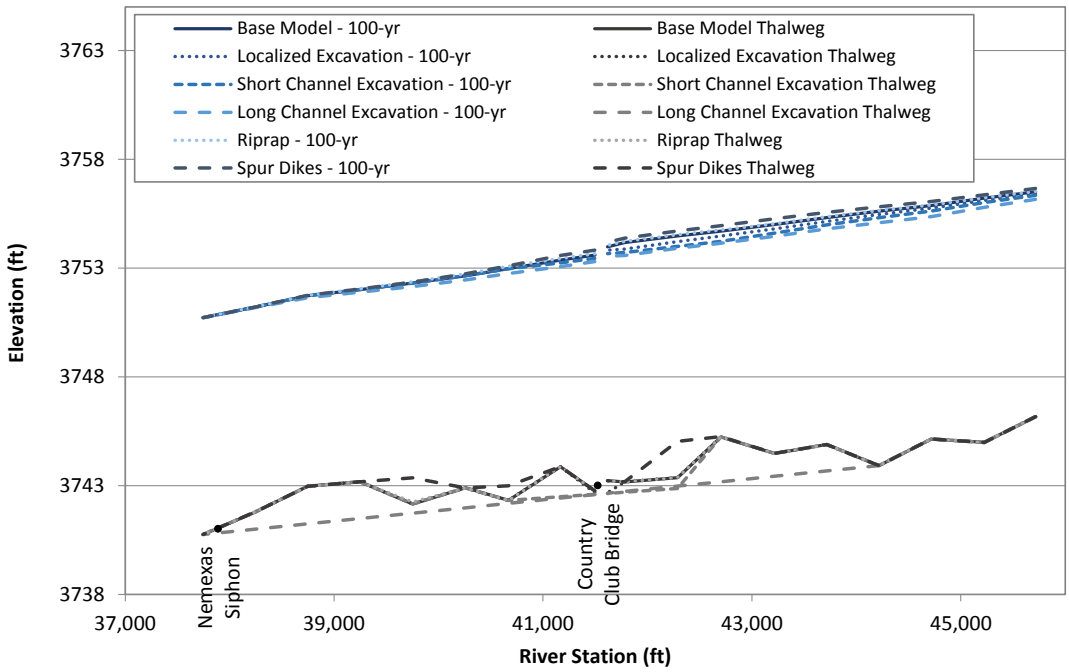


Figure L.63. Predicted water-surface profiles at the routed 100-year peak flow at Problem Location 8 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

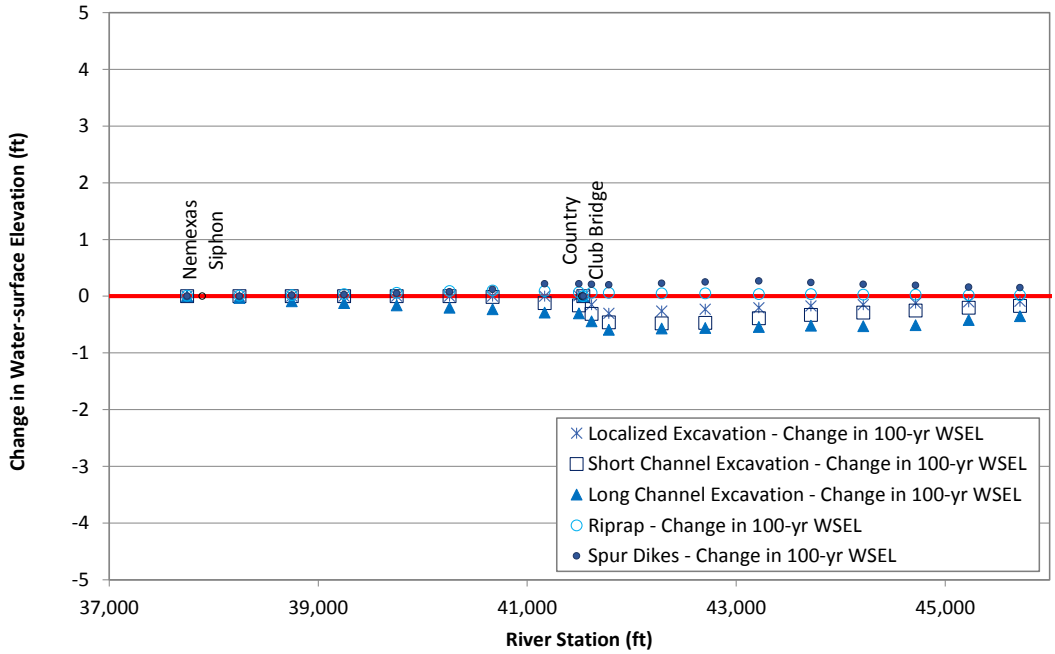


Figure L.64. Predicted change in water-surface elevation at the routed 100-year peak flow at Problem Location 8 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

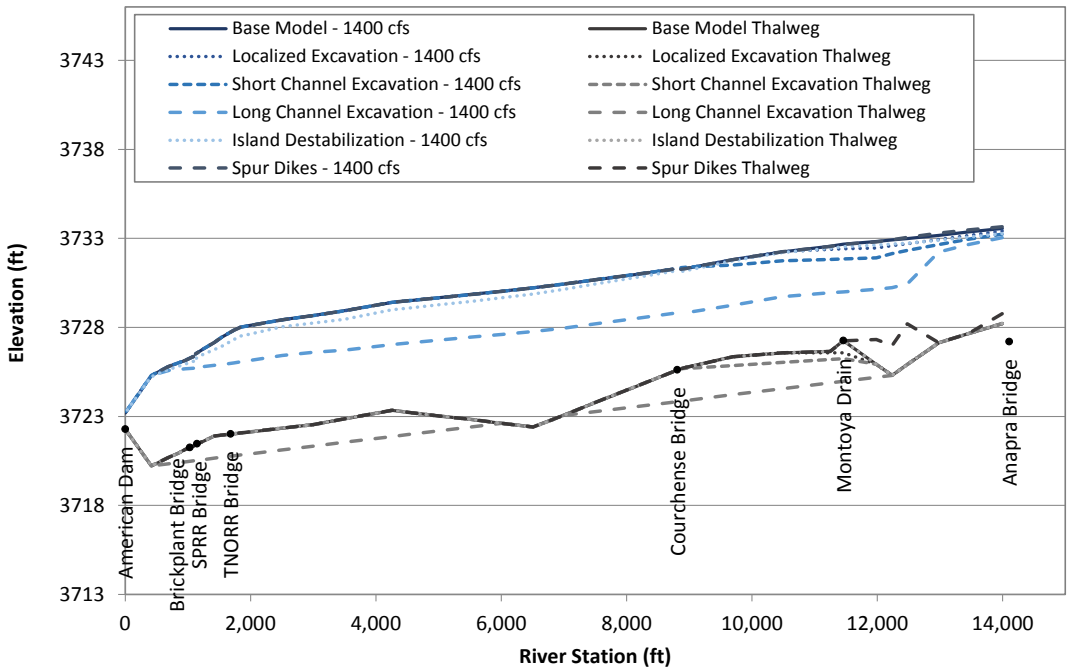


Figure L.65. Predicted water-surface profiles at 1,400 cfs at Problem Location 9 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

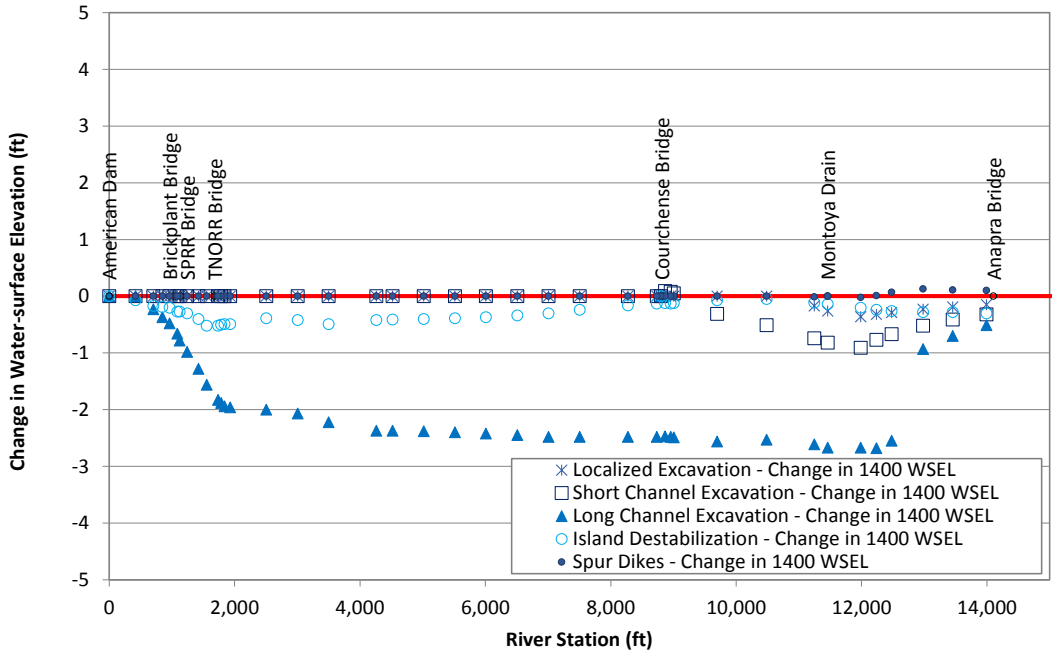


Figure L.66. Predicted change in water-surface elevation at 1,400 cfs at Problem Location 9 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

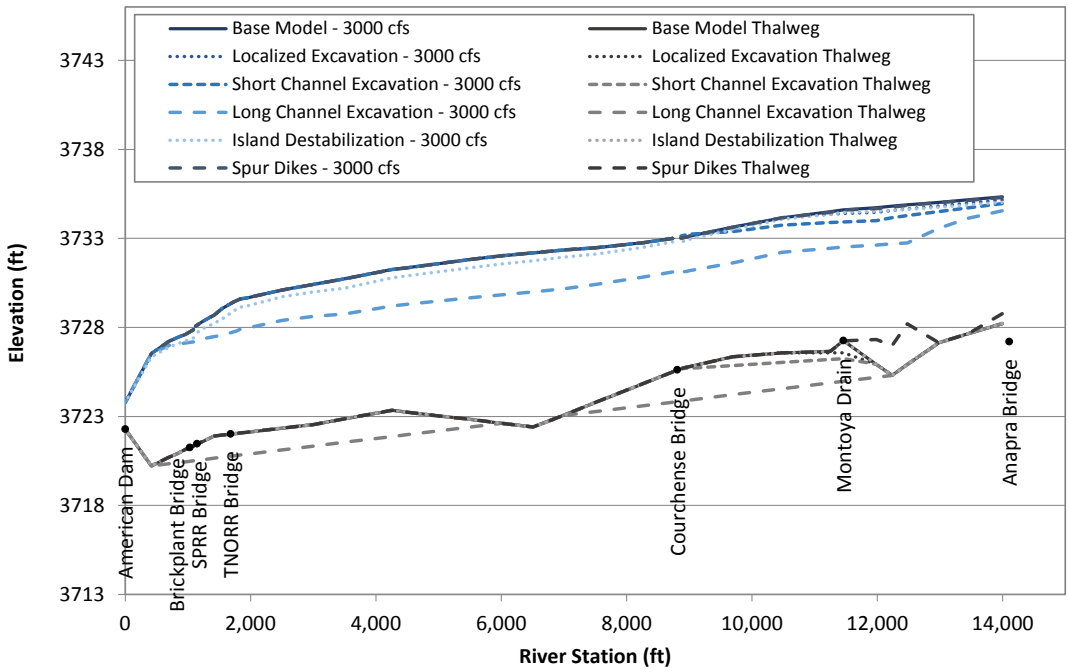


Figure L.67. Predicted water-surface profiles at 3,000 cfs at Problem Location 9 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

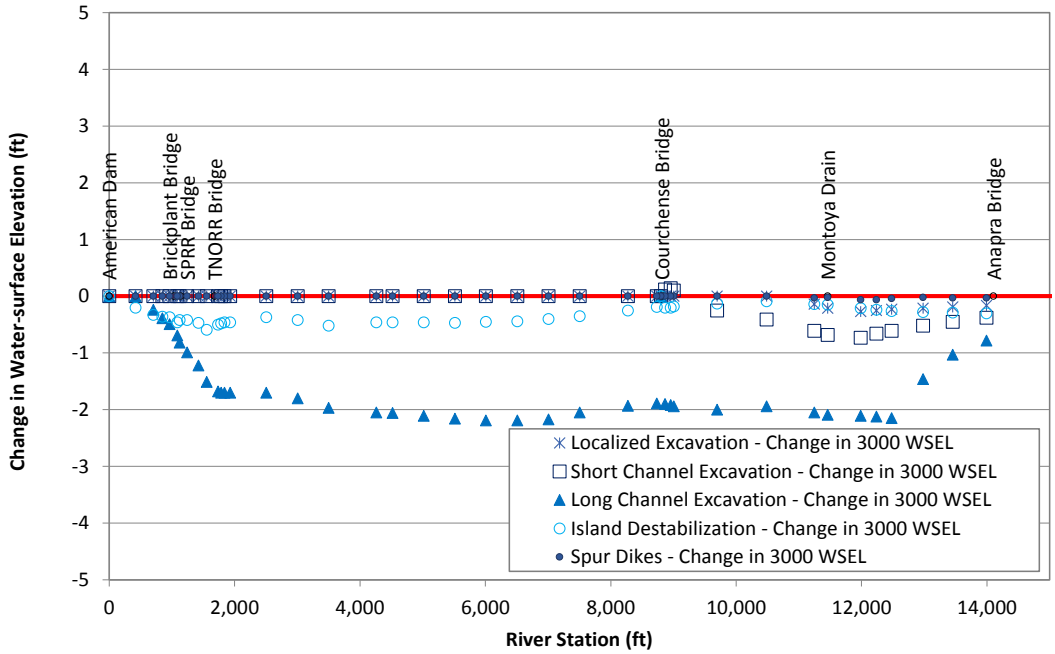


Figure L.68. Predicted change in water-surface elevation at 3,000 cfs at Problem Location 9 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

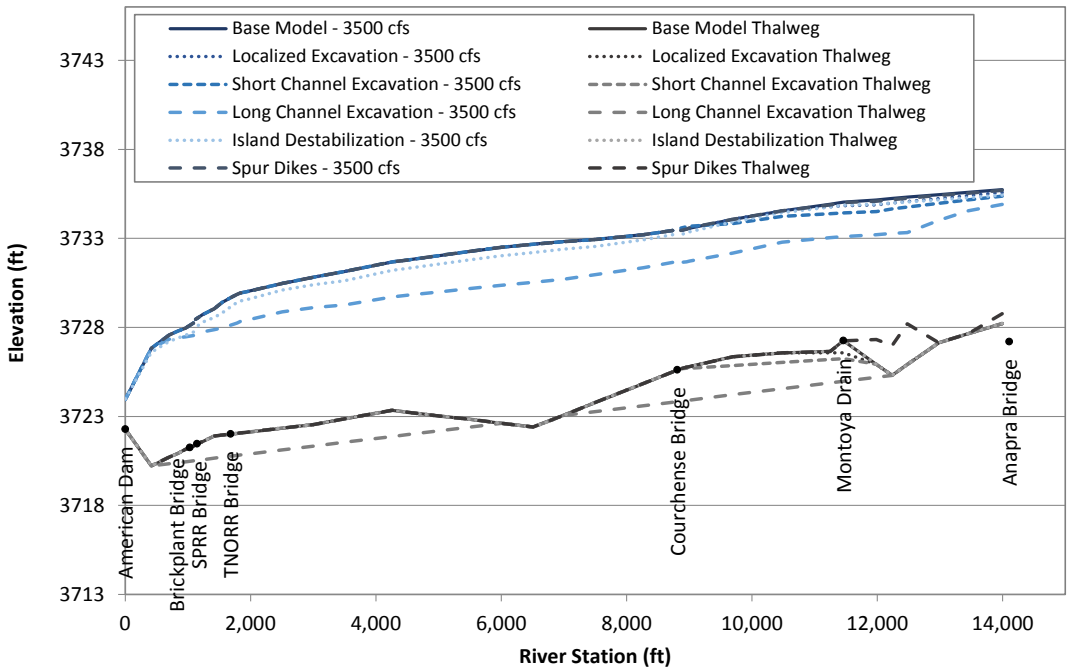


Figure L.69. Predicted water-surface profiles at 3,500 cfs at Problem Location 9 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

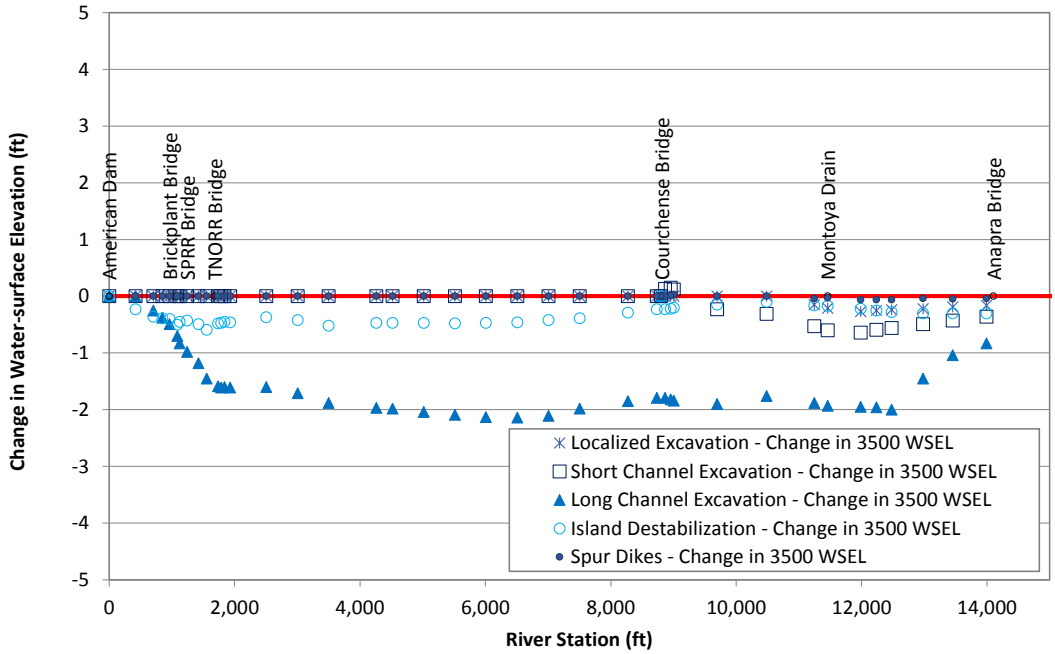


Figure L.70. Predicted change in water-surface elevation at 3,500 cfs at Problem Location 9 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

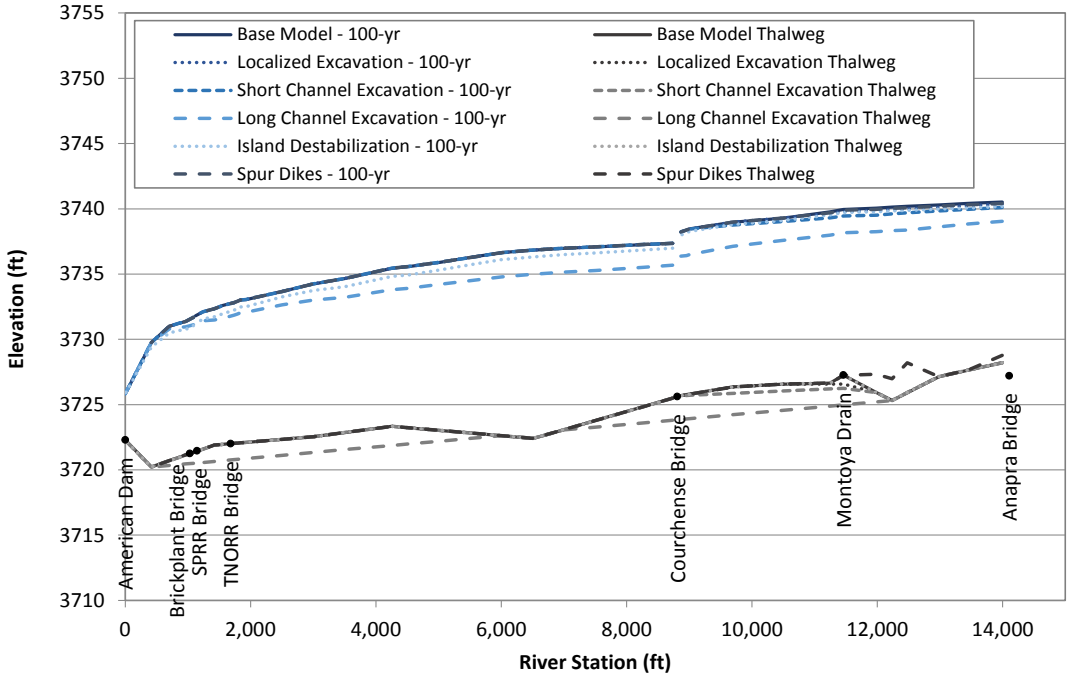


Figure L.71. Predicted water-surface profiles at the routed 100-year peak flow at Problem Location 9 under existing (base model) conditions and for the alternatives that were evaluated with the steady-state hydraulic model.

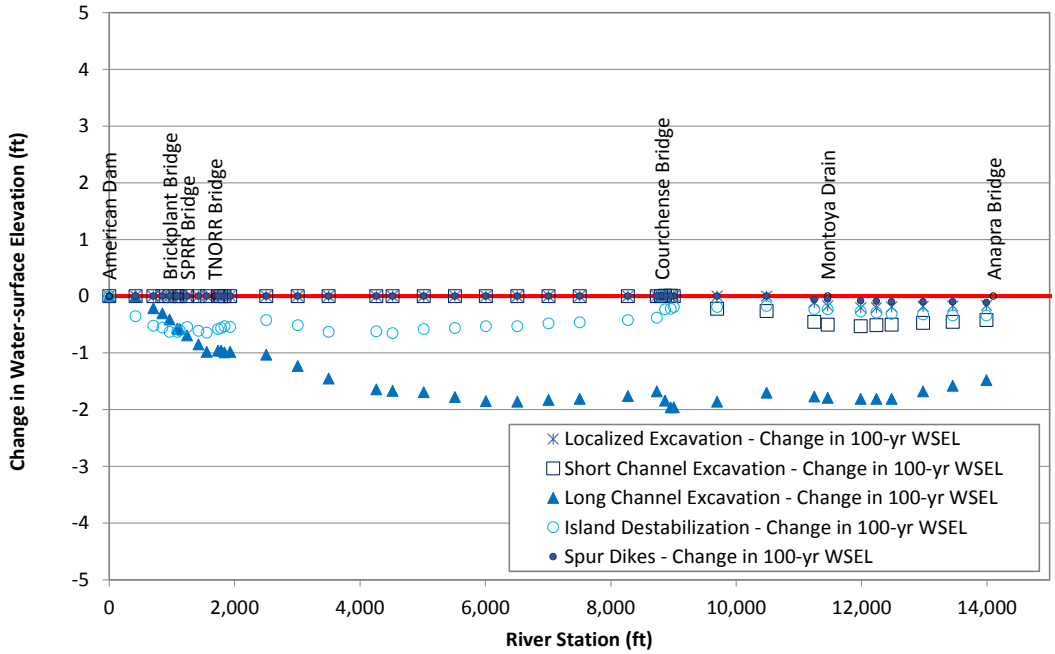


Figure L.72. Predicted change in water-surface elevation at the routed 100-year peak flow at Problem Location 9 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project:
Final Report

APPENDIX M

Sediment-transport Model Results

October 20, 2015

Contract No. IBM09D0006
Order No. IBM14T0016

Appendix M.1

Comparative Spatial Profiles of the
Sediment-transport Modeling Results
for the Base and Alternative Conditions

Page Intentionally Left Blank

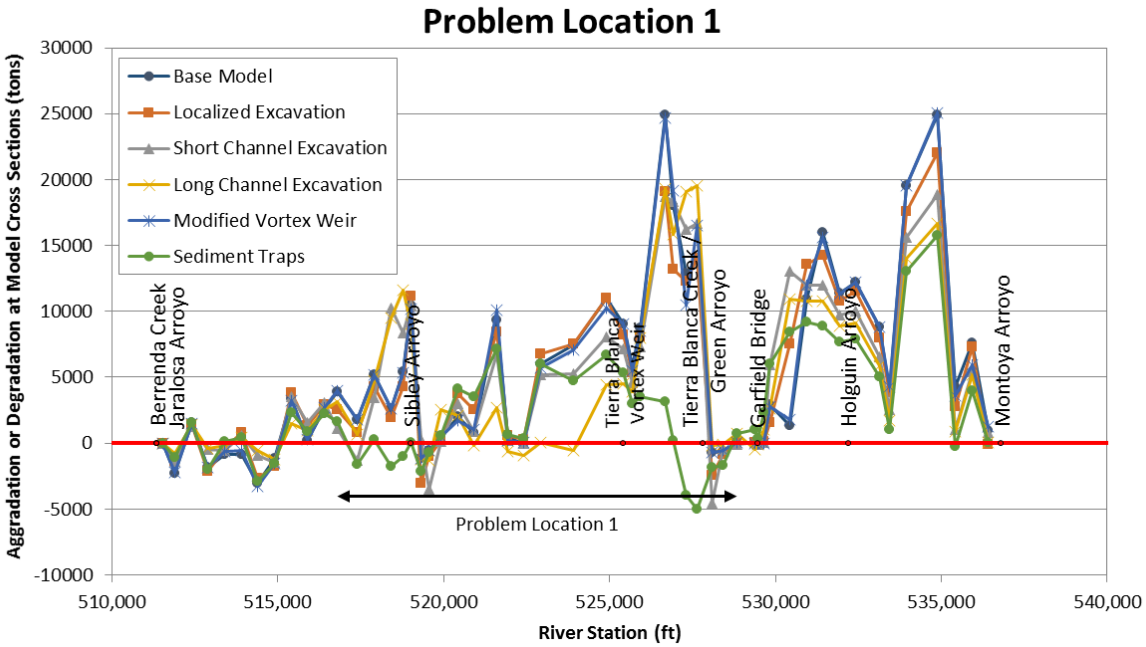


Figure M.1.1. Spatial profiles showing the predicted cumulative mass of aggradation or degradation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 1.

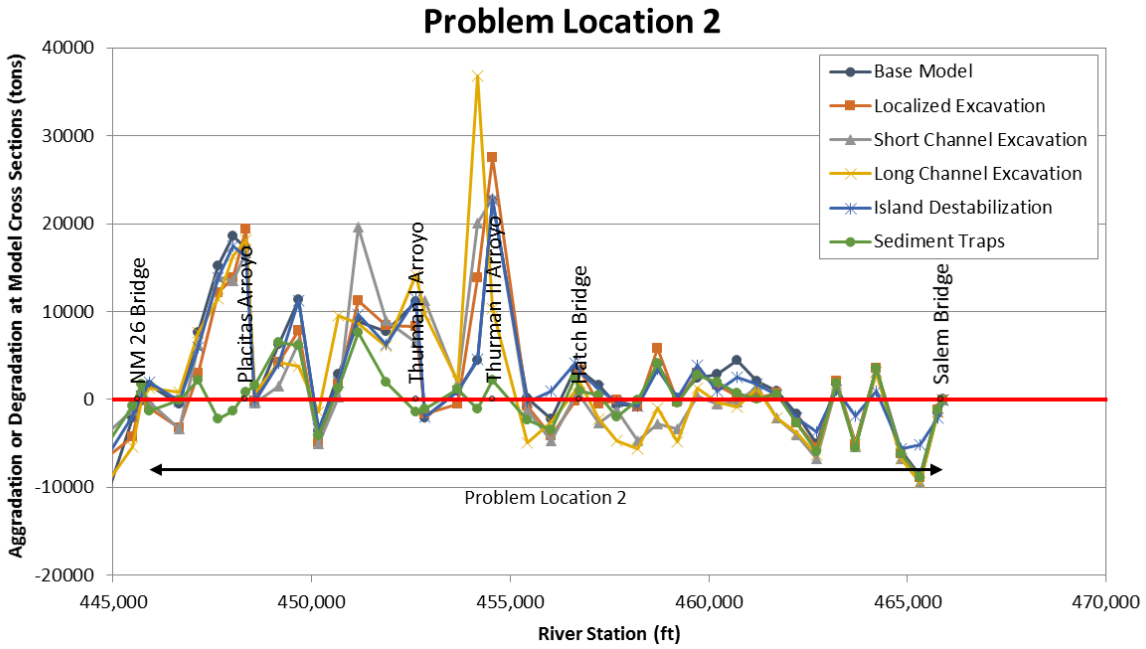


Figure M.1.2. Spatial profiles showing the predicted cumulative mass of aggradation or degradation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 2.

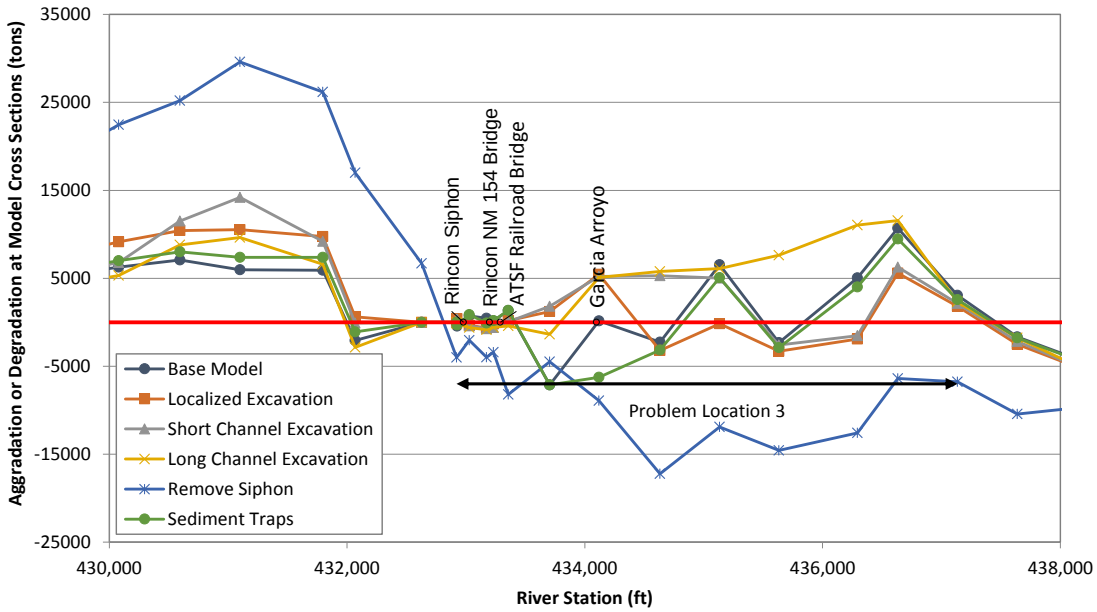


Figure M.1.3. Spatial profiles showing the predicted cumulative mass of aggradation or degradation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 3.

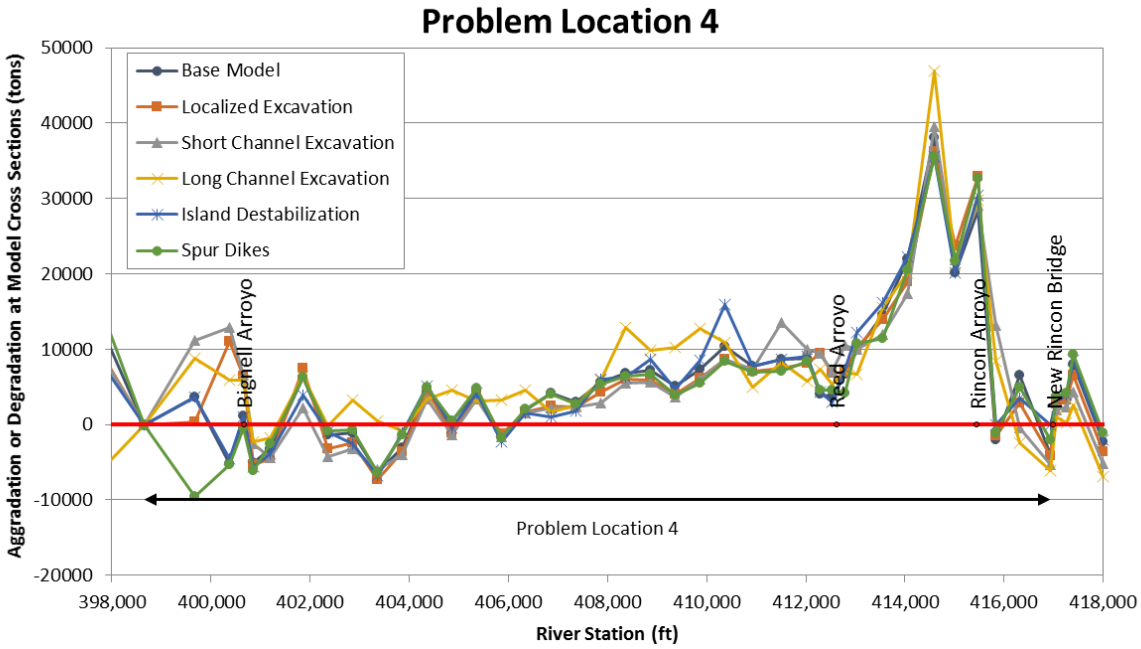


Figure M.1.4. Spatial profiles showing the predicted cumulative mass of aggradation or degradation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 4.

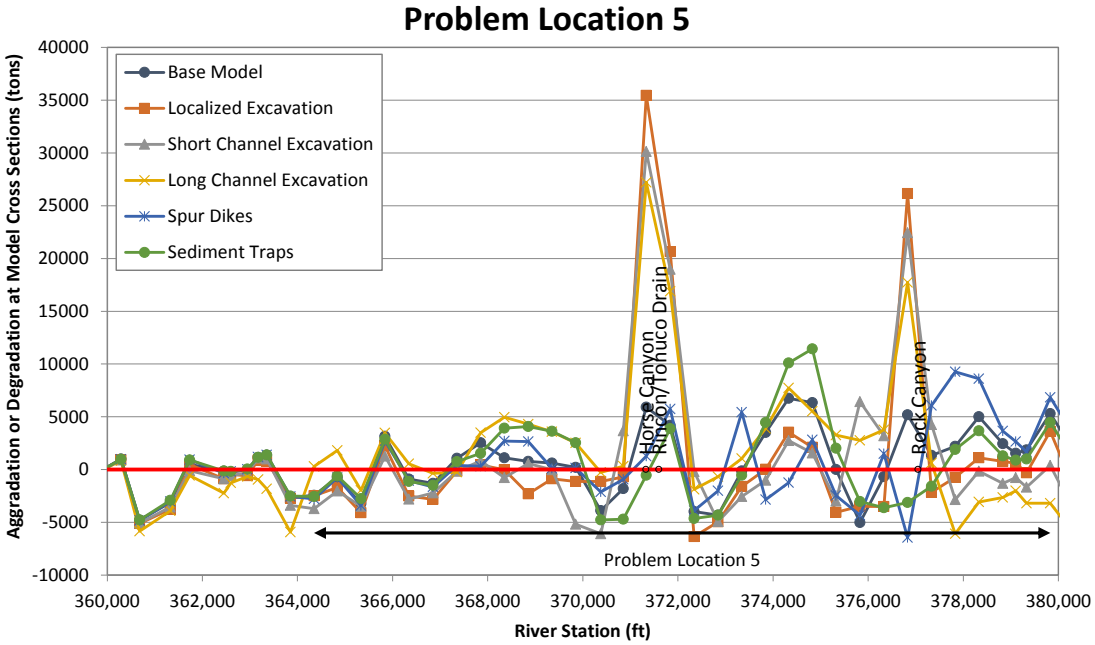


Figure M.1.5. Spatial profiles showing the predicted cumulative mass of aggradation or degradation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 5.

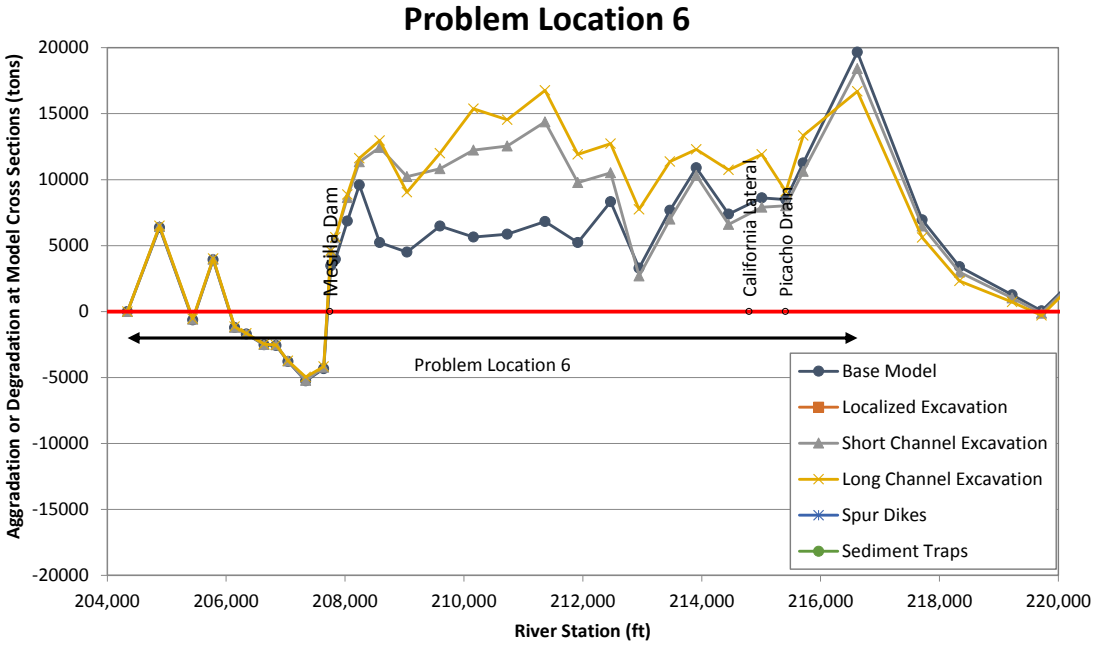


Figure M.1.6. Spatial profiles showing the predicted cumulative mass of aggradation or degradation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 6.

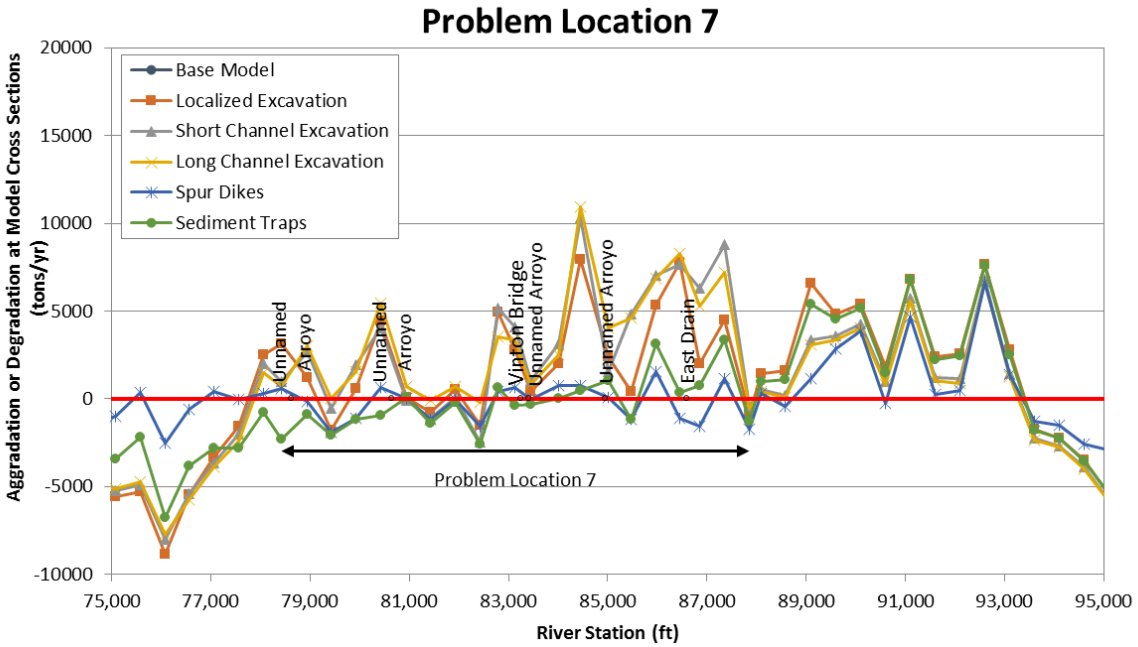


Figure M.1.7. Spatial profiles showing the predicted cumulative mass of aggradation or degradation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 7.

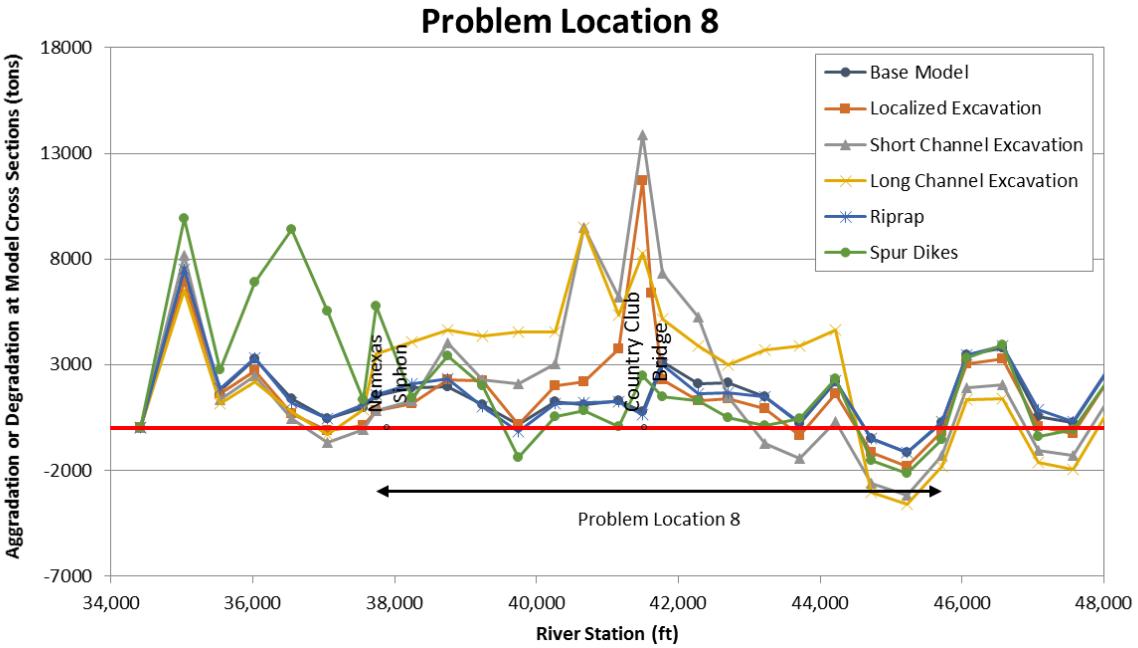


Figure M.1.8. Spatial profiles showing the predicted cumulative mass of aggradation or degradation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 8.

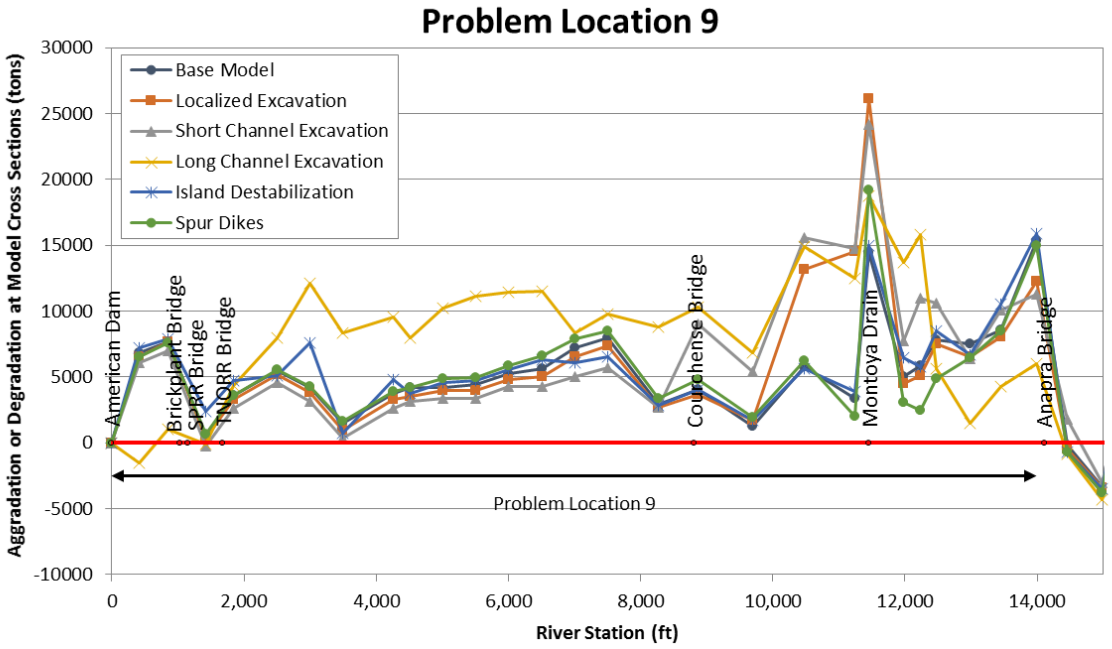


Figure M.1.9. Spatial profiles showing the predicted cumulative mass of aggradation or degradation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 9.

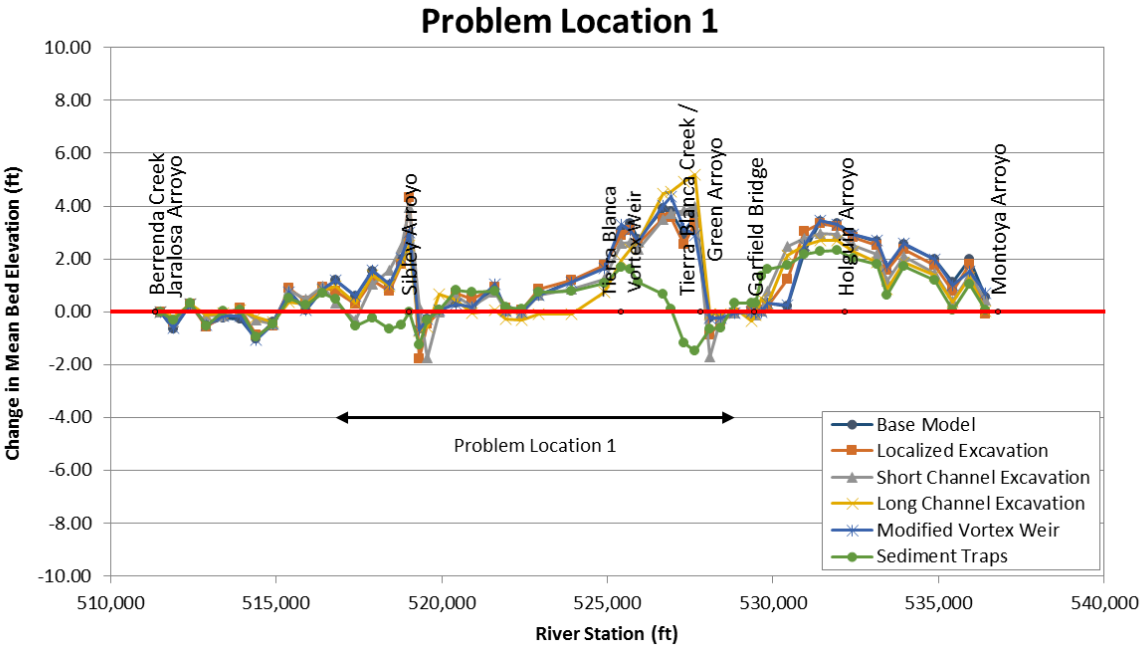


Figure M.1.10. Spatial profiles showing the predicted change in mean bed elevation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 1.

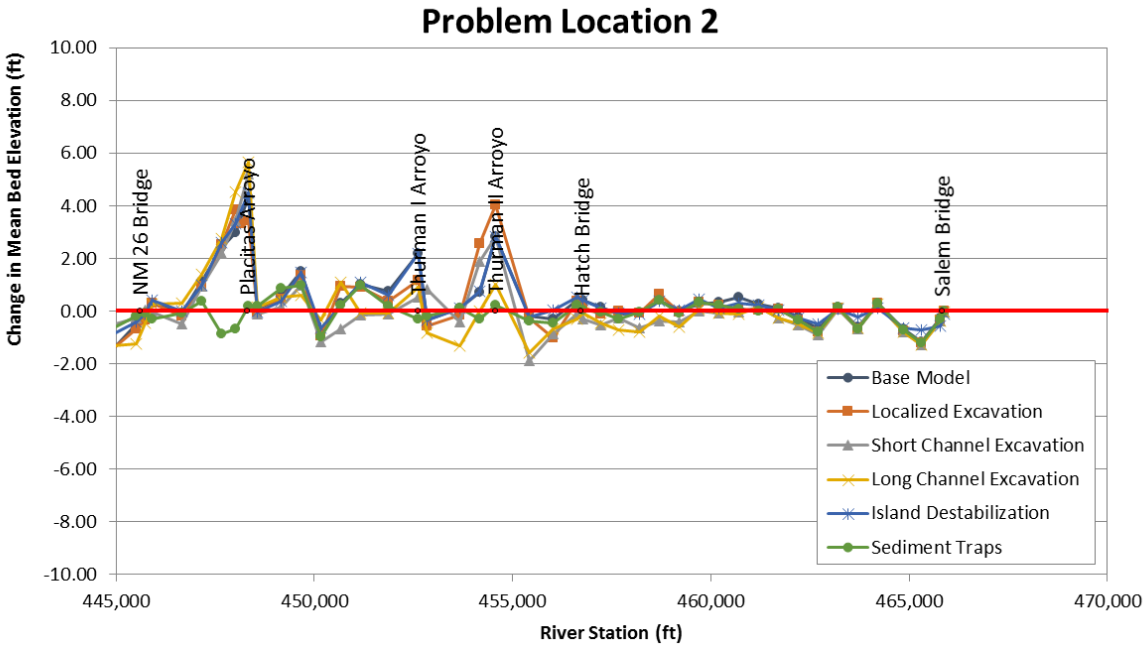


Figure M.1.11. Spatial profiles showing the predicted change in mean bed elevation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 2.

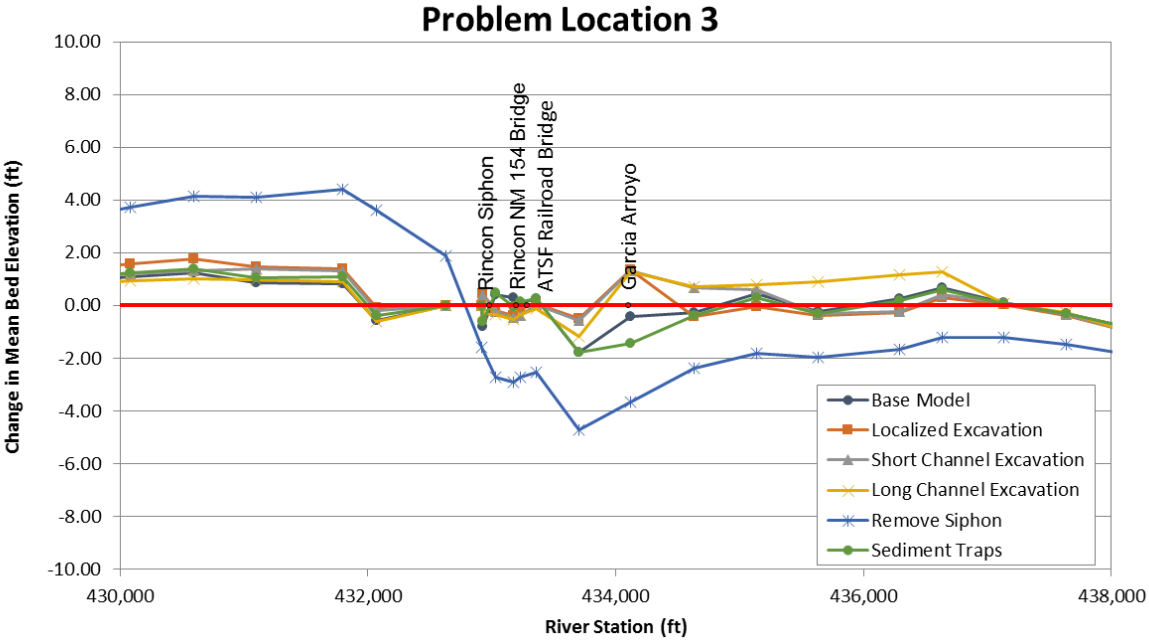


Figure M.1.12. Spatial profiles showing the predicted change in mean bed elevation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 3.

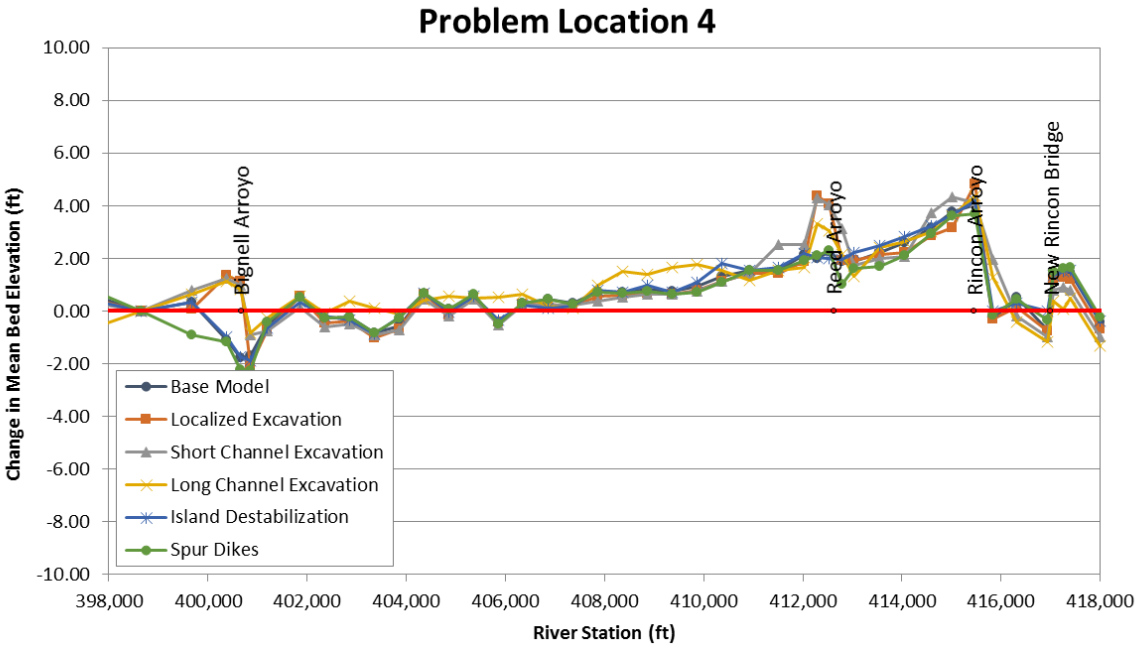


Figure M.1.13. Spatial profiles showing the predicted change in mean bed elevation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 4.

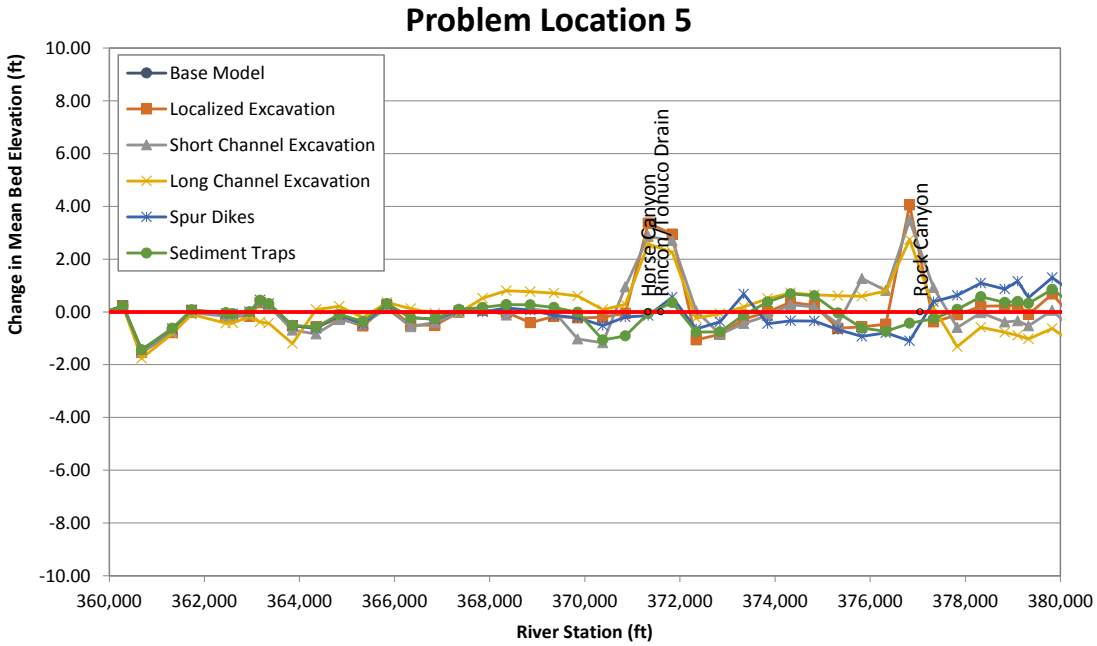


Figure M.1.14. Spatial profiles showing the predicted change in mean bed elevation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 5.

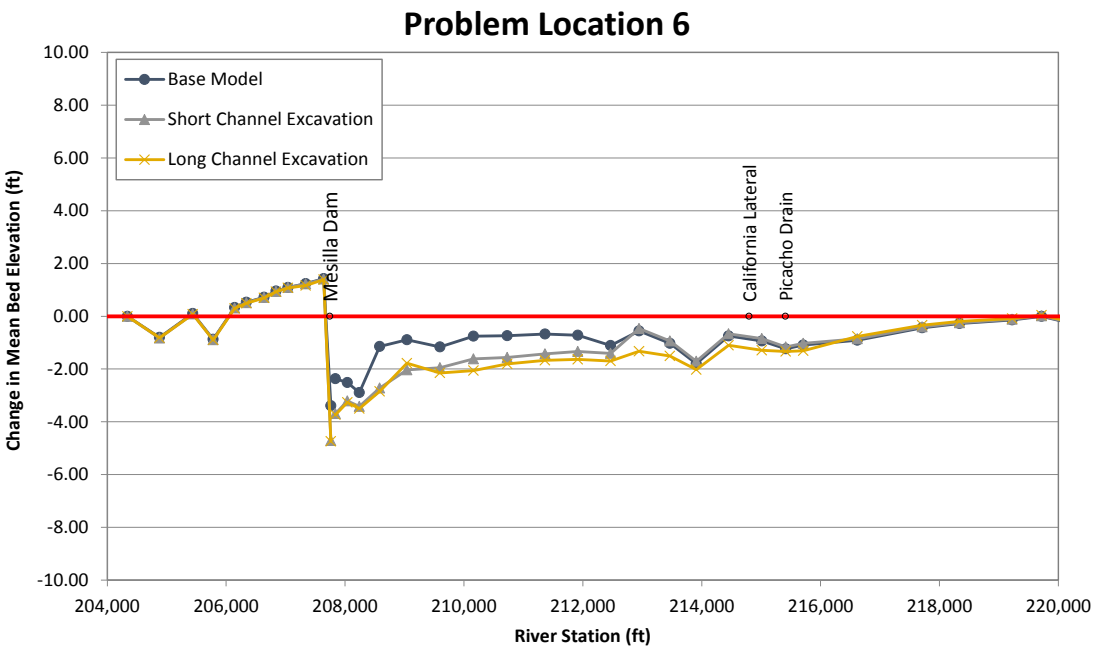


Figure M.1.15. Spatial profiles showing the predicted change in mean bed elevation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 6.

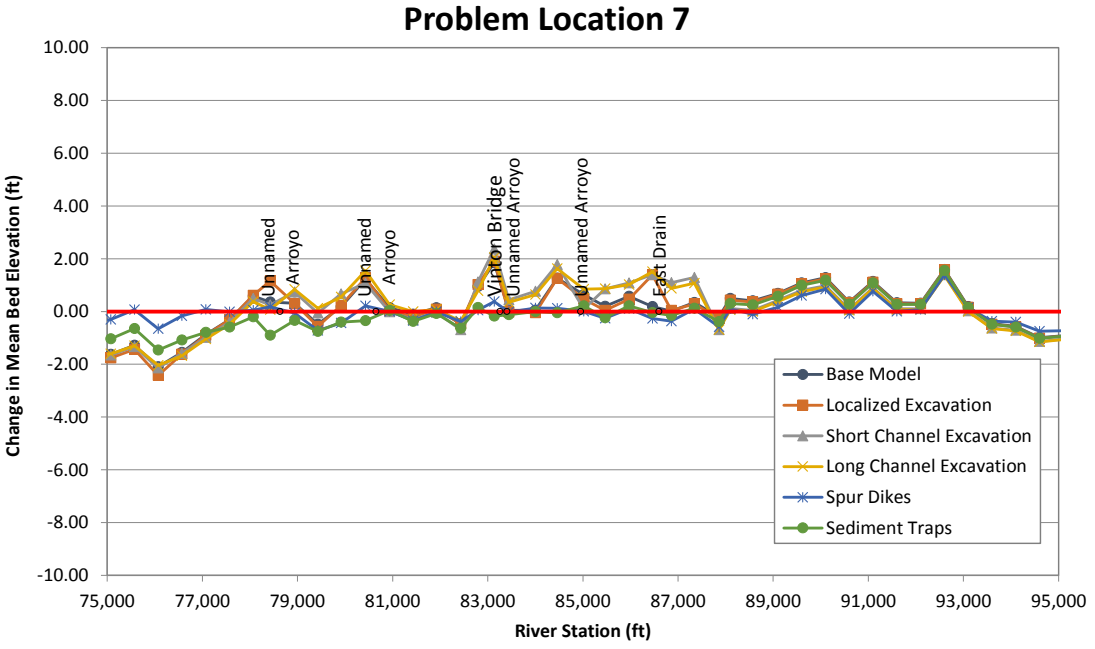


Figure M.1.16. Spatial profiles showing the predicted change in mean bed elevation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 7.

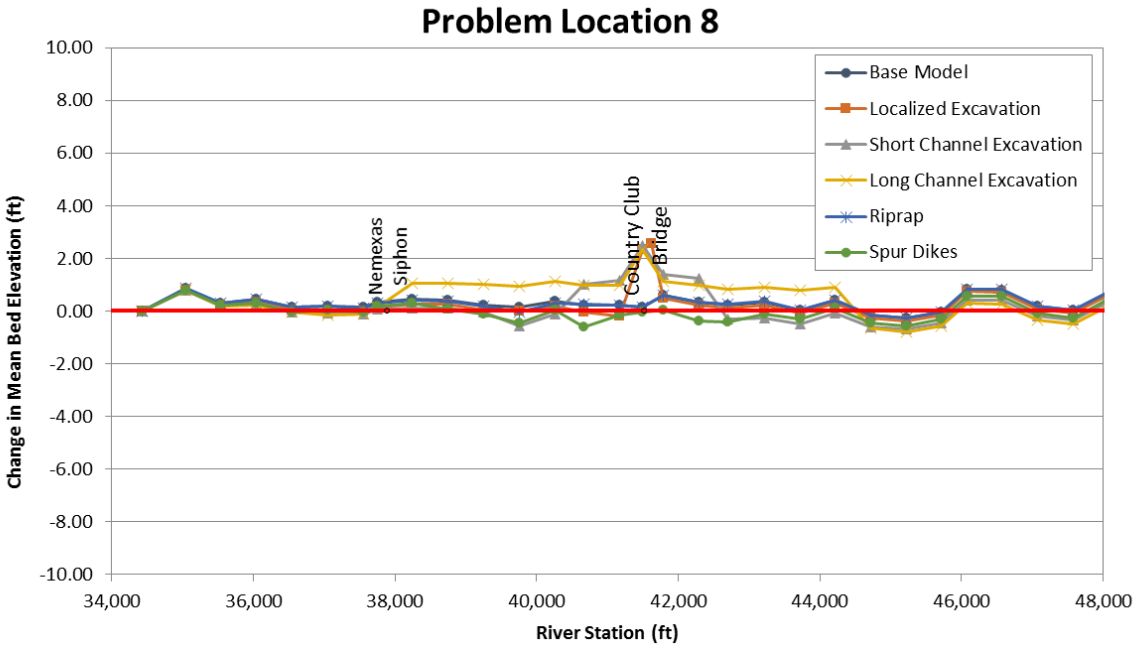


Figure M.1.17. Spatial profiles showing the predicted change in mean bed elevation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 8.

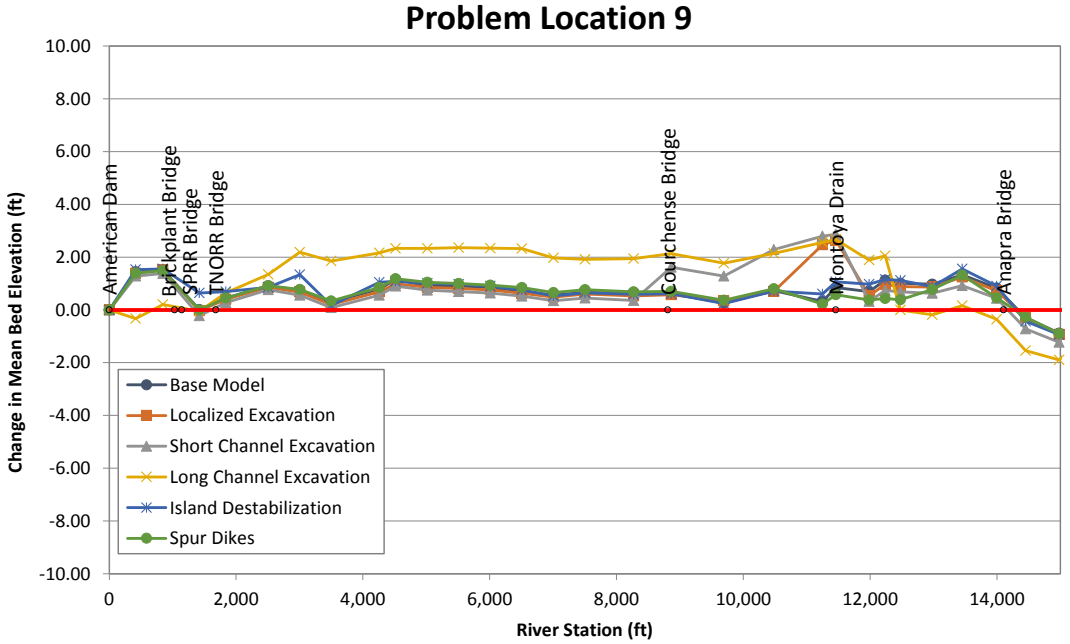


Figure M.1.18. Spatial profiles showing the predicted change in mean bed elevation at the end of the sediment-transport simulations for base alternative conditions at Problem Location 9.

Appendix M.2

Comparative Temporal Plots Showing the Sediment-transport Modeling Results for the Base and Alternative Conditions

Page Intentionally Left Blank

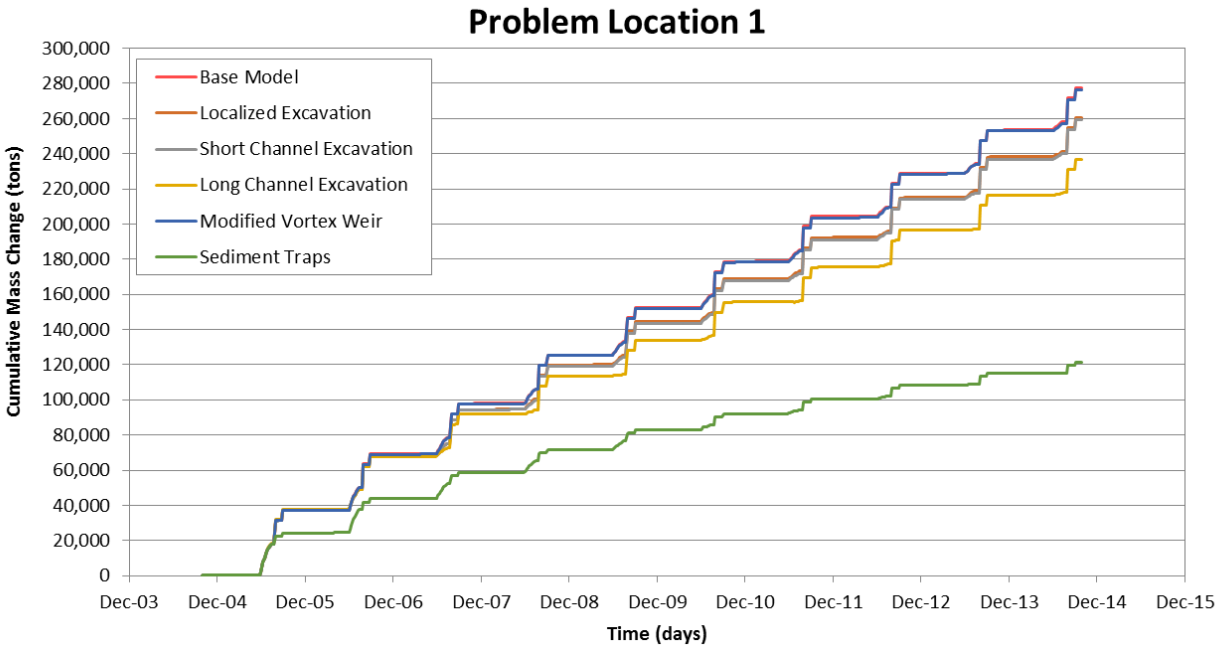


Figure M.2.1. Predicted cumulative mass of aggradation or degradation over time along the modeled reach at Problem Location 1 from the sediment-transport simulations of the base and alternative conditions.

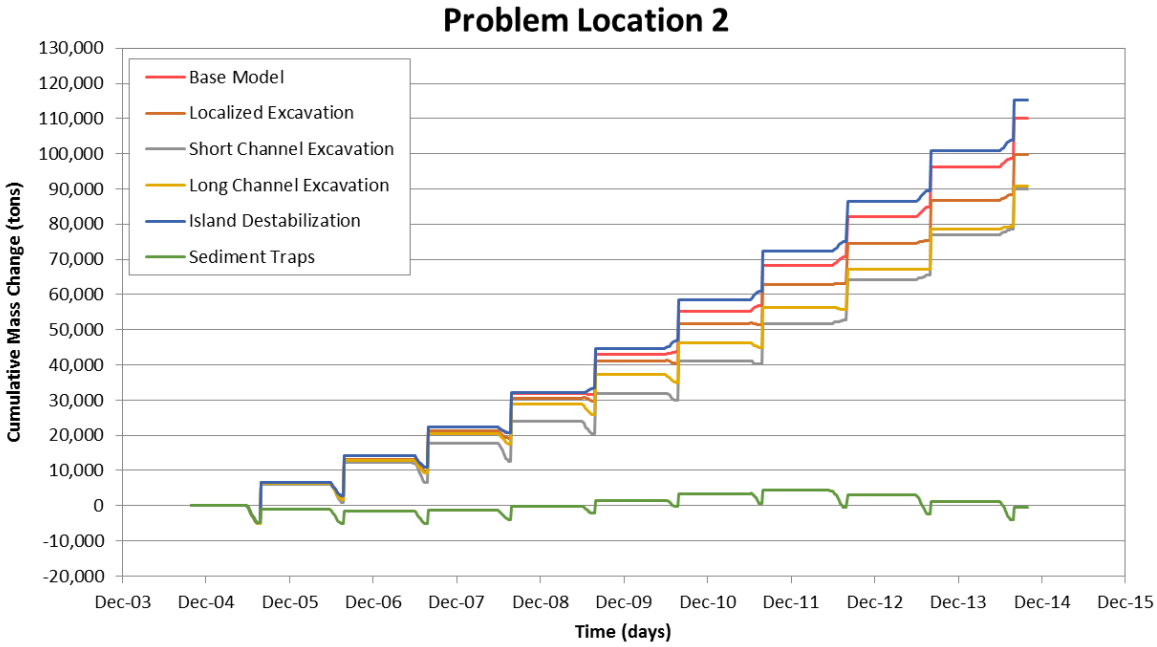


Figure M.2.2. Predicted cumulative mass of aggradation or degradation over time along the modeled reach at Problem Location 2 from the sediment-transport simulations of the base and alternative conditions.

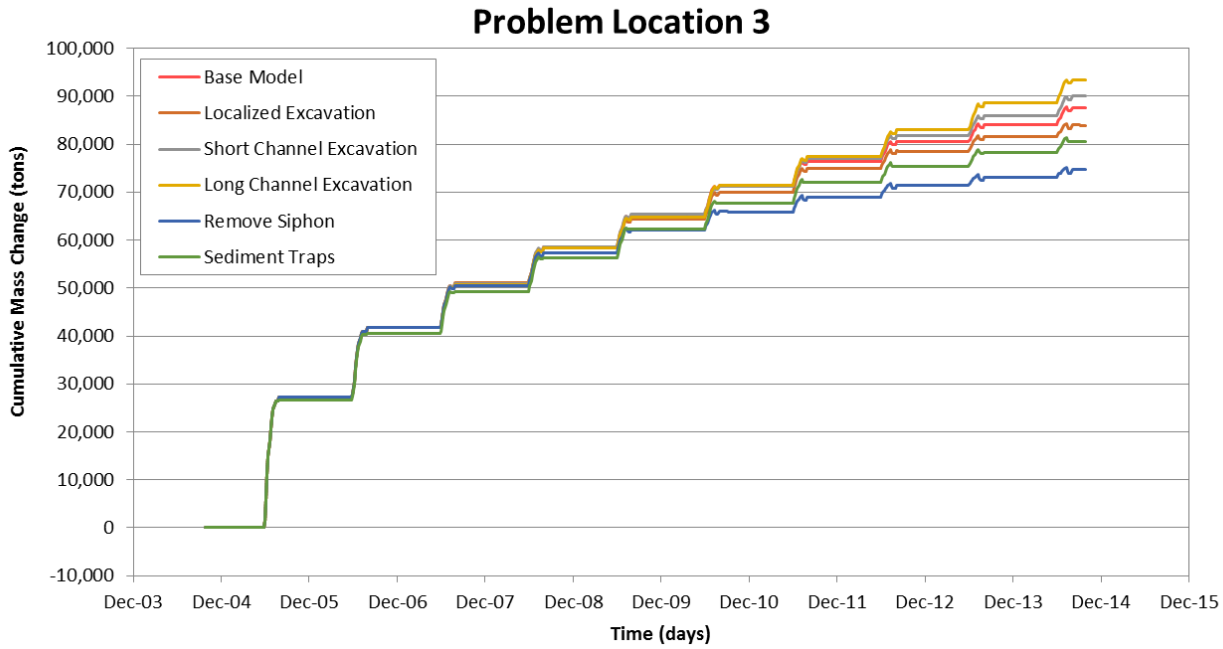


Figure M.2.3. Predicted cumulative mass of aggradation or degradation over time along the modeled reach at Problem Location 3 from the sediment-transport simulations of the base and alternative conditions.

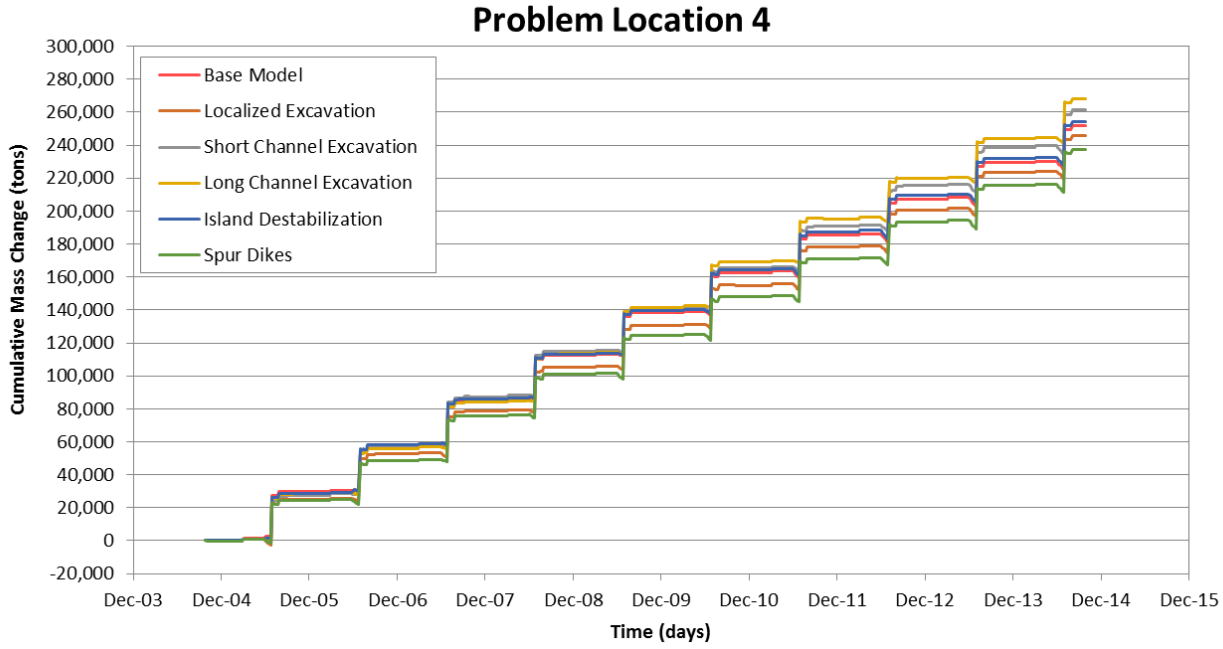


Figure M.2.4. Predicted cumulative mass of aggradation or degradation over time along the modeled reach at Problem Location 4 from the sediment-transport simulations of the base and alternative conditions.

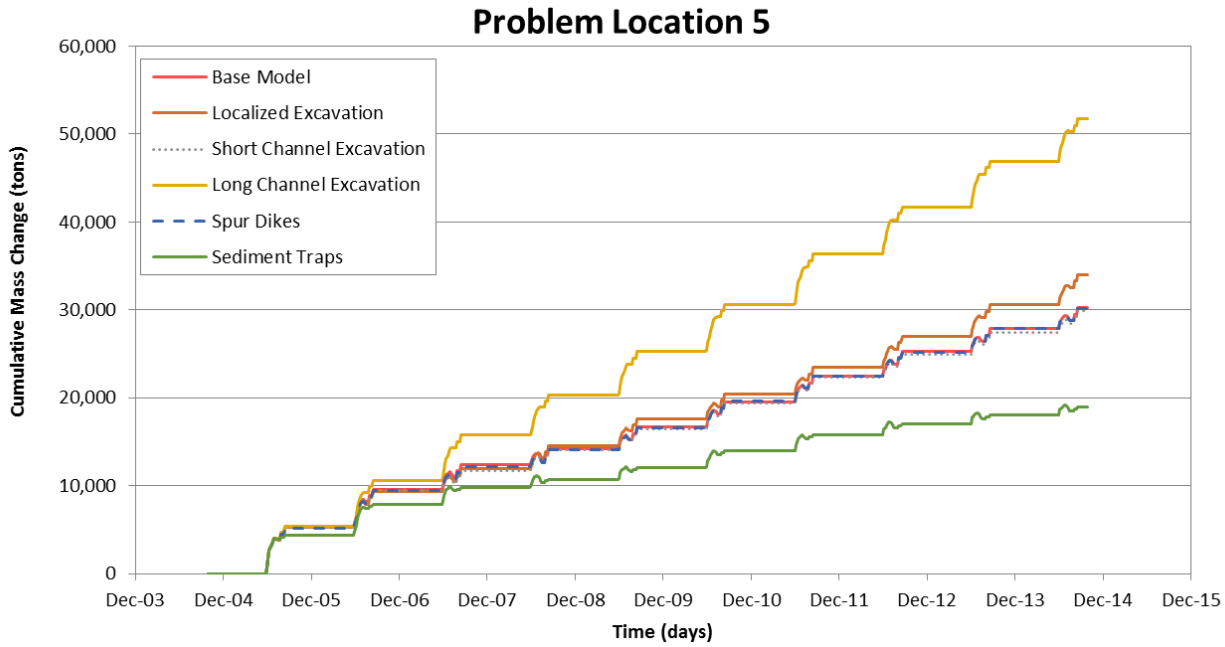


Figure M.2.5. Predicted cumulative mass of aggradation or degradation over time along the modeled reach at Problem Location 5 from the sediment-transport simulations of the base and alternative conditions.

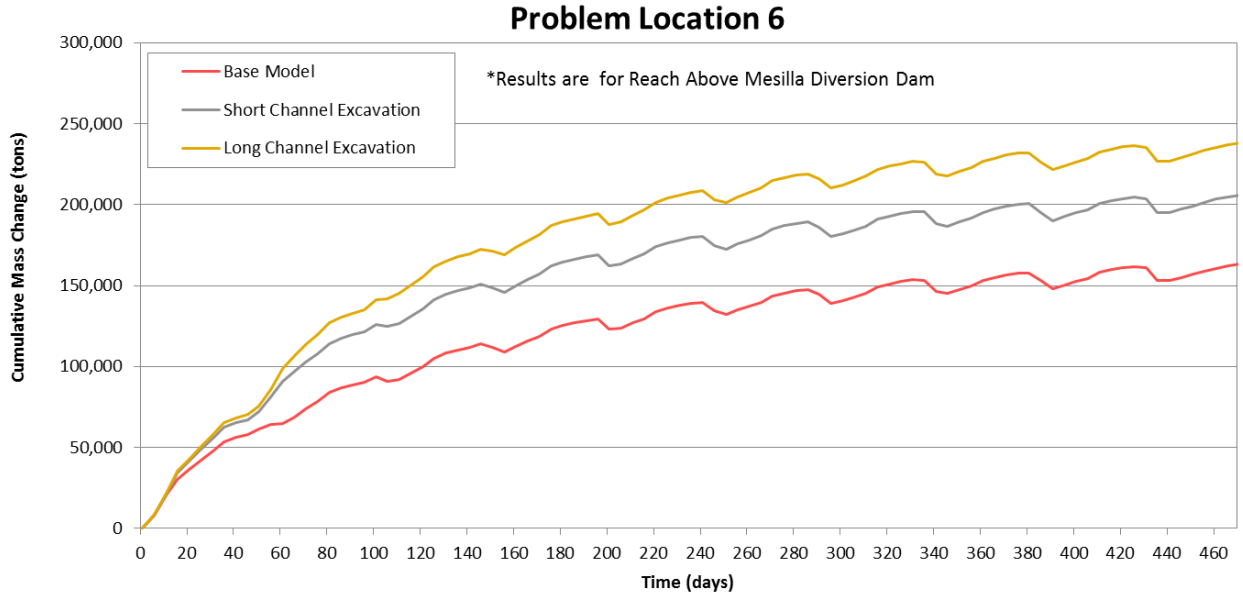


Figure M.2.6. Predicted cumulative mass of aggradation or degradation over time along the modeled reach at Problem Location 6 from the sediment-transport simulations of the base and alternative conditions.

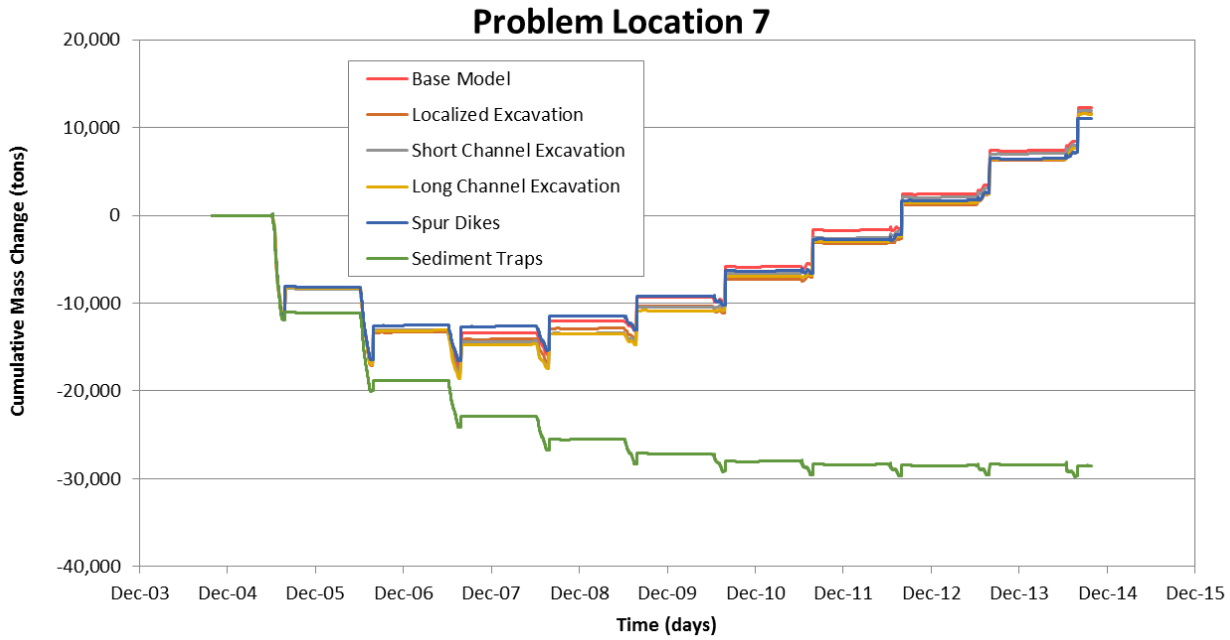


Figure M.2.7. Predicted cumulative mass of aggradation or degradation over time along the modeled reach at Problem Location 7 from the sediment-transport simulations of the base and alternative conditions.

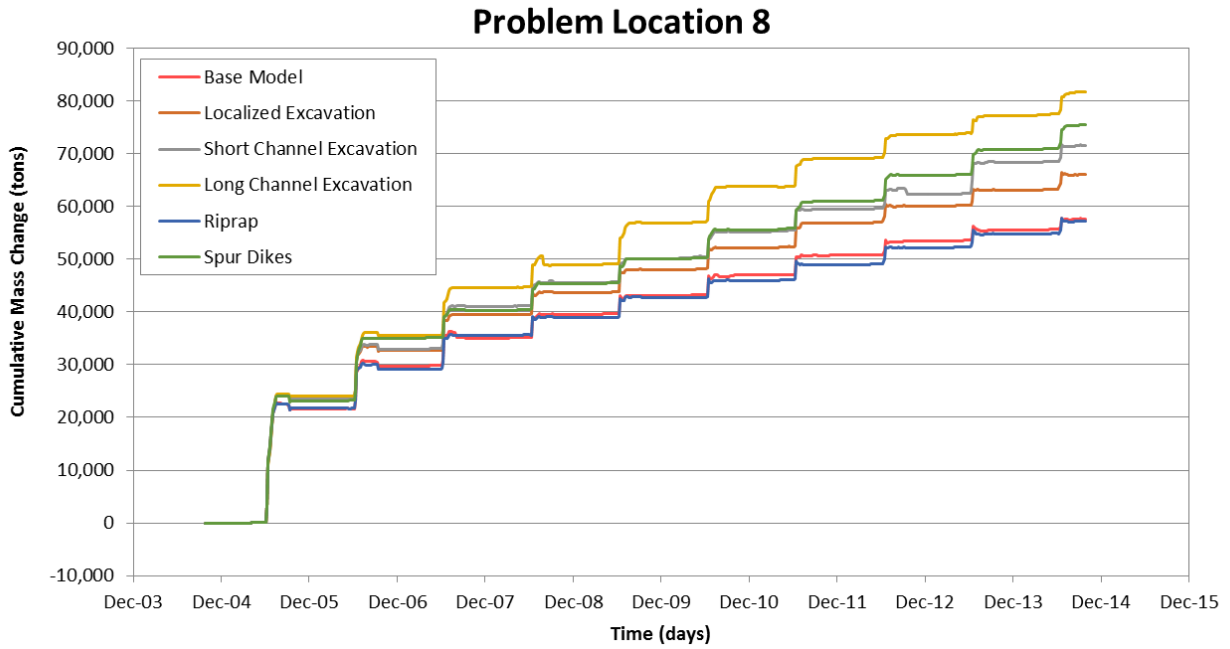


Figure M.2.8. Predicted cumulative mass of aggradation or degradation over time along the modeled reach at Problem Location 8 from the sediment-transport simulations of the base and alternative conditions.

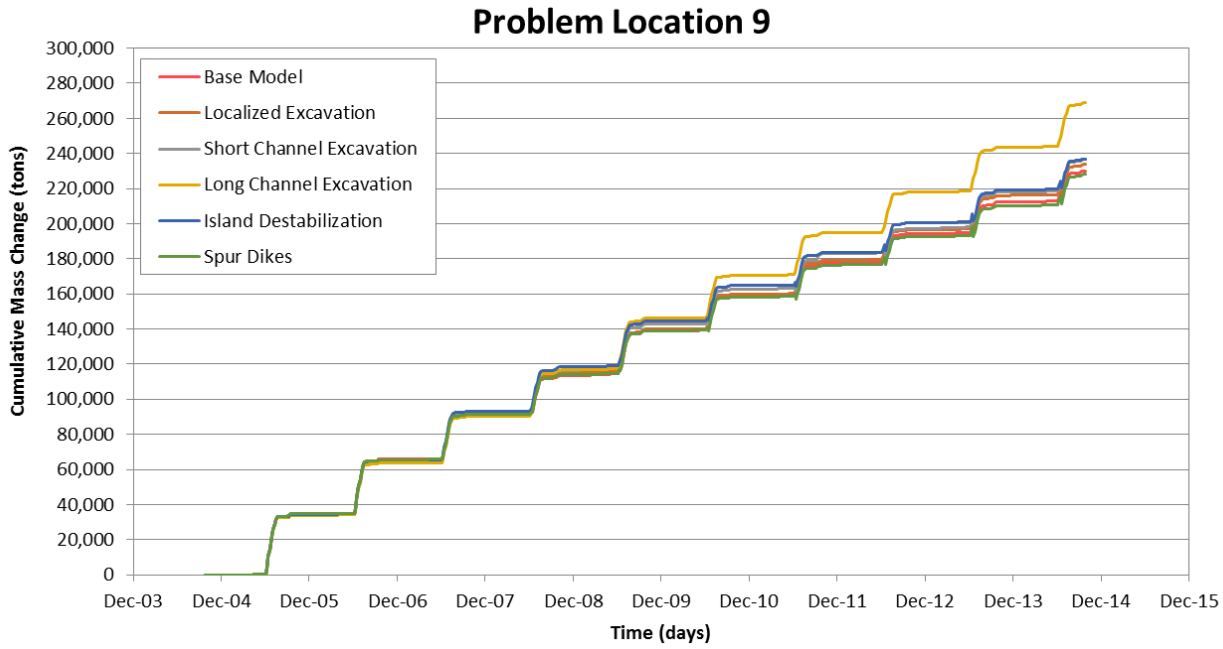


Figure M.2.9. Predicted cumulative mass of aggradation or degradation over time along the modeled reach at Problem Location 9 from the sediment-transport simulations of the base and alternative conditions.

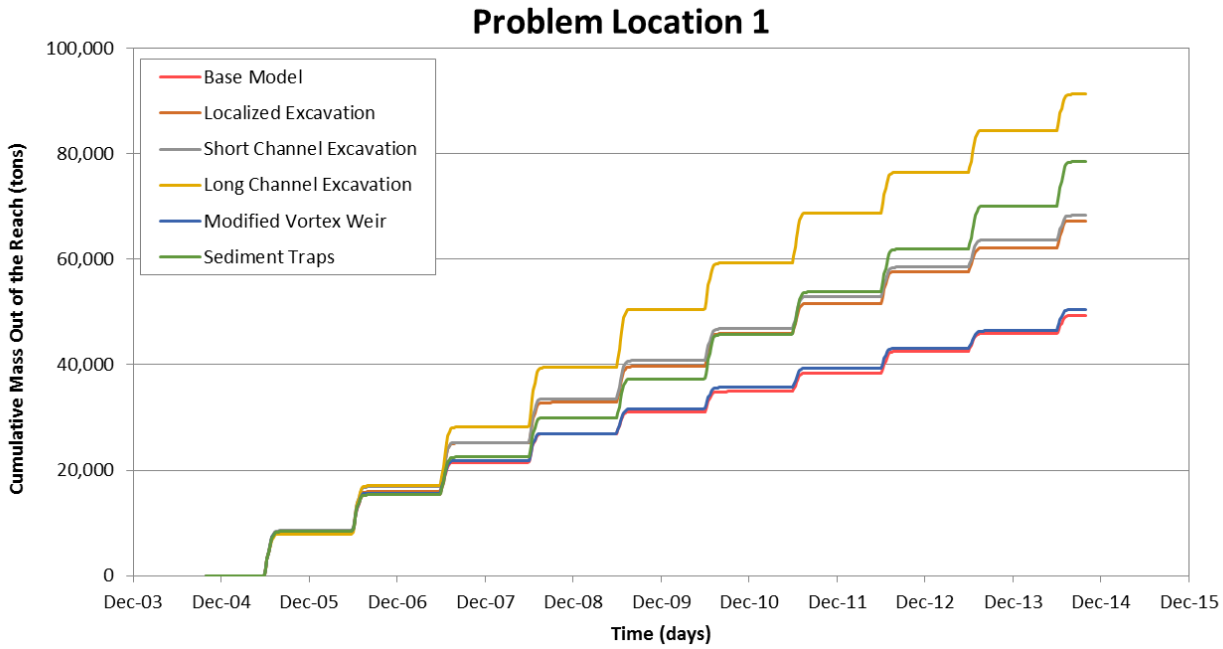


Figure M.2.10. Predicted cumulative mass delivered from the downstream of the model reach at Problem Location 1 from the sediment-transport simulations of the base and alternative conditions.

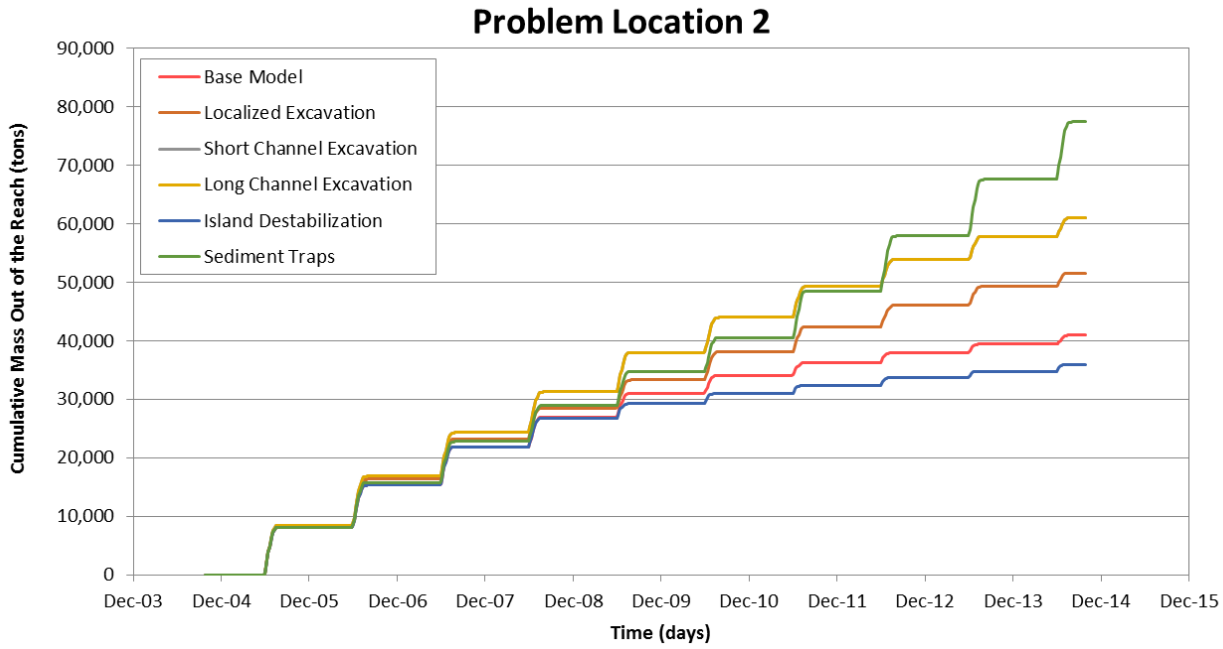


Figure M.2.11. Predicted cumulative mass delivered from the downstream of the model reach at Problem Location 2 from the sediment-transport simulations of the base and alternative conditions.

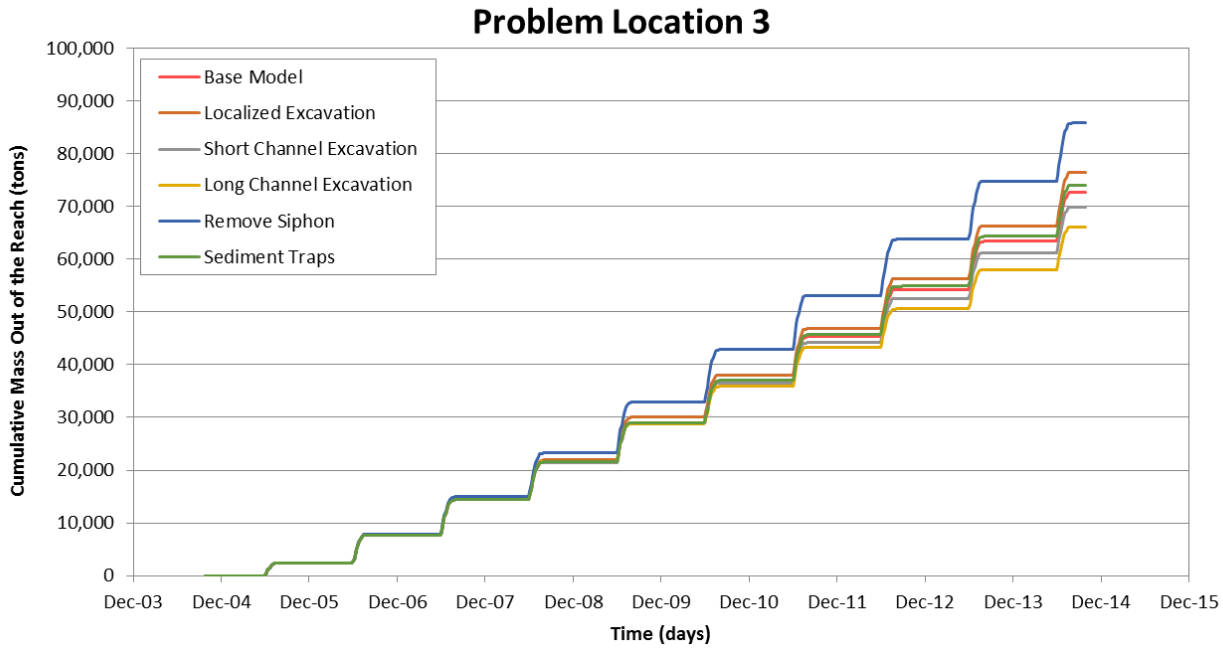


Figure M.2.12. Predicted cumulative mass delivered from the downstream of the model reach at Problem Location 3 from the sediment-transport simulations of the base and alternative conditions.

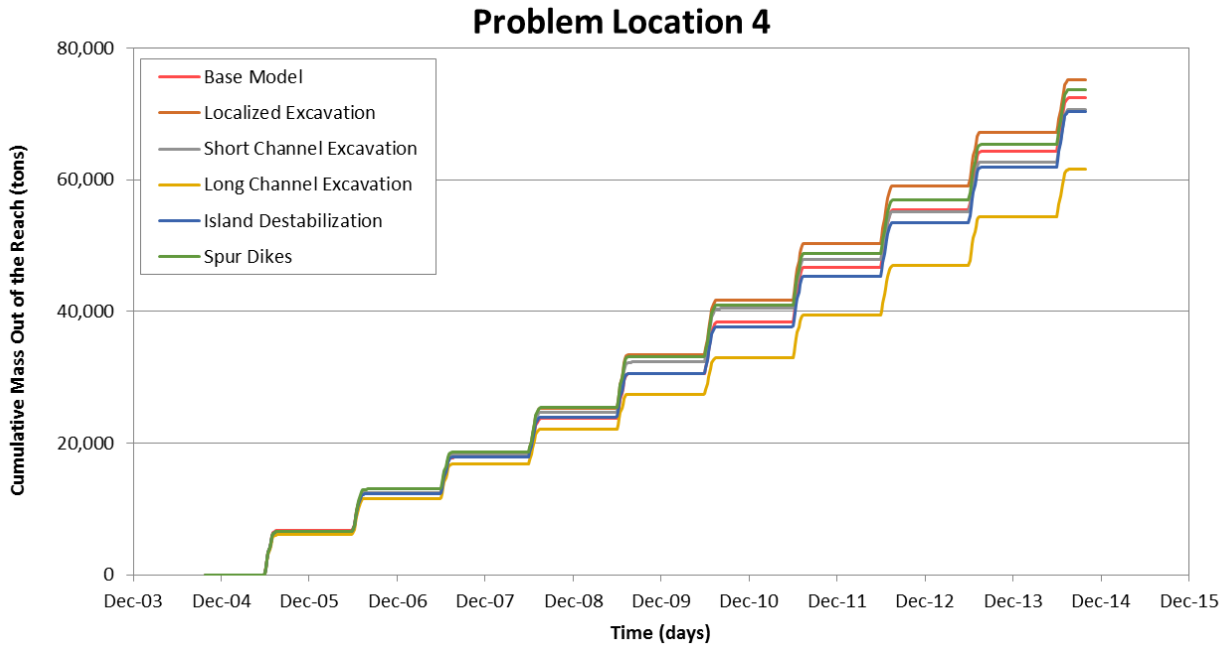


Figure M.2.13. Predicted cumulative mass delivered from the downstream of the model reach at Problem Location 4 from the sediment-transport simulations of the base and alternative conditions.

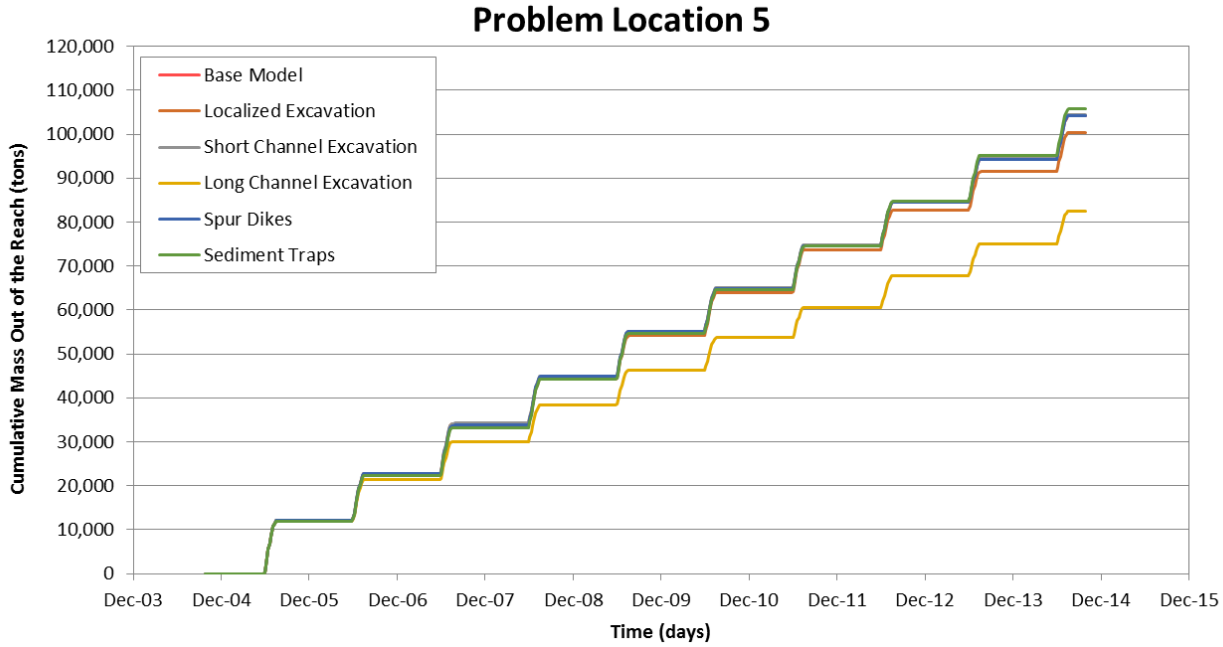


Figure M.2.14. Predicted cumulative mass delivered from the downstream of the model reach at Problem Location 5 from the sediment-transport simulations of the base and alternative conditions.

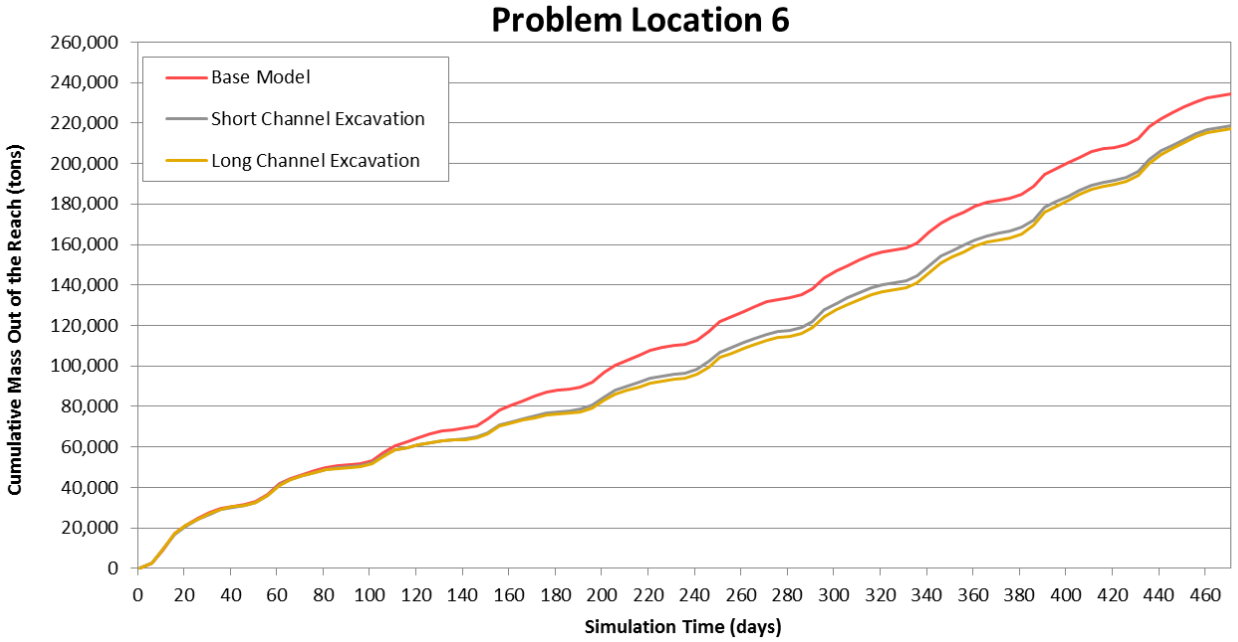


Figure M.2.15. Predicted cumulative mass delivered from the downstream of the model reach at Problem Location 6 from the sediment-transport simulations of the base and alternative conditions.

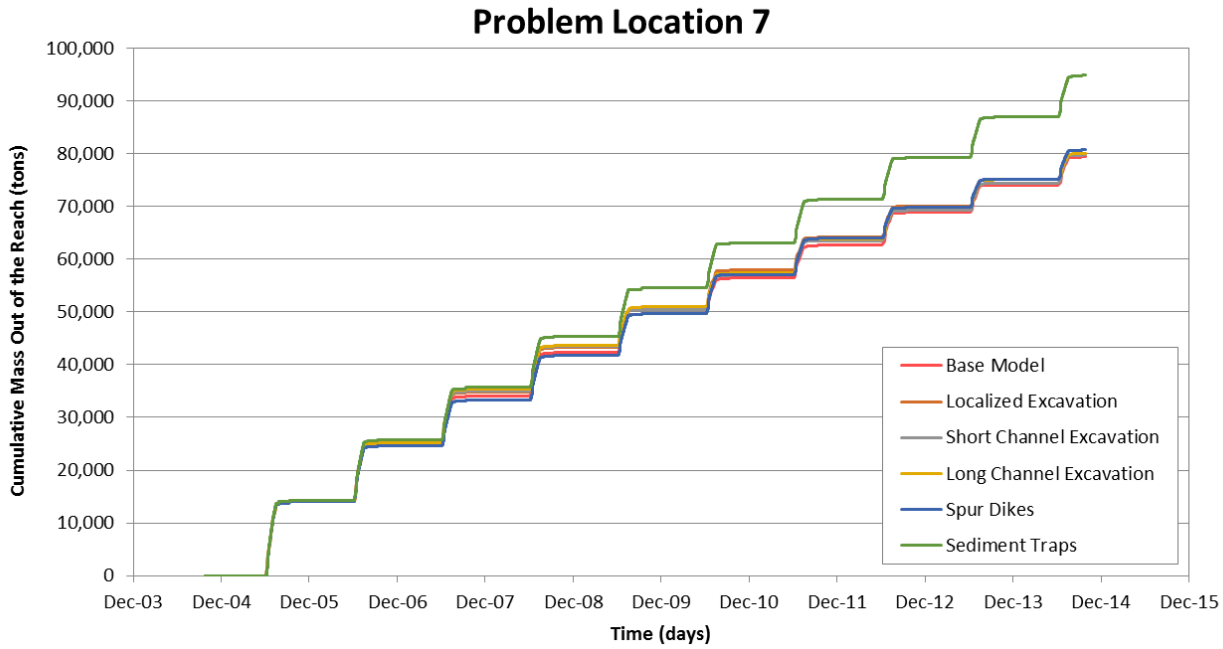


Figure M.2.16. Predicted cumulative mass delivered from the downstream of the model reach at Problem Location 7 from the sediment-transport simulations of the base and alternative conditions.

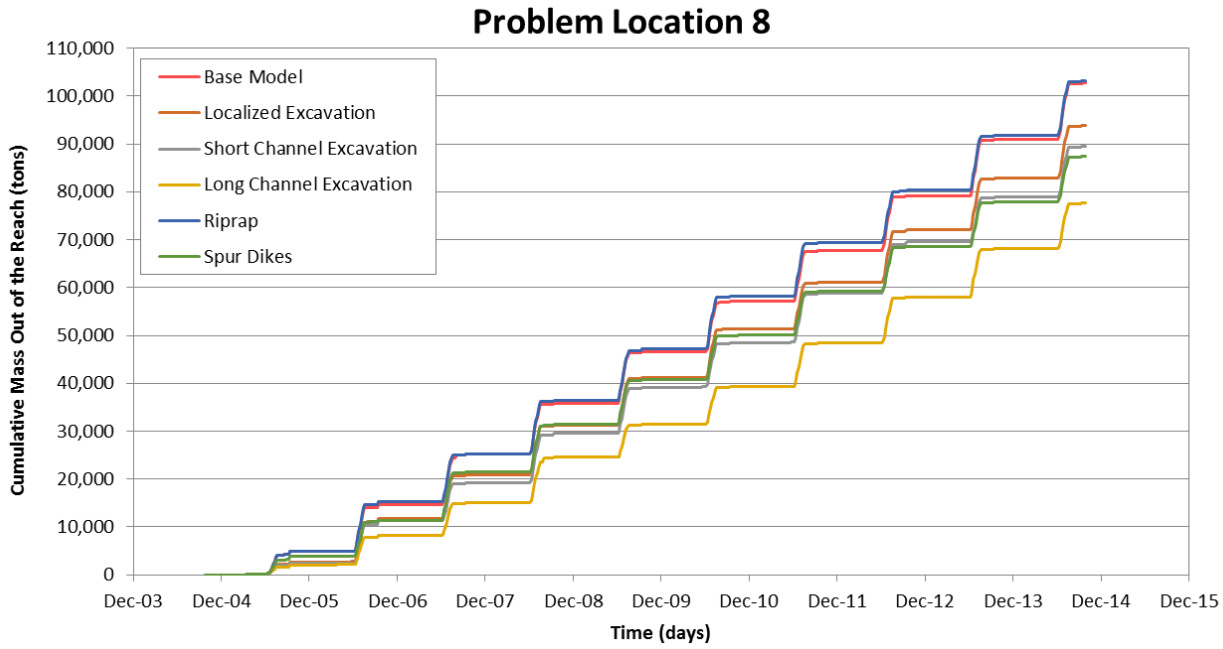


Figure M.2.17. Predicted cumulative mass delivered from the downstream of the model reach at Problem Location 8 from the sediment-transport simulations of the base and alternative conditions.

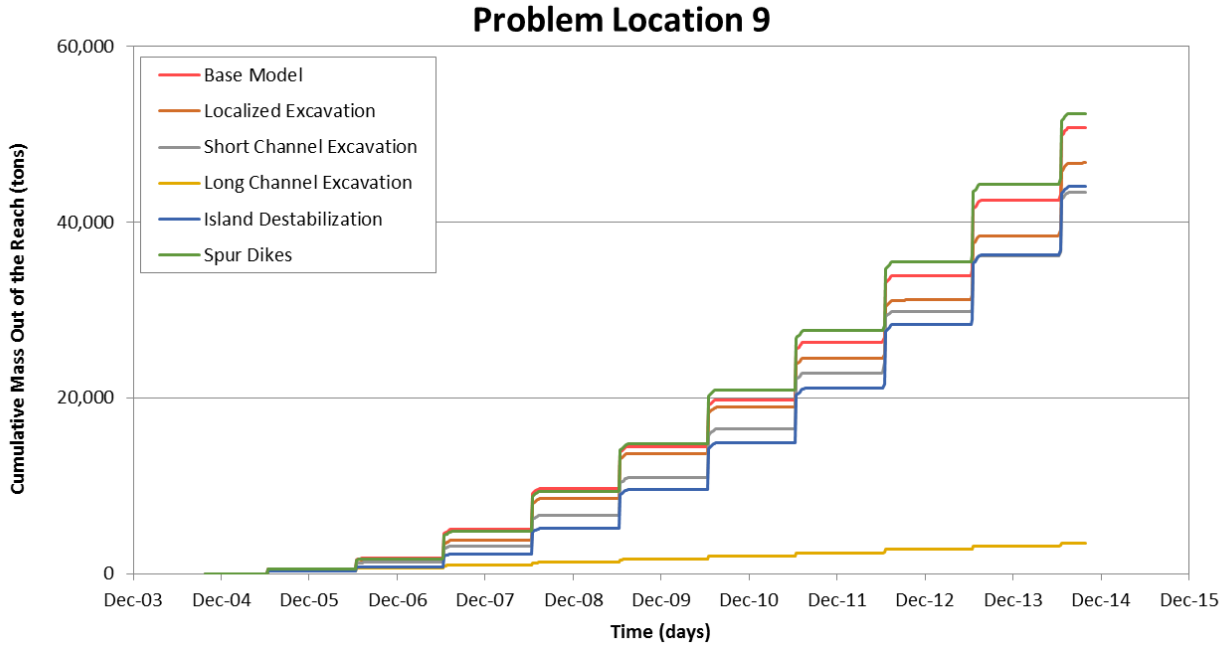


Figure M.2.18. Predicted cumulative mass delivered from the downstream of the model reach at Problem Location 9 from the sediment-transport simulations of the base and alternative conditions.

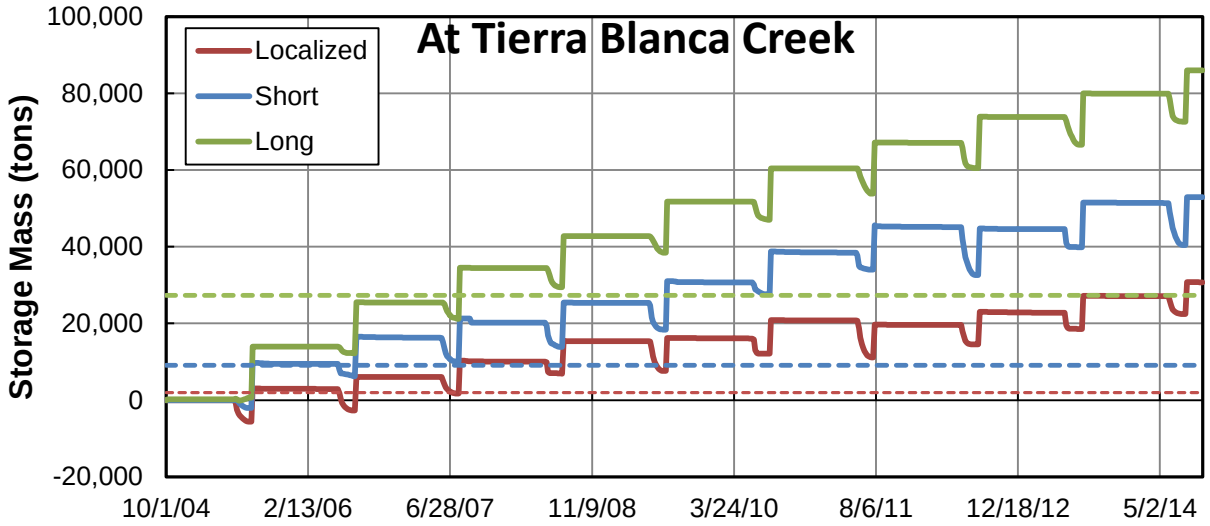


Figure M.2.19. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Tierra Blanca Creek (Problem Location 1) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

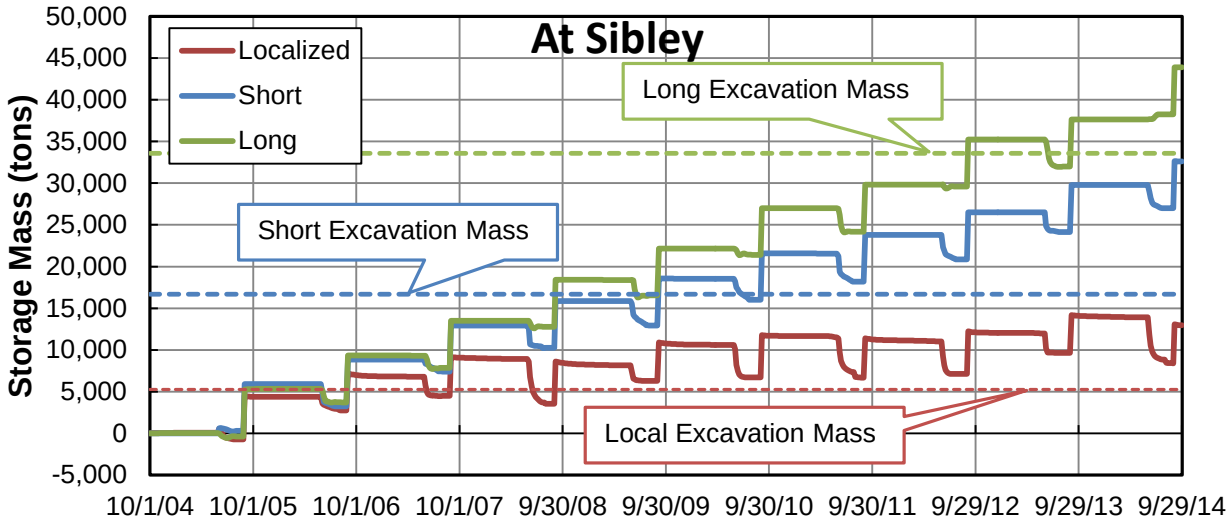


Figure M.2.20. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Sibley Arroyo (Problem Location 1) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

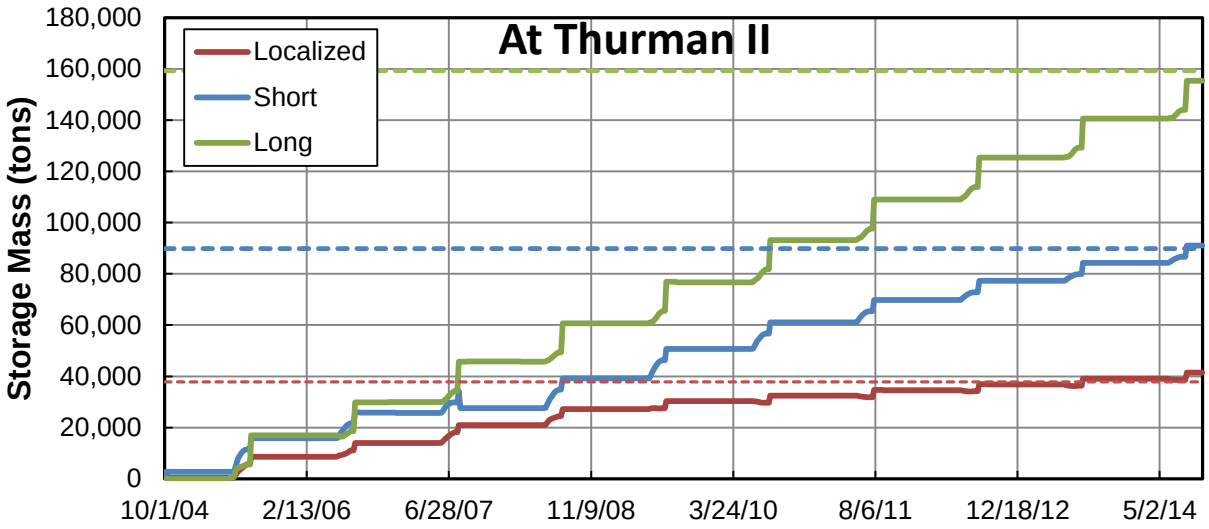


Figure M.2.21. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Thurman II Arroyo (Problem Location 2) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

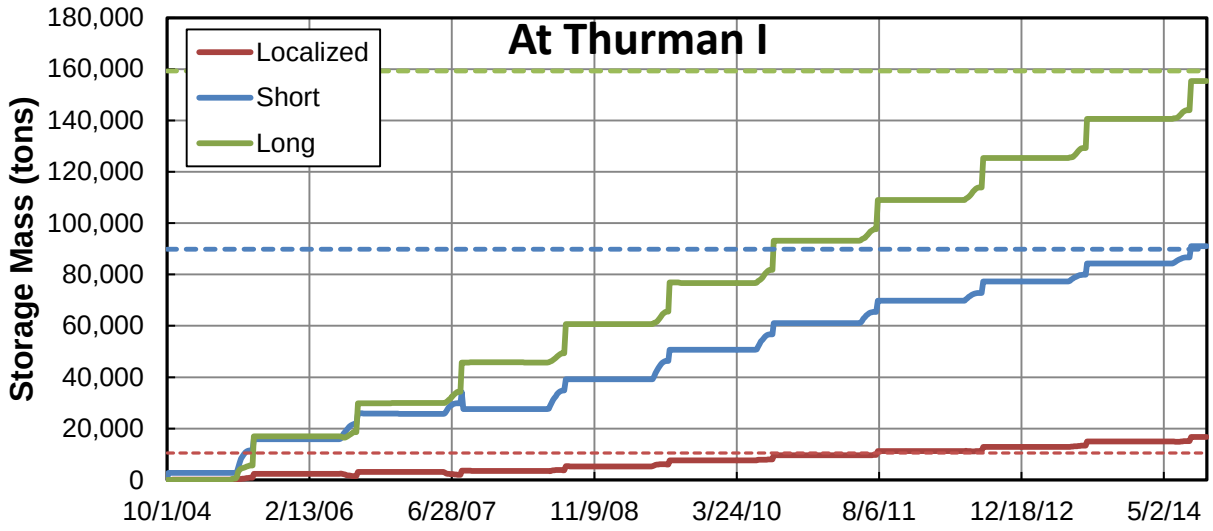


Figure M.2.22. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Thurman I Arroyo (Problem Location 2) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

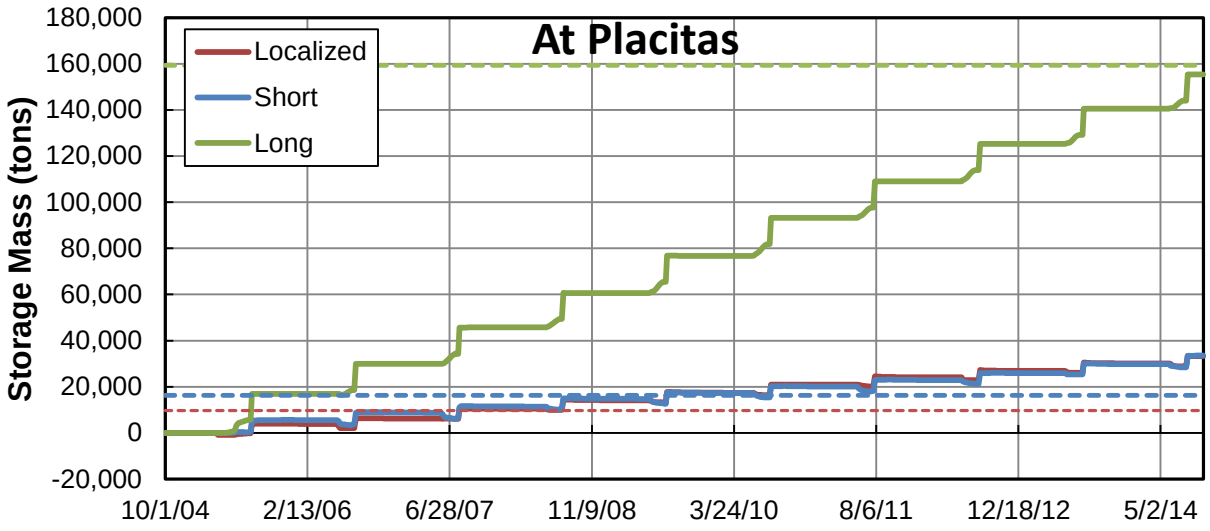


Figure M.2.23. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Placitas Arroyo (Problem Location 2) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

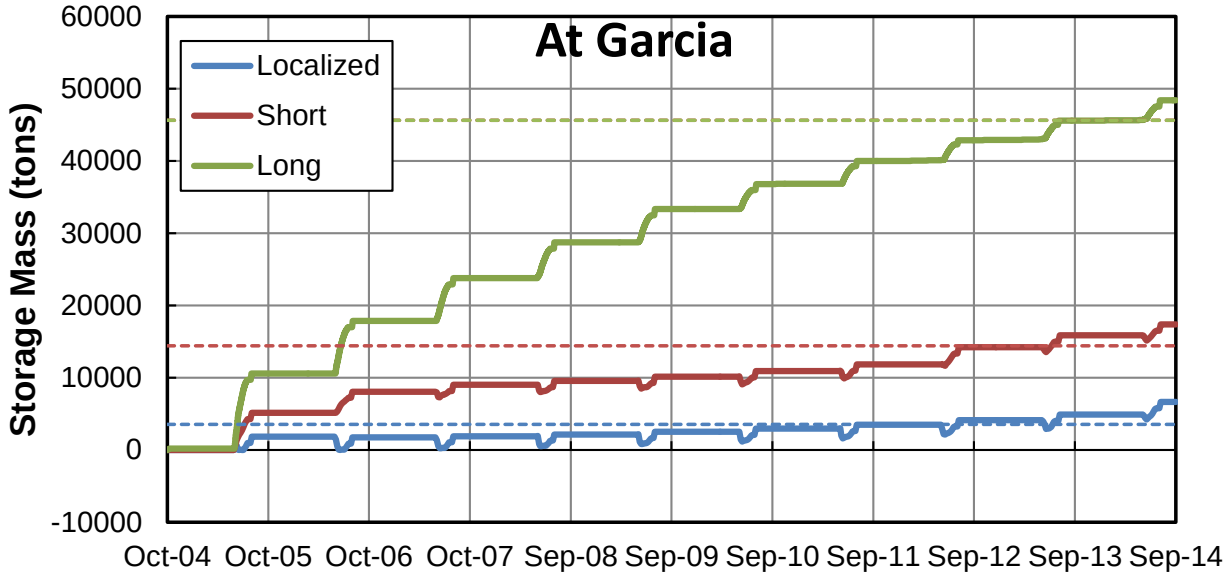


Figure M.2.24. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Garcia Arroyo (Problem Location 3) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

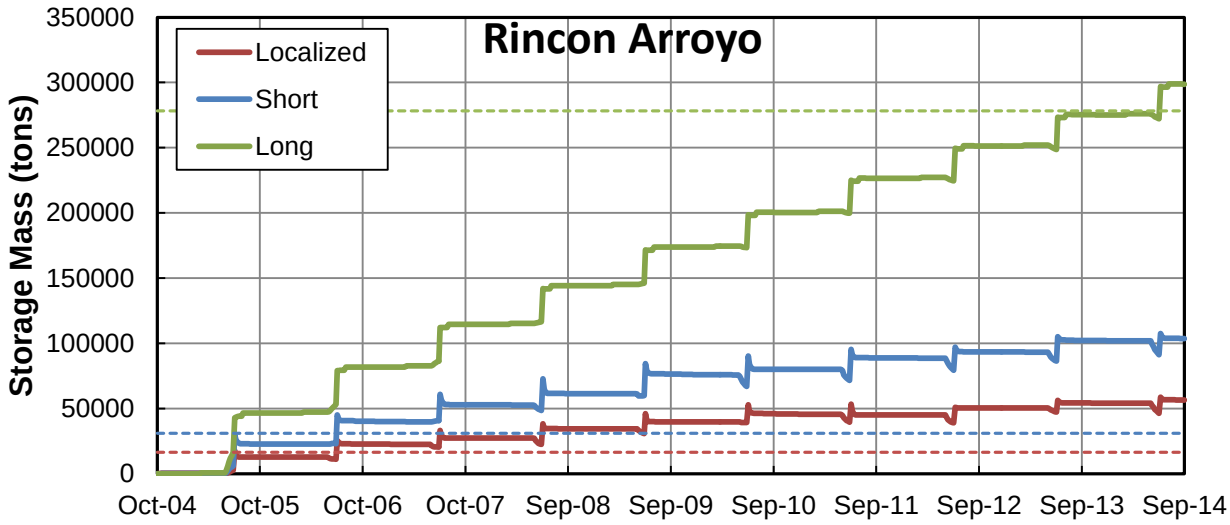


Figure M.2.25. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Rincon Arroyo (Problem Location 4) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

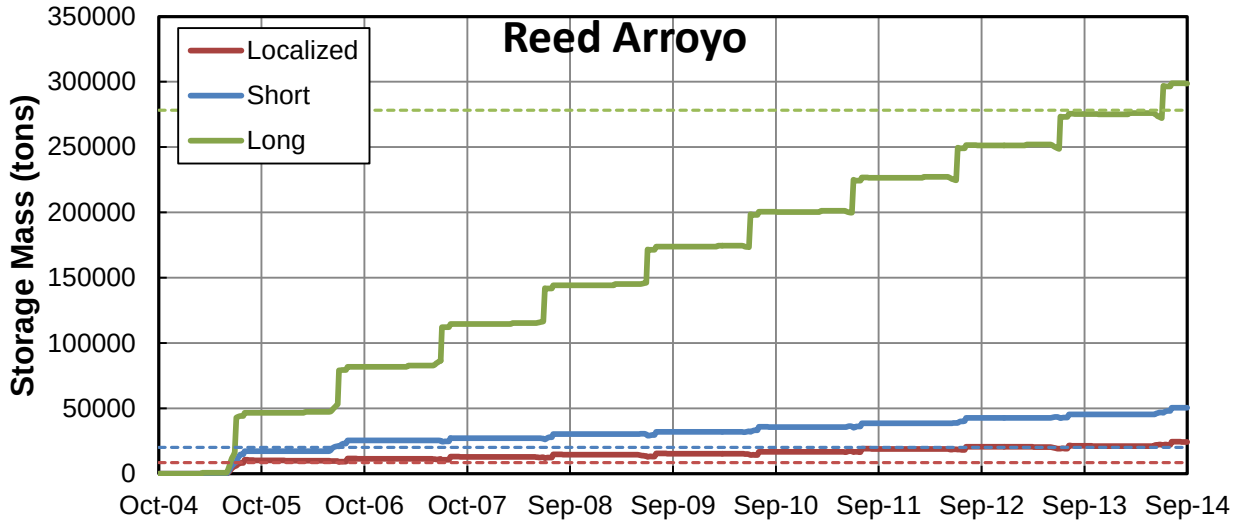


Figure M.2.26. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Reed Arroyo (Problem Location 4) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

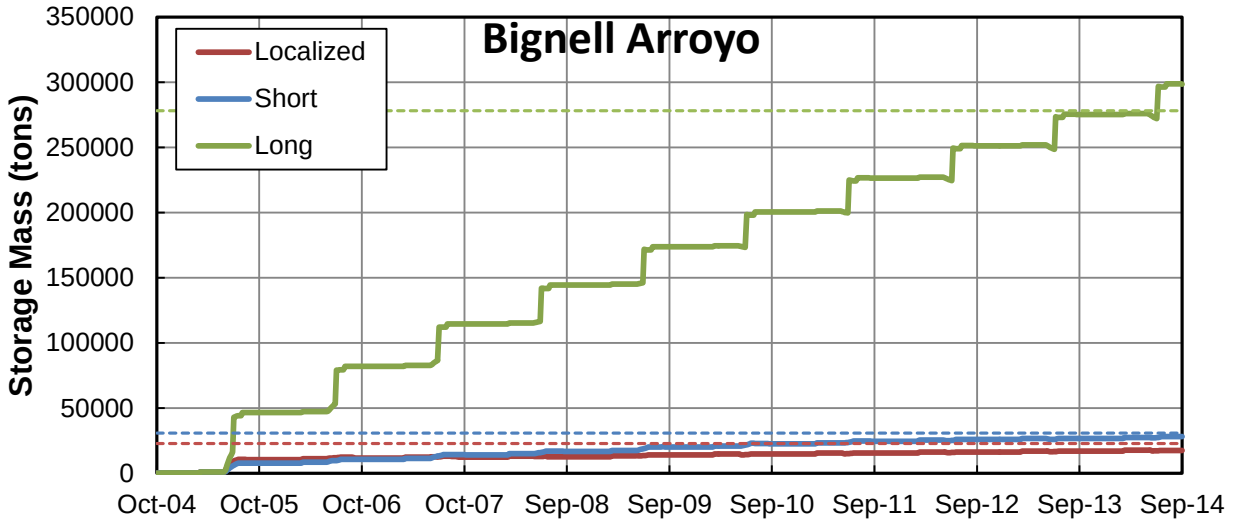


Figure M.2.27. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Bignell Arroyo (Problem Location 4) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

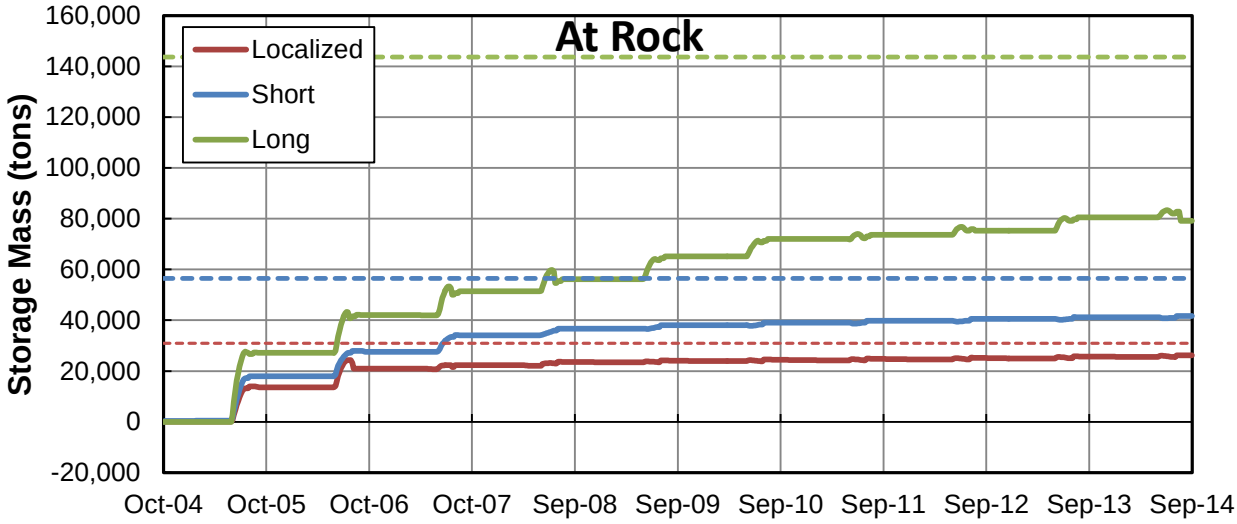


Figure M.2.28. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Rock Canyon (Problem Location 5) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

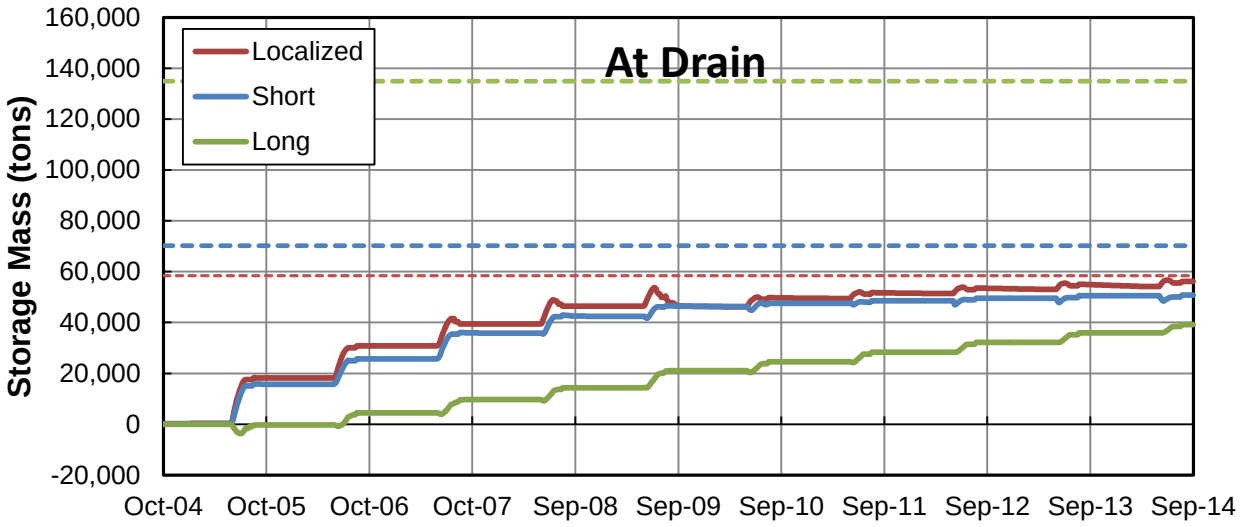


Figure M.2.29. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at the Rincon/Tonuco Drain (Problem Location 5) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

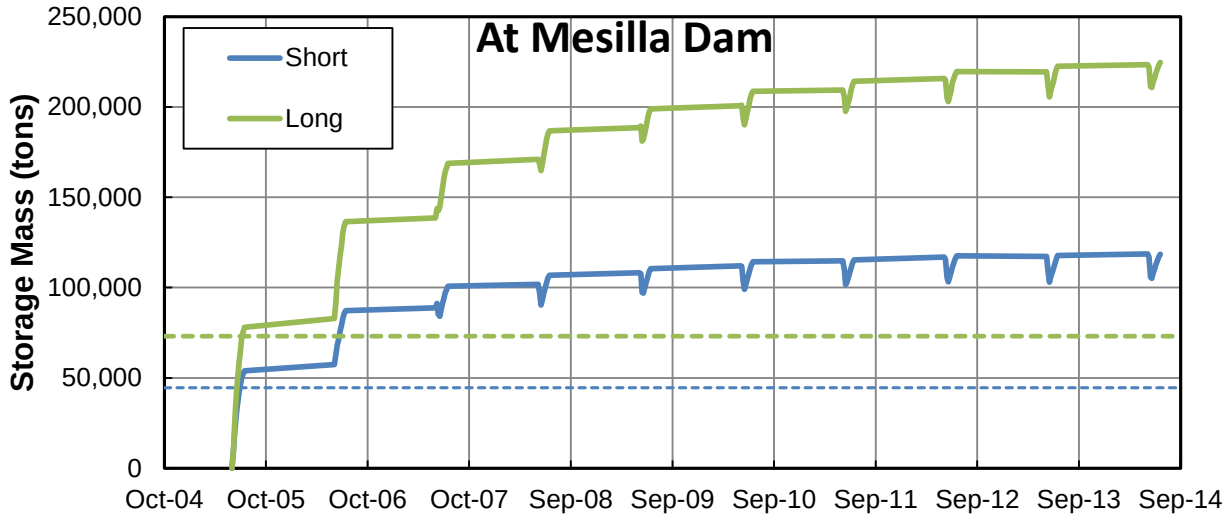


Figure M.2.30. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Mesilla Dam (Problem Location 6) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

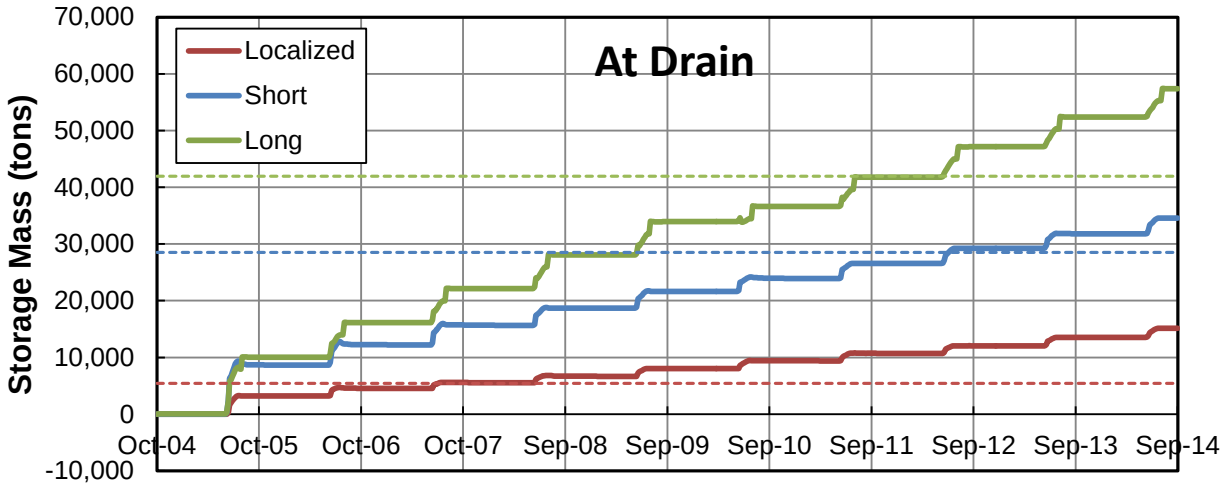


Figure M.2.31. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at the East Drain (Problem Location 7) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

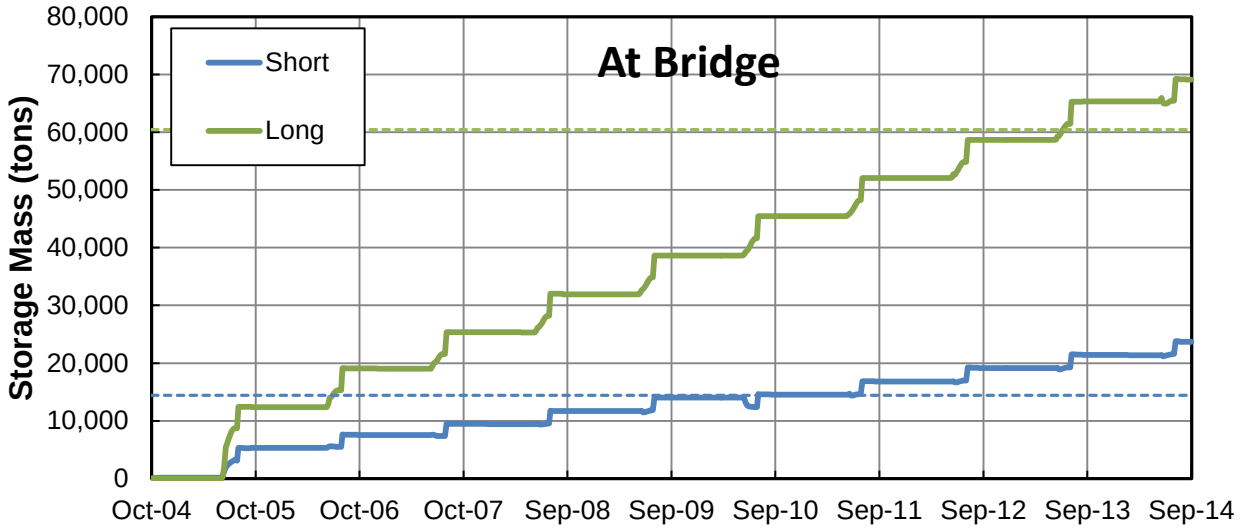


Figure M.2.32. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Vinton Bridge (Problem Location 7) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

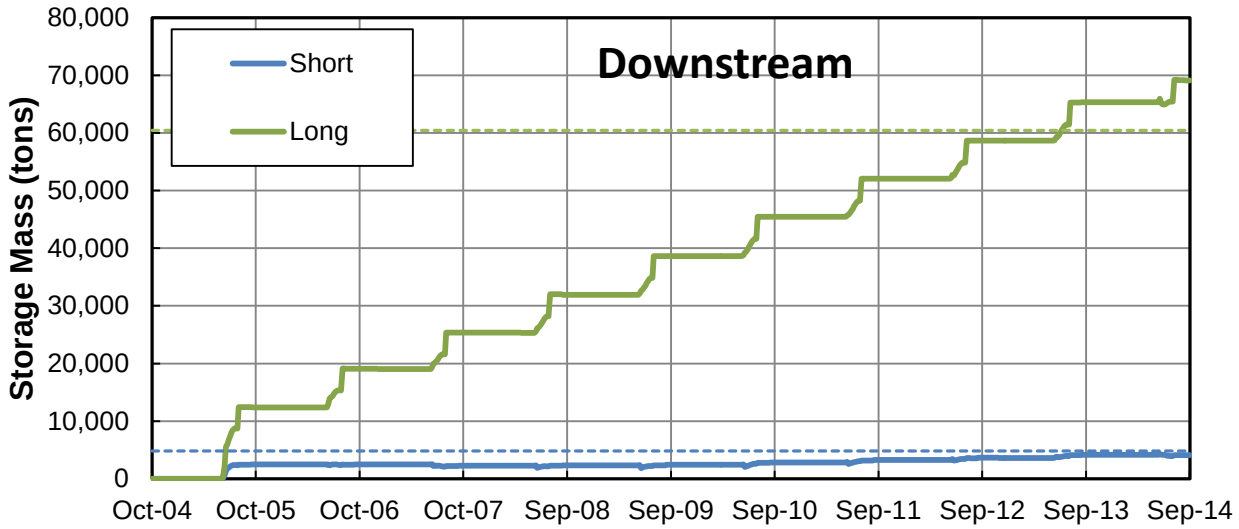


Figure M.2.33. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at the Subarea 103 (U/S) Arroyo (Problem Location 7) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

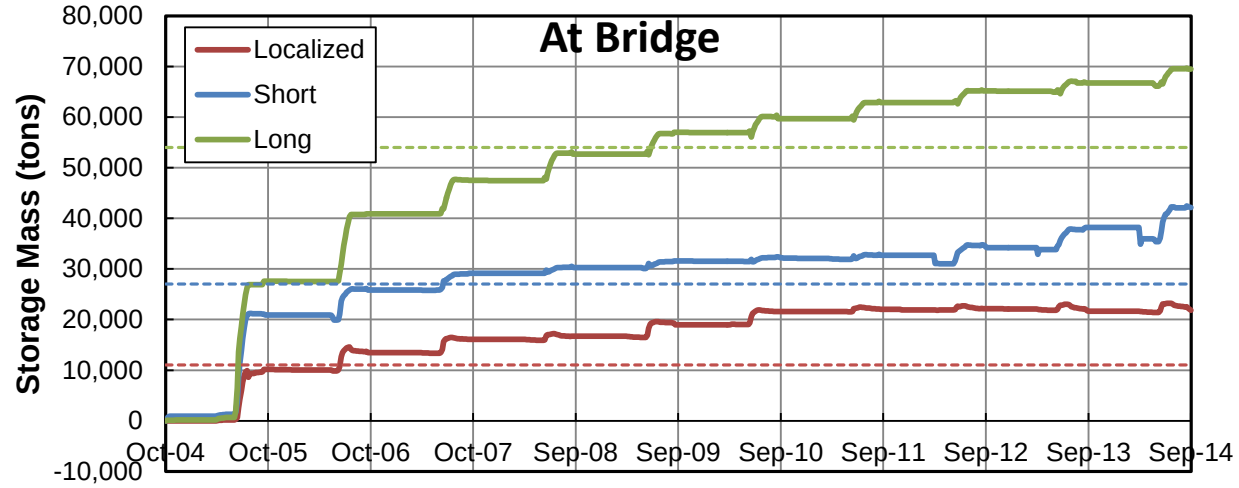


Figure M.2.34. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Country Club Bridge (Problem Location 8) from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

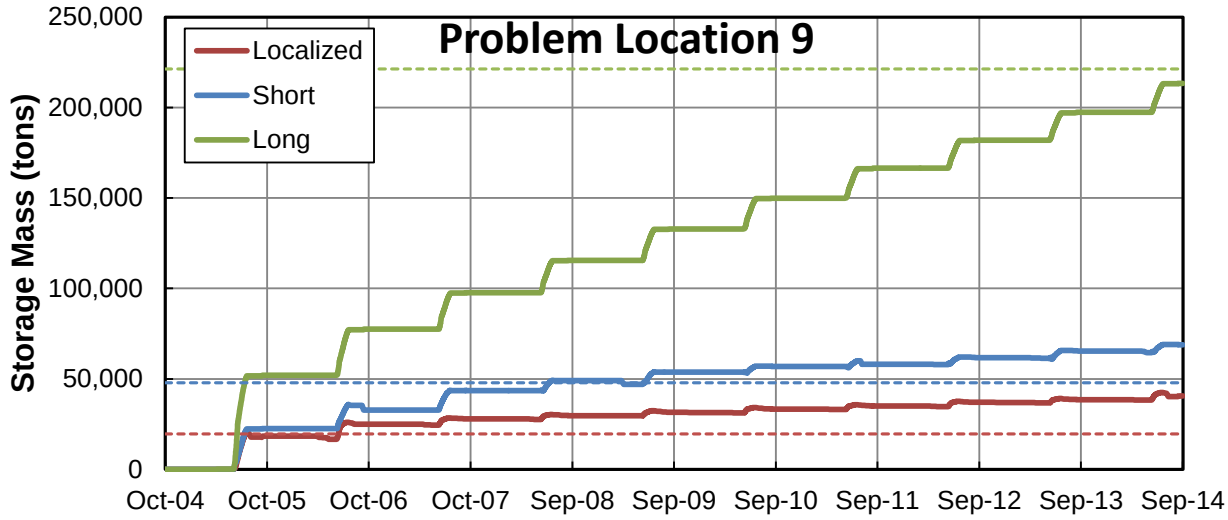


Figure M.2.35. Predicted cumulative mass of aggradation or degradation over time along the extents of the excavated reaches at Problem Location 9 from the sediment-transport simulations of the sediment-removal alternatives. The dashed lines represent the excavated mass for each type of excavation.

Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project:
Final Report

APPENDIX N

Long-term Water-surface Elevation Profiles

October 20, 2015

Contract No. IBM09D0006
Order No. IBM14T0016

Appendix N

Comparative Long-term Water-surface Elevation Profile Plots for Modeled Alternatives and Predicted Change from Baseline Conditions Based on the Localized Hydraulic Models with Predicted Geometries at the End of the Sediment-transport Simulations

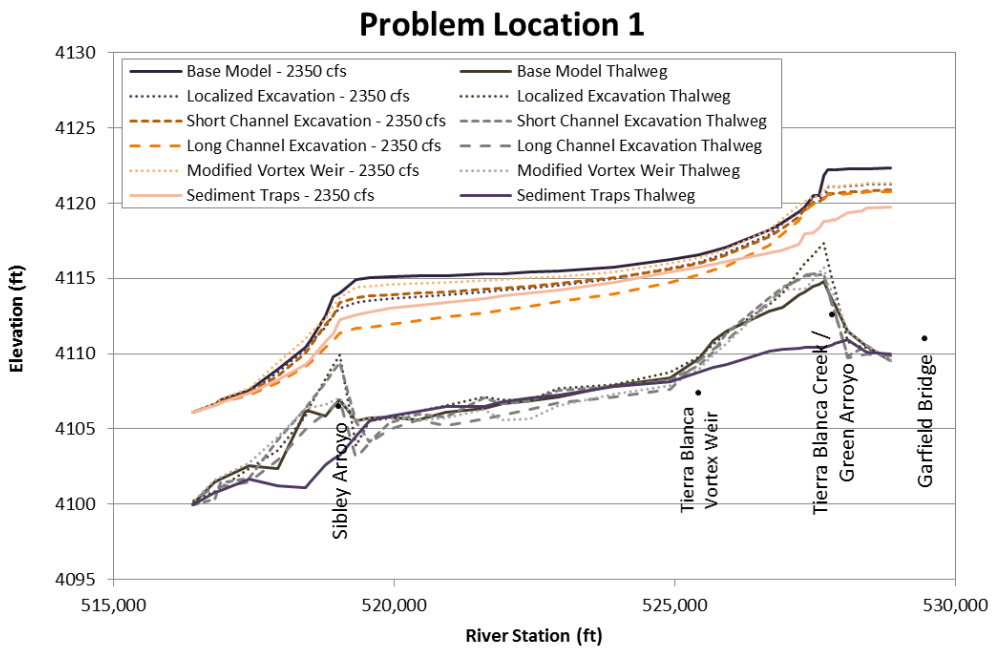


Figure N.1. Predicted water-surface profiles at 2,350 cfs at Problem Location 1 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

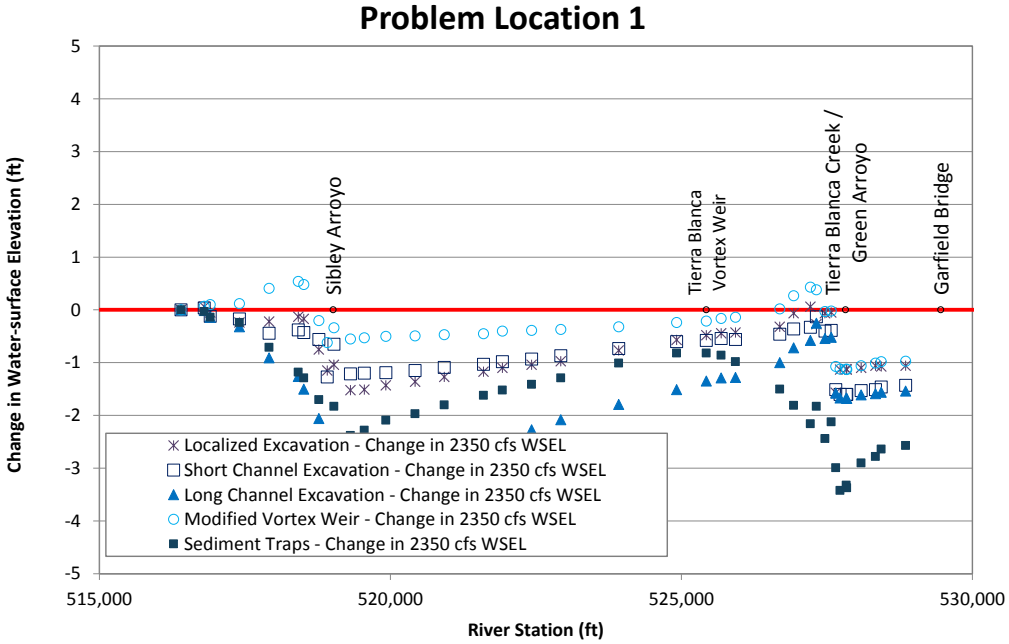


Figure N.2. Predicted change in long-term water-surface elevation at 2,350 cfs relative to the base condition at Problem Location 1 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

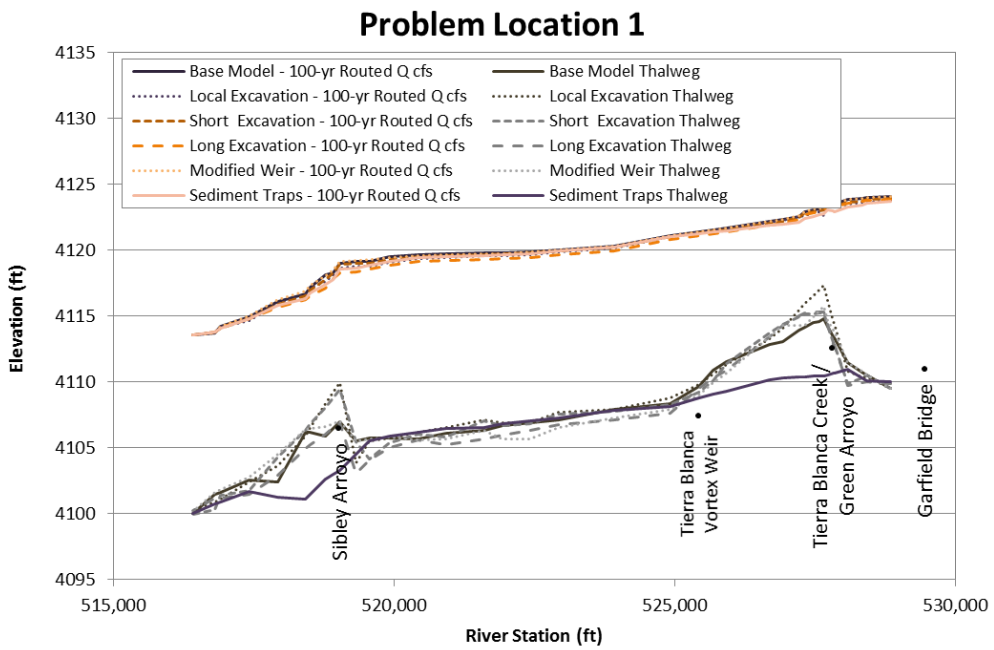


Figure N.3. Predicted water-surface profiles at the 100-year peak flow at Problem Location 1 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

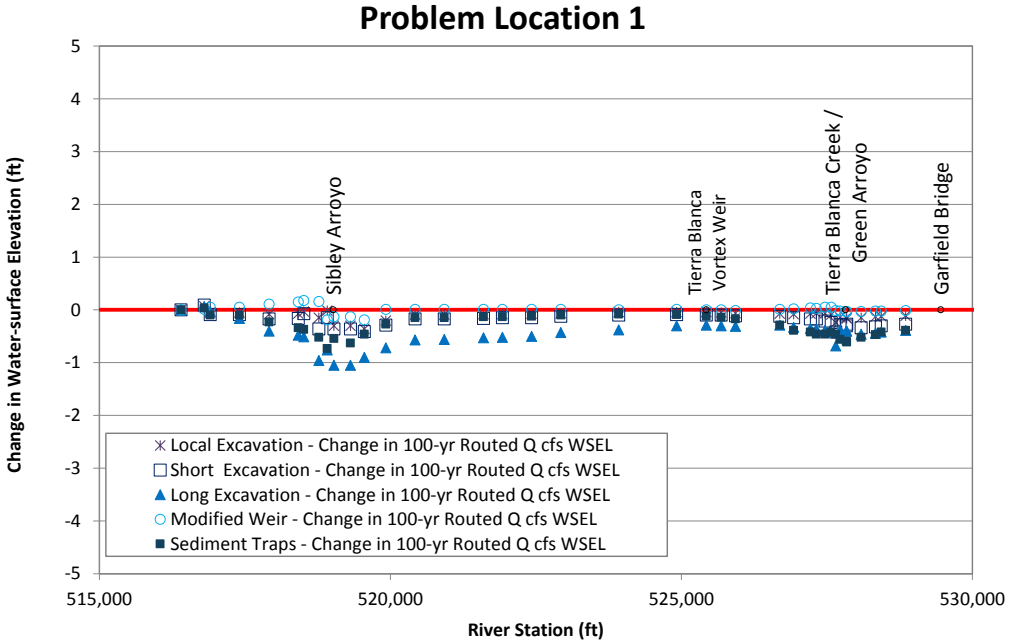


Figure N.4. Predicted change in long-term water-surface elevation at the 100-year peak flow relative to the base condition at Problem Location 1 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

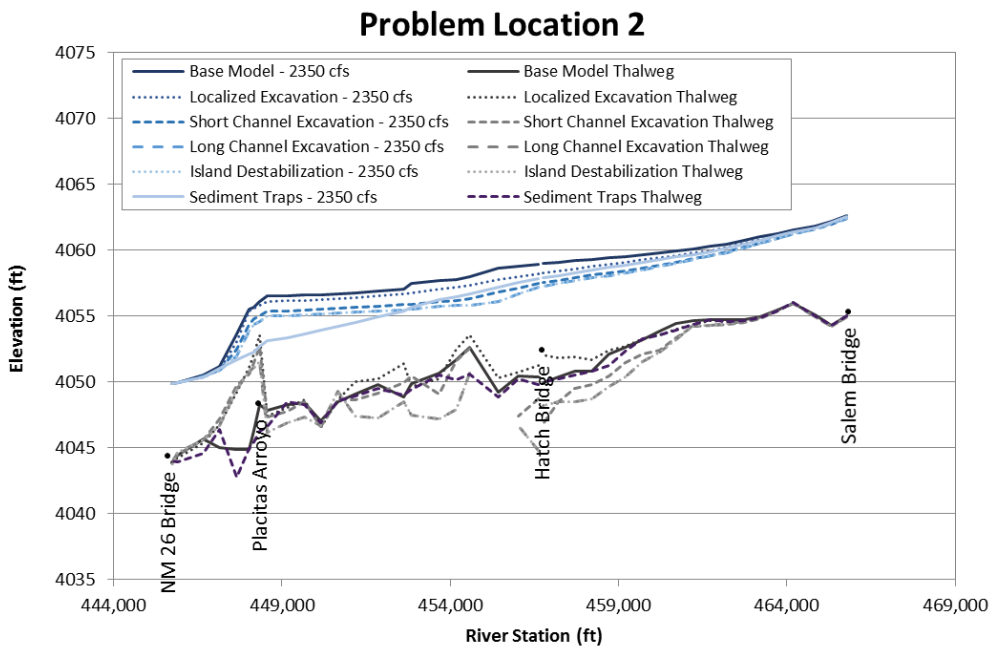


Figure N.5. Predicted water-surface profiles at 2,350 cfs at Problem Location 2 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

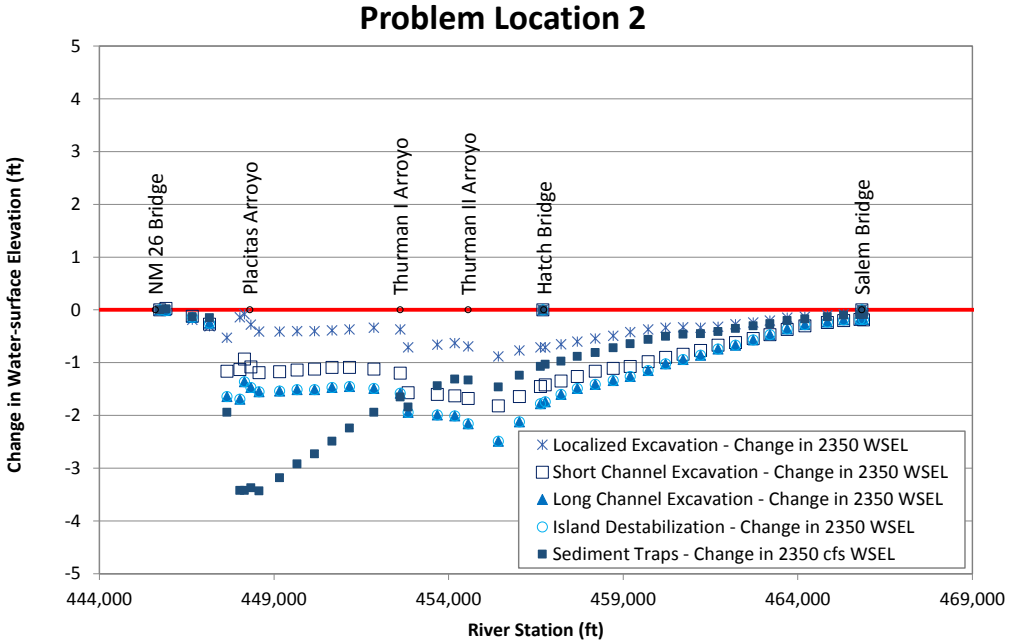


Figure N.6. Predicted change in long-term water-surface elevation at 2,350 cfs relative to the base condition at Problem Location 2 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

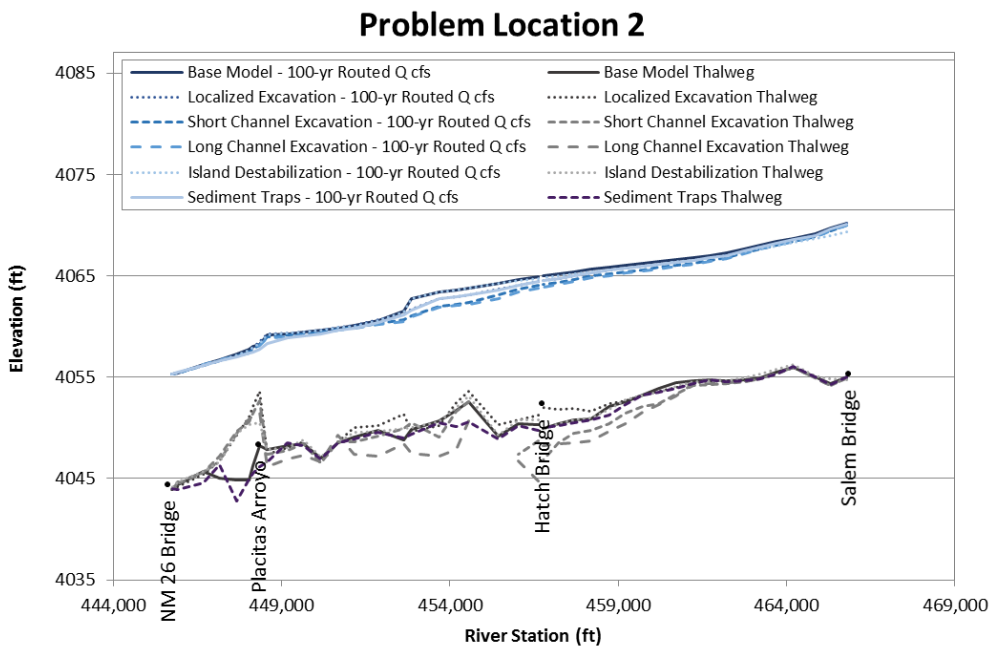


Figure N.7. Predicted water-surface profiles at the 100-year peak flow at Problem Location 2 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

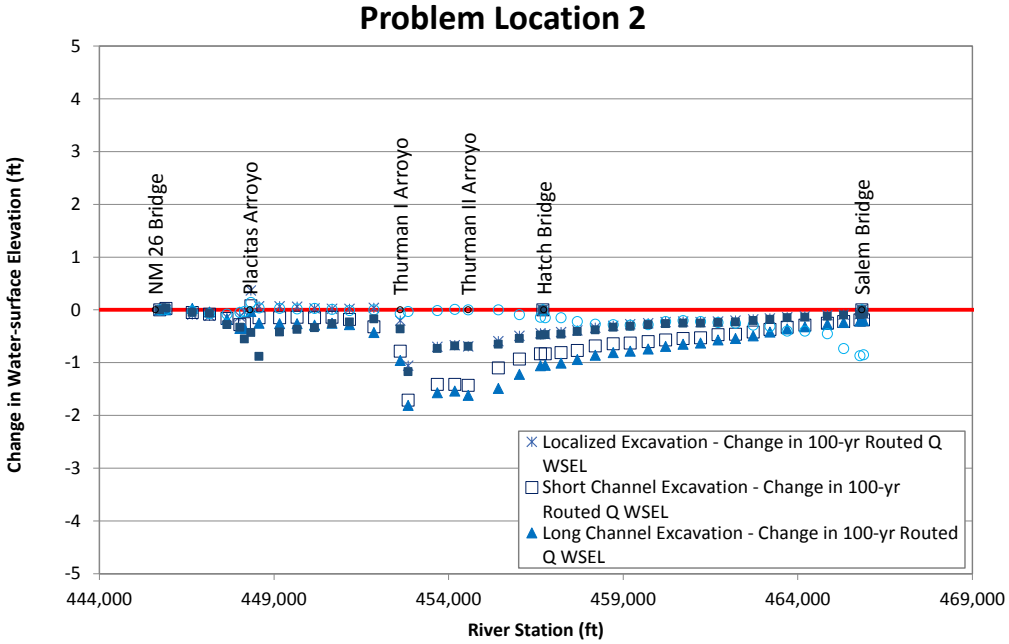


Figure N.8. Predicted change in long-term water-surface elevation at the 100-year peak flow relative to the base condition at Problem Location 2 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

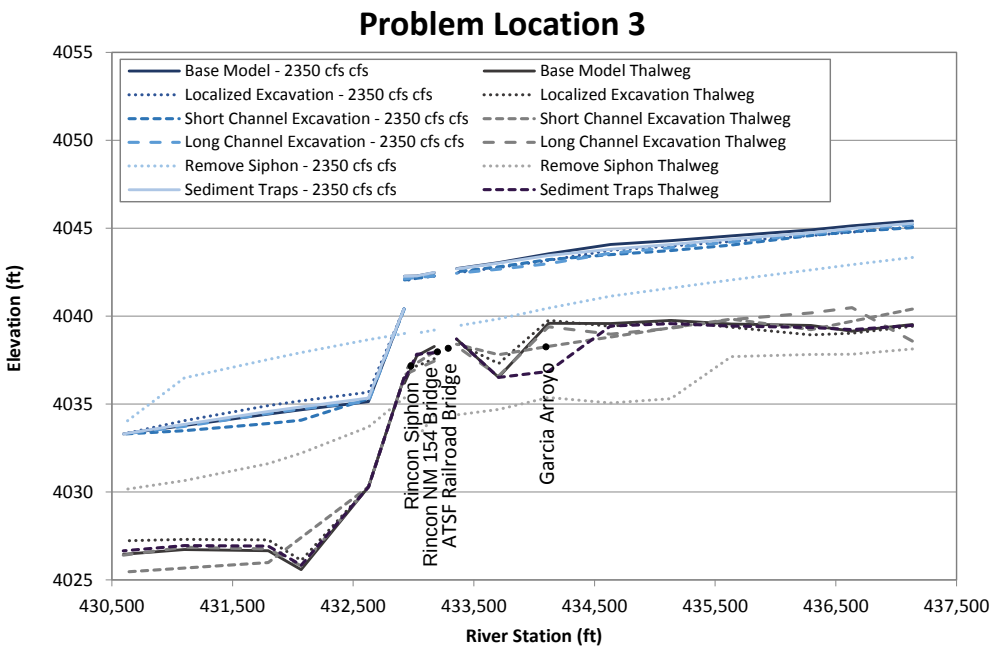


Figure N.9. Predicted water-surface profiles at 2,350 cfs at Problem Location 3 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

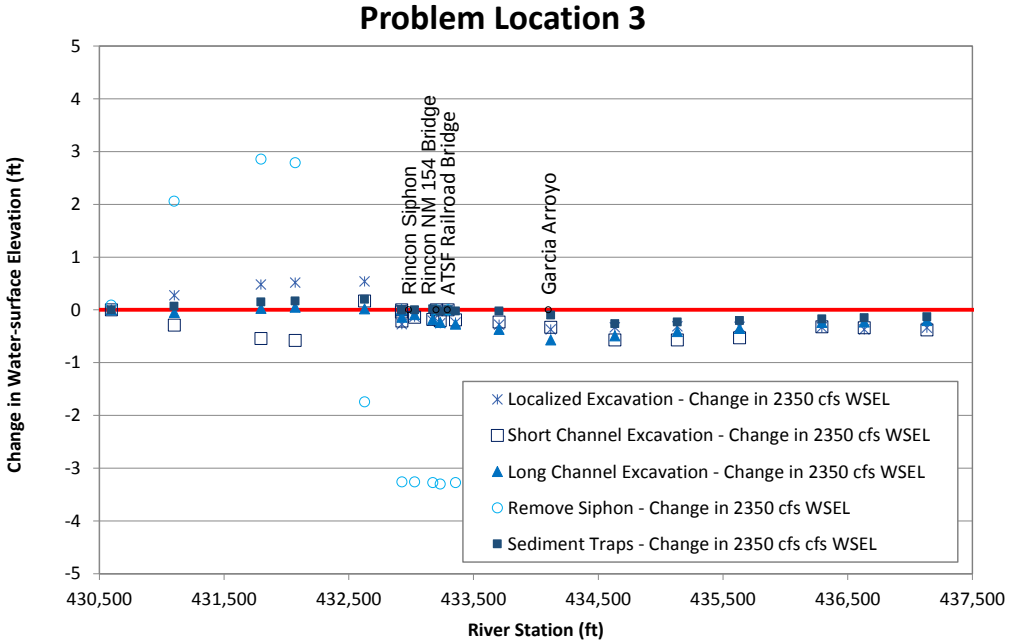


Figure N.10. Predicted change in long-term water-surface elevation at 2,350 cfs relative to the base condition at Problem Location 3 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

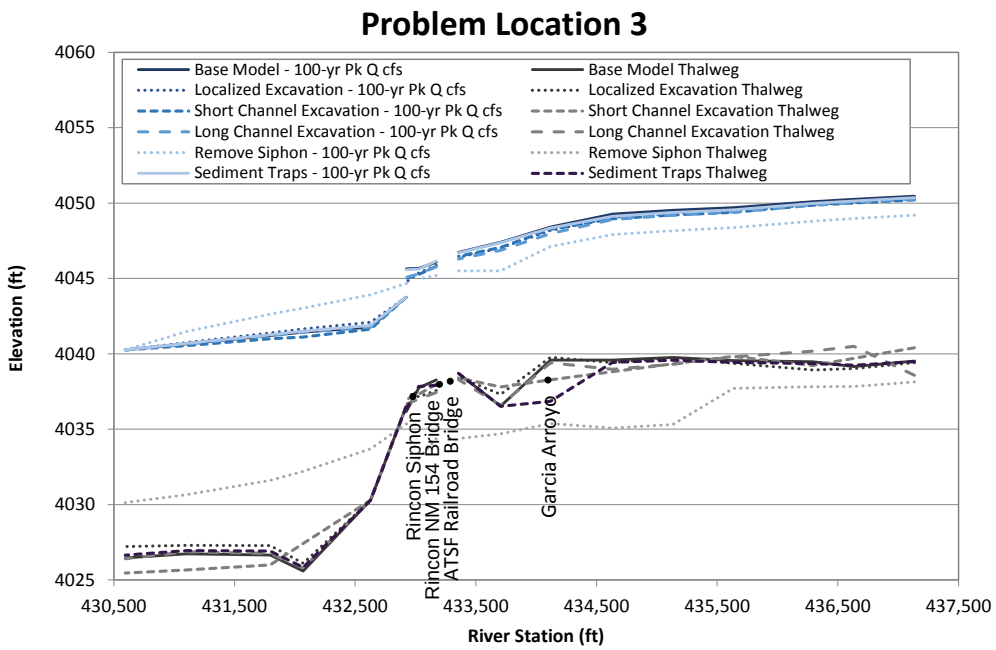


Figure N.11. Predicted water-surface profiles at the 100-year peak flow at Problem Location 3 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

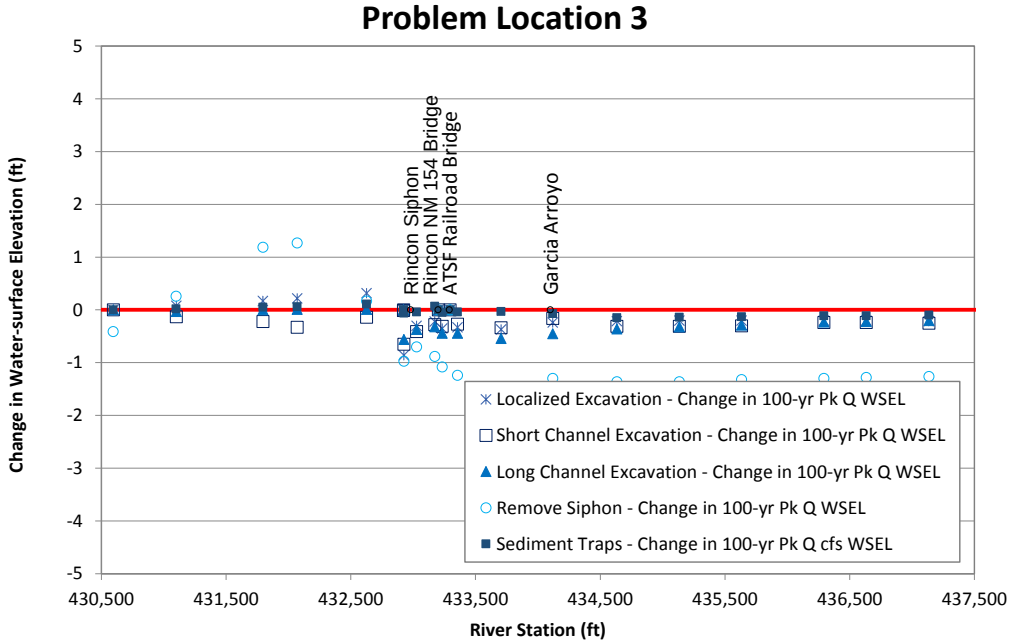


Figure N.12. Predicted change in long-term water-surface elevation at the 100-year peak flow relative to the base condition at Problem Location 3 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

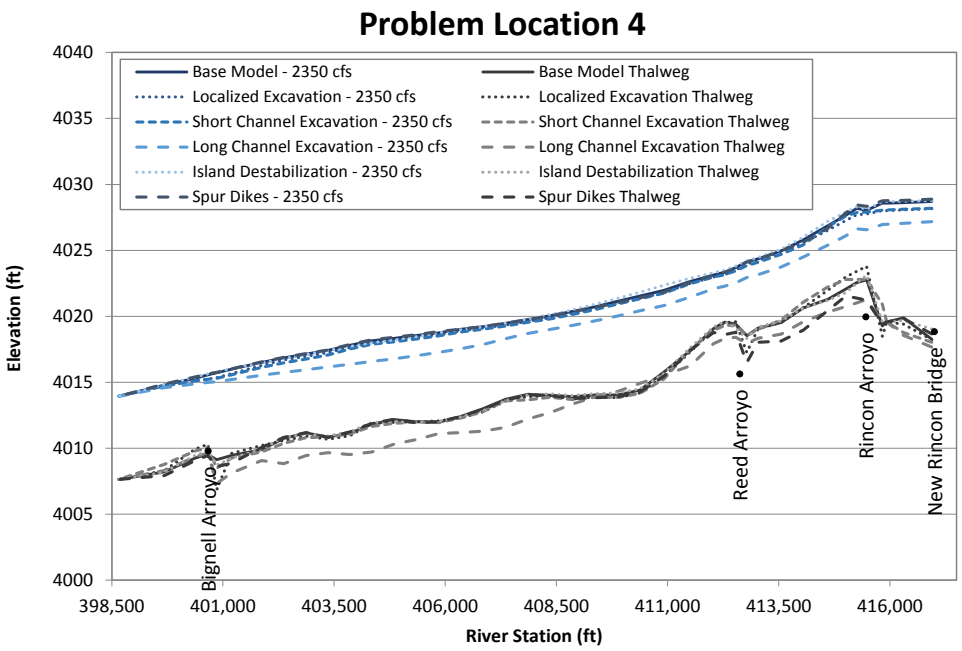


Figure N.13. Predicted water-surface profiles at 2,350 cfs at Problem Location 4 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

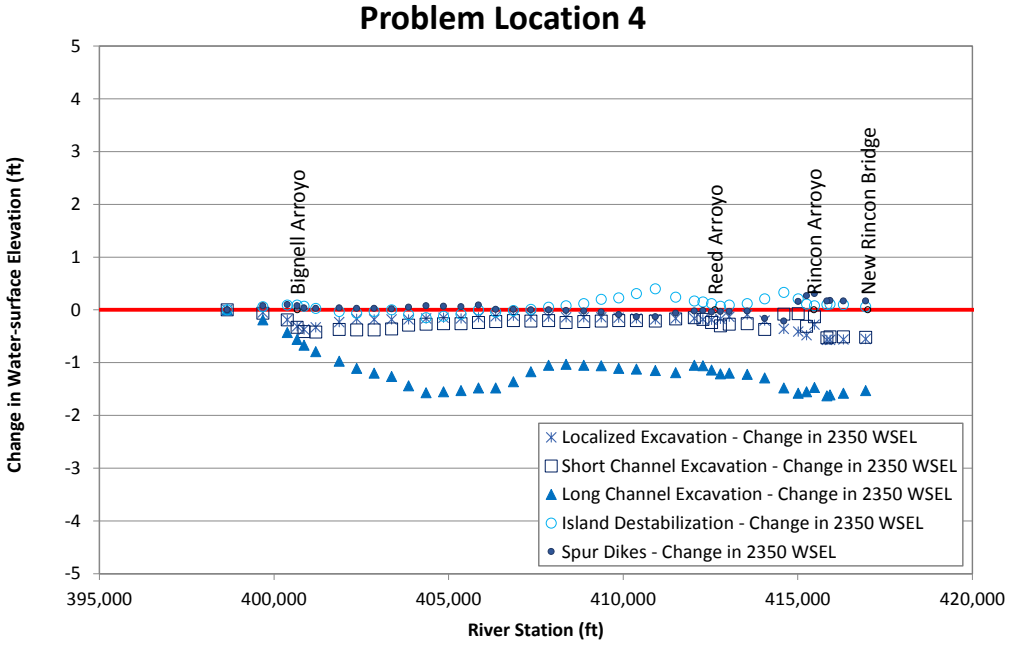


Figure N.14. Predicted change in long-term water-surface elevation at 2,350 cfs relative to the base condition at Problem Location 4 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

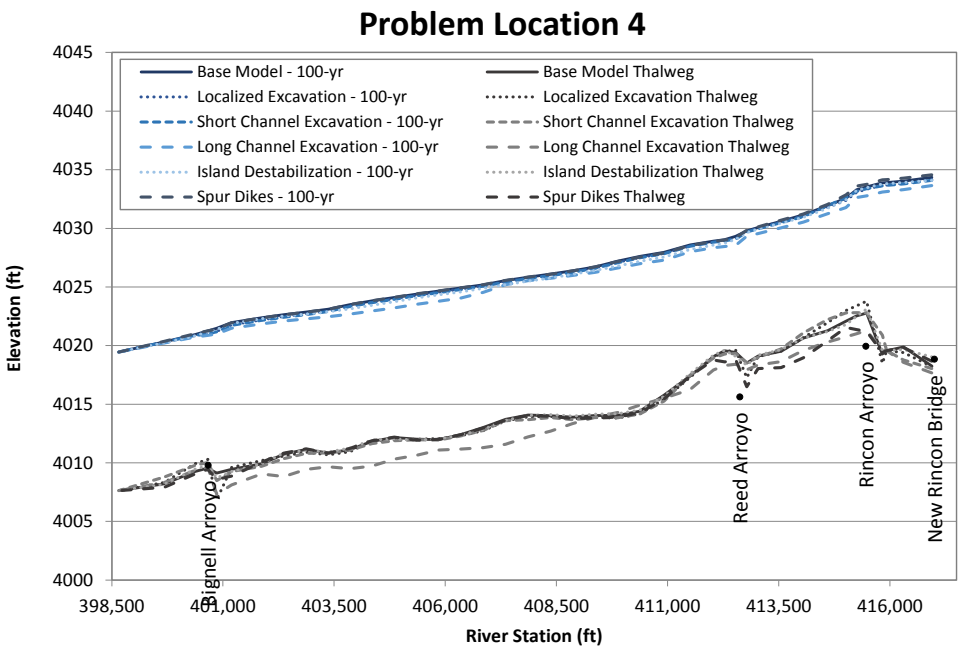


Figure N.15. Predicted water-surface profiles at the 100-year peak flow at Problem Location 4 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

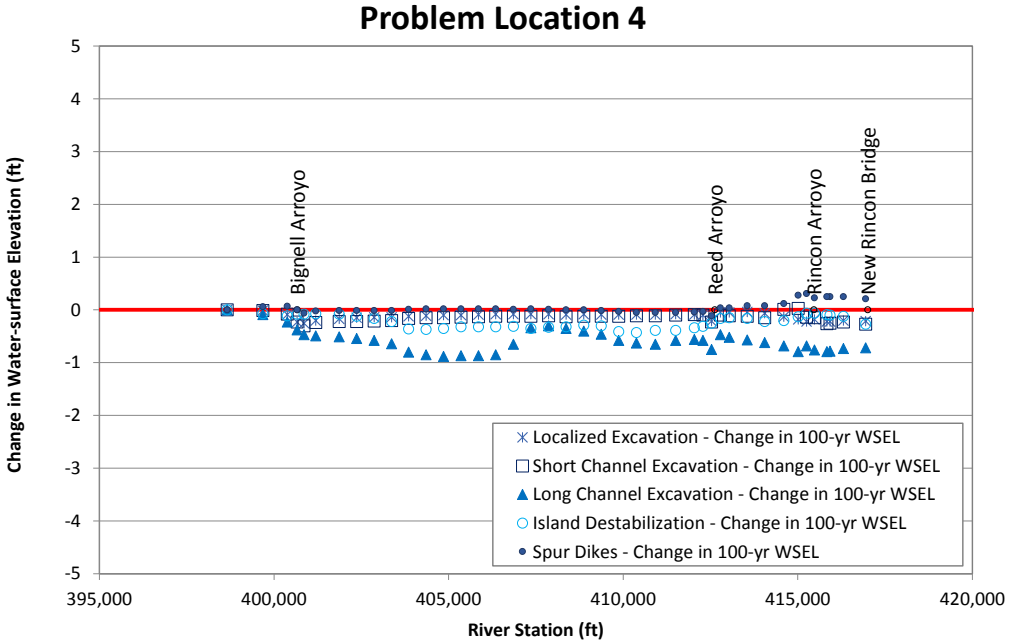


Figure N.16. Predicted change in long-term water-surface elevation at the 100-year peak flow relative to the base condition at Problem Location 4 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

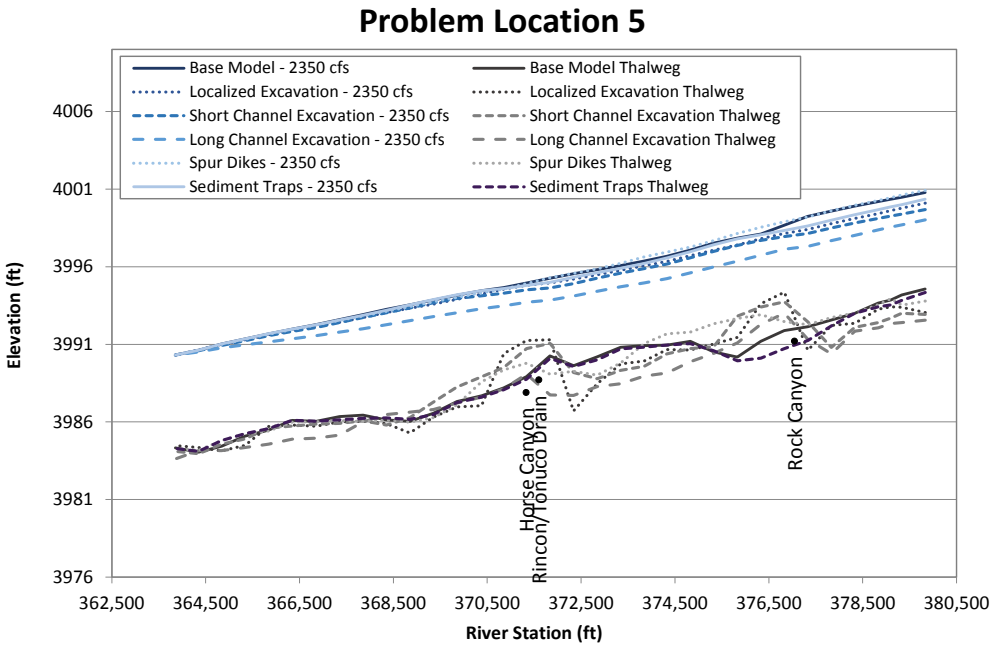


Figure N.17. Predicted water-surface profiles at 2,350 cfs at Problem Location 5 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

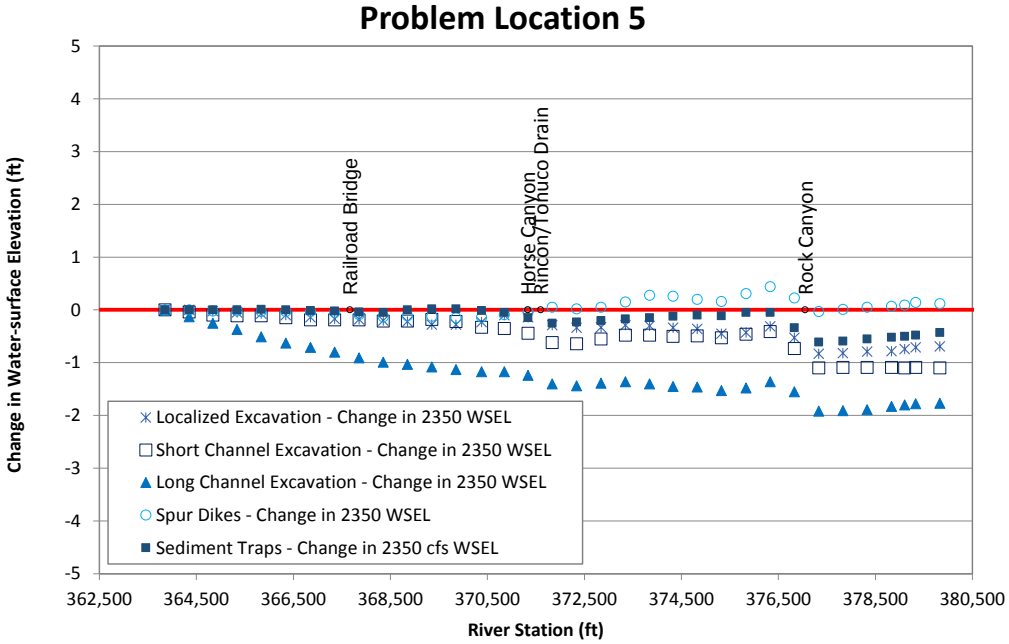


Figure N.18. Predicted change in long-term water-surface elevation at 2,350 cfs relative to the base condition at Problem Location 5 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

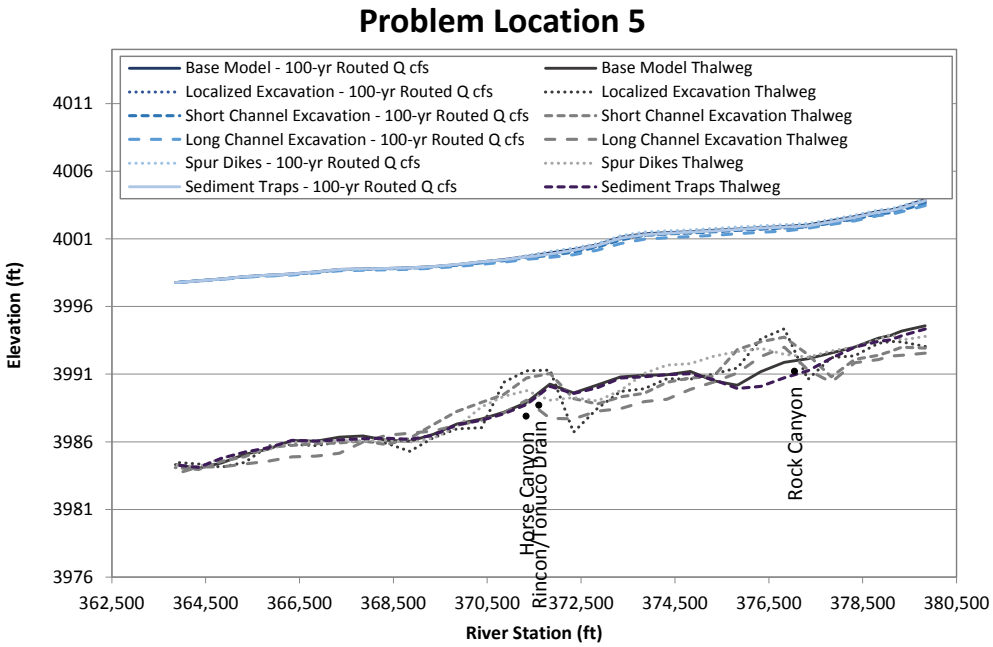


Figure N.19. Predicted water-surface profiles at the 100-year peak flow at Problem Location 5 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

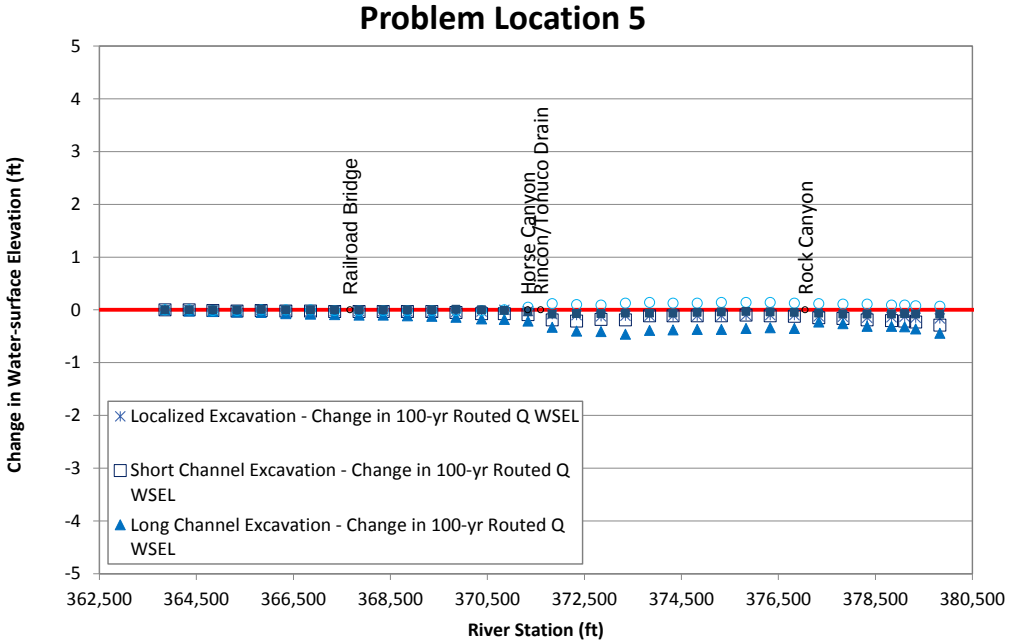


Figure N.20. Predicted change in long-term water-surface elevation at the 100-year peak flow relative to the base condition at Problem Location 5 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

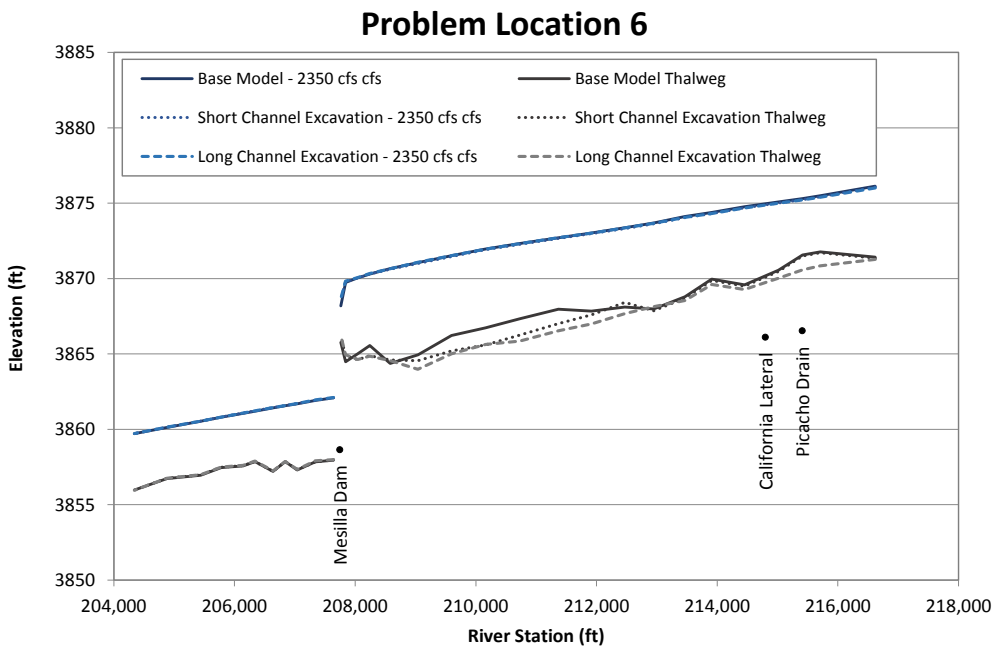


Figure N.21. Predicted water-surface profiles at 2,350 cfs at Problem Location 6 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

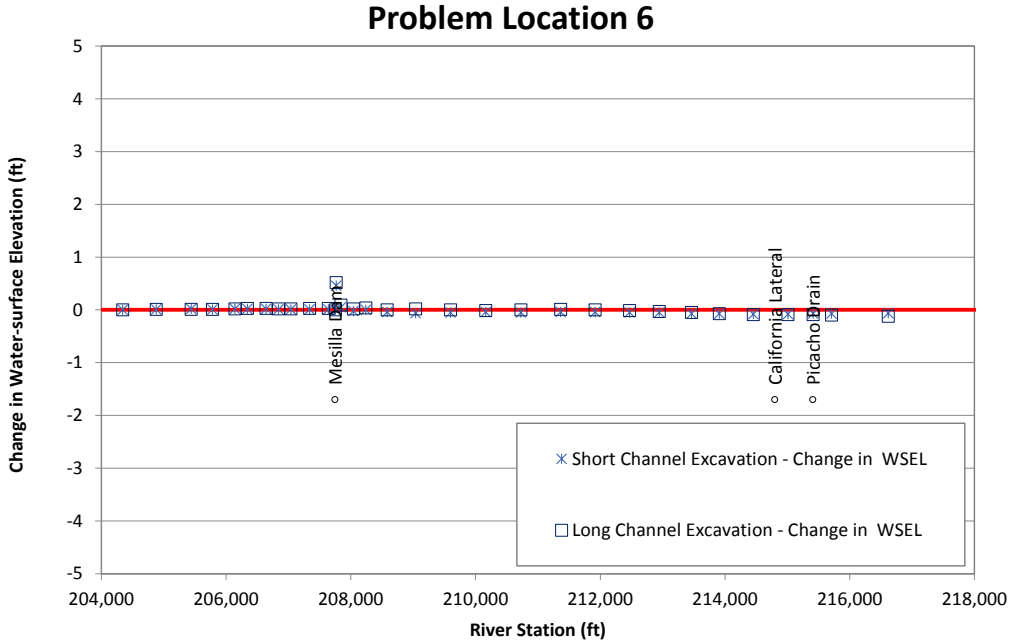


Figure N.22. Predicted change in long-term water-surface elevation at 2,350 cfs relative to the base condition at Problem Location 6 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

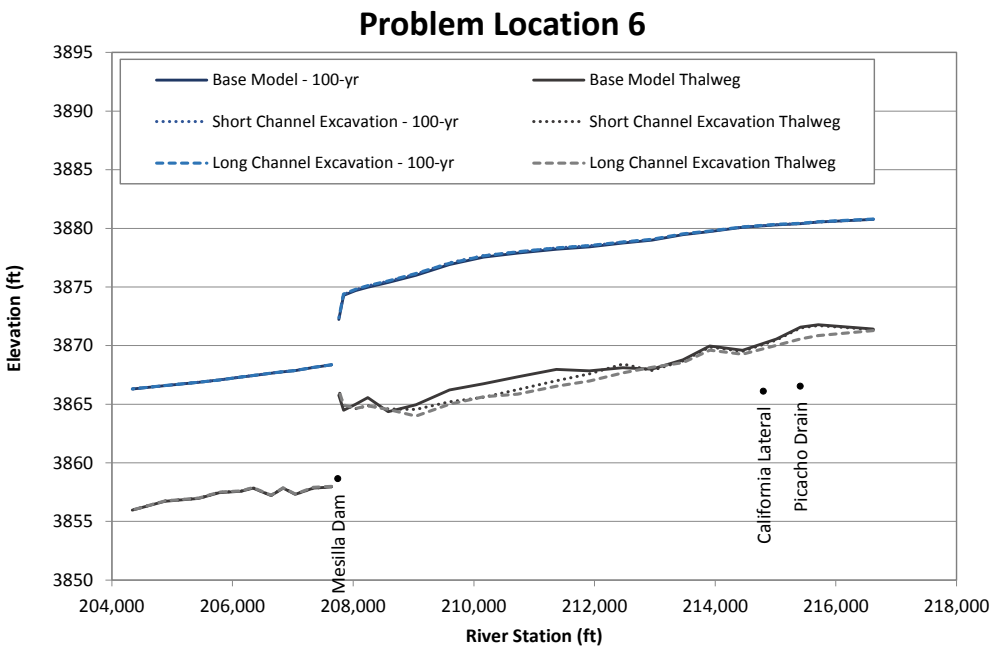


Figure N.23. Predicted water-surface profiles at the 100-year peak flow at Problem Location 6 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

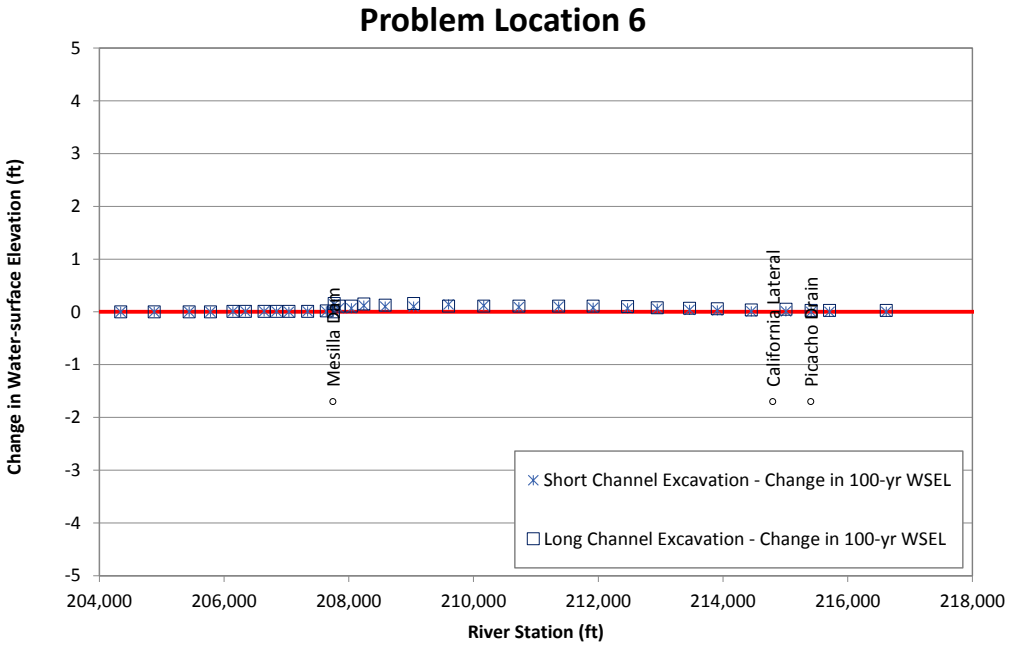


Figure N.24. Predicted change in long-term water-surface elevation at the 100-year peak flow relative to the base condition at Problem Location 6 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

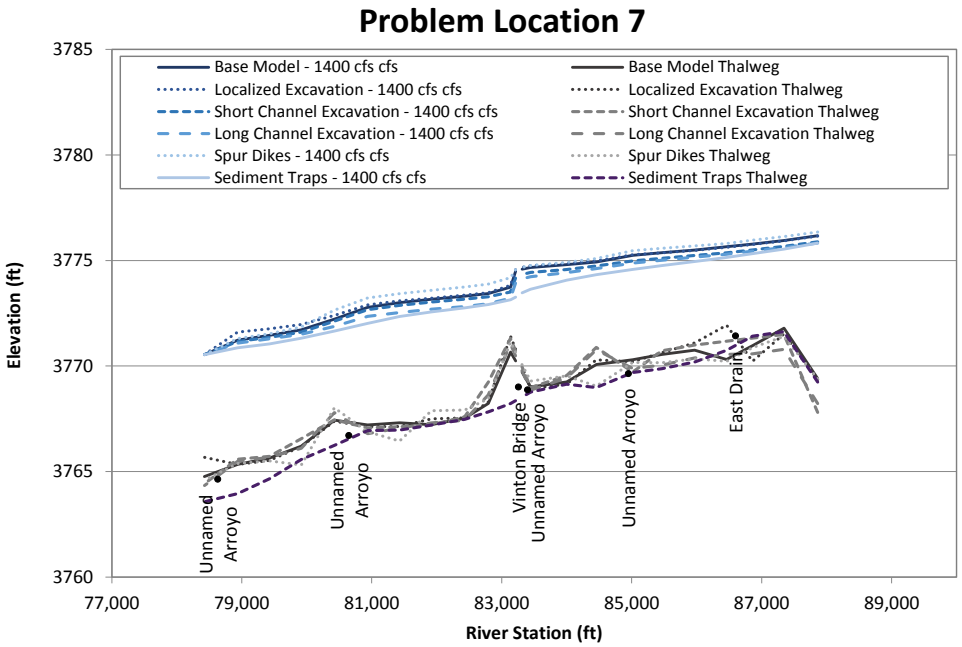


Figure N.25. Predicted water-surface profiles at 1,400 cfs at Problem Location 7 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

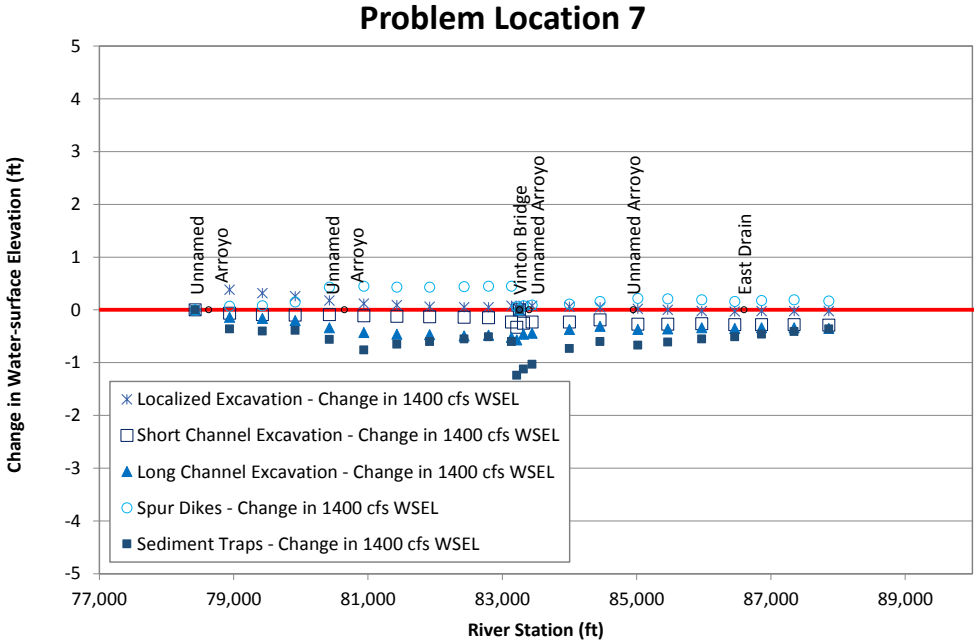


Figure N.26. Predicted change in long-term water-surface elevation at 1,400 cfs relative to the base condition at Problem Location 7 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

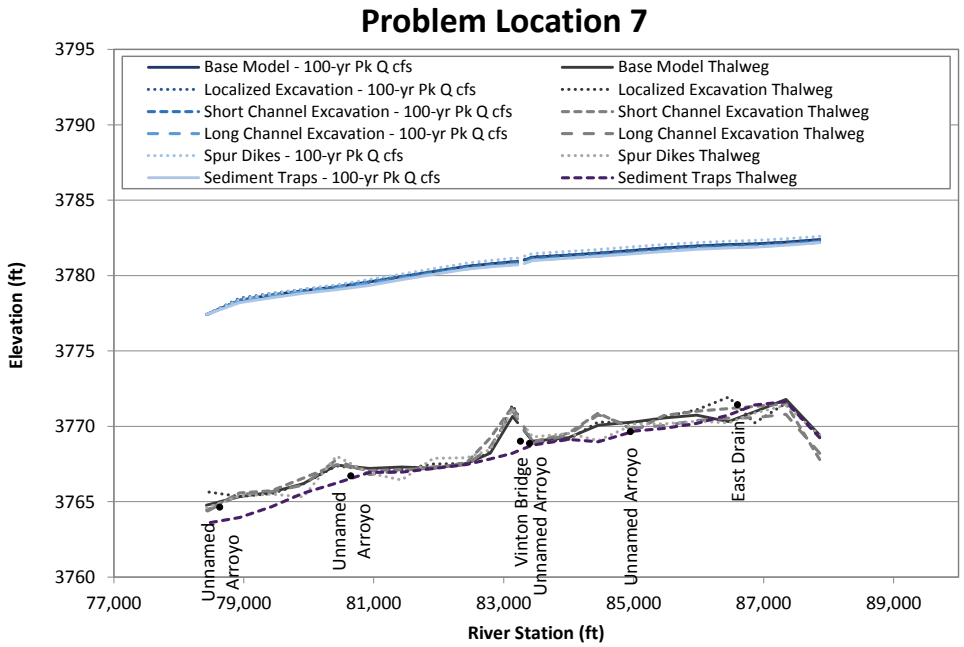


Figure N.27. Predicted water-surface profiles at the 100-year peak flow at Problem Location 7 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

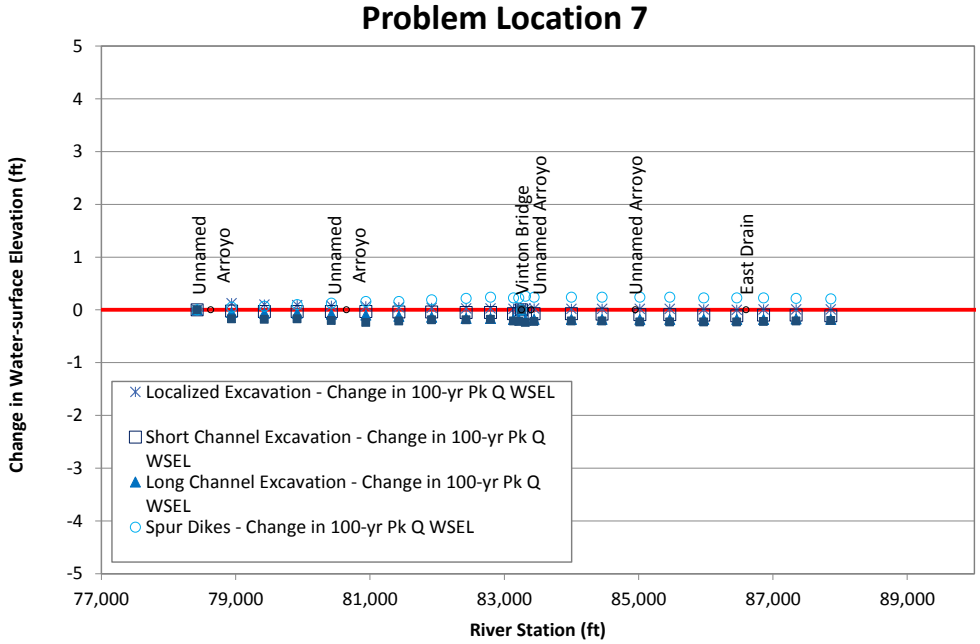


Figure N.28. Predicted change in long-term water-surface elevation at the 100-year peak flow relative to the base condition at Problem Location 7 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

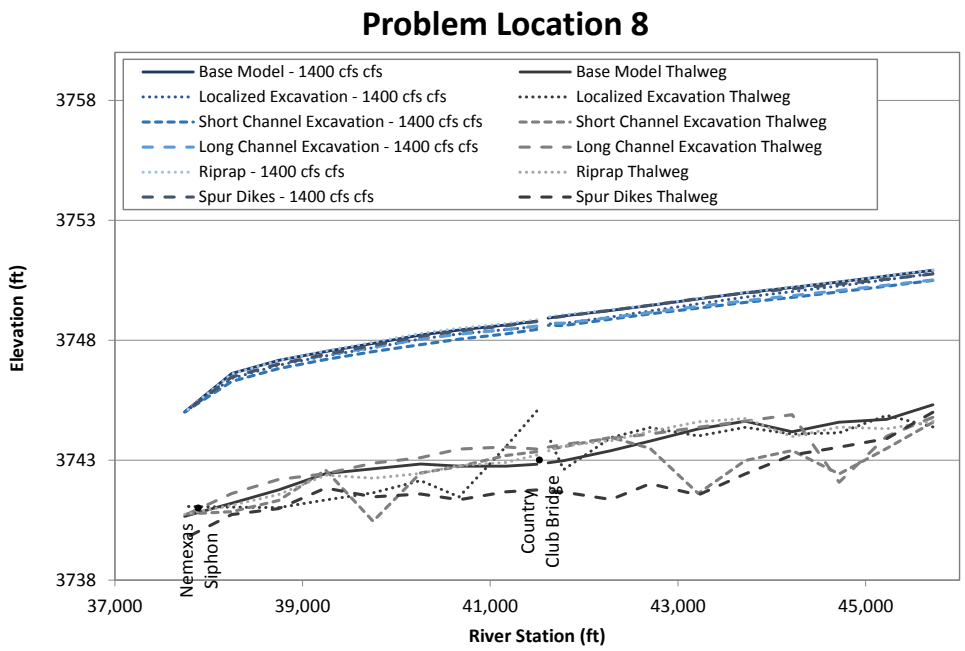


Figure N.29. Predicted water-surface profiles at 1,400 cfs at Problem Location 8 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

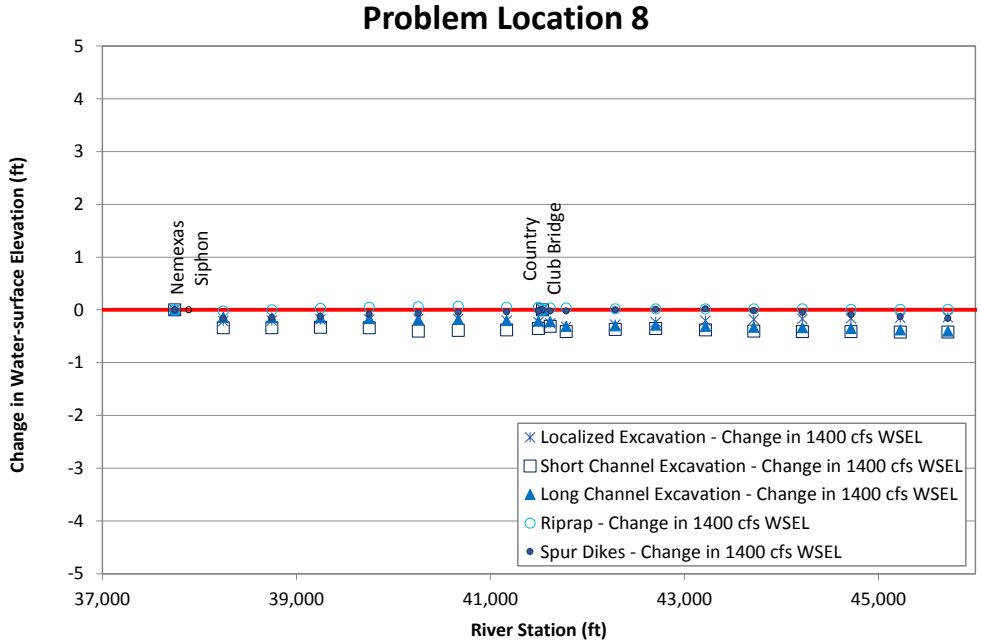


Figure N.30. Predicted change in long-term water-surface elevation at 1,400 cfs relative to the base condition at Problem Location 8 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

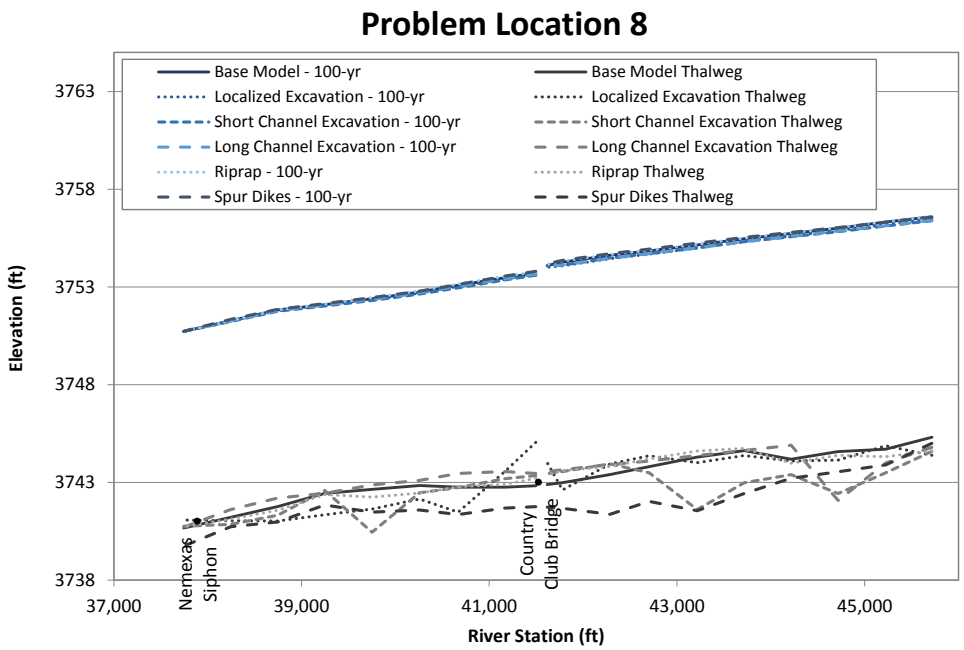


Figure N.31. Predicted water-surface profiles at the 100-year peak flow at Problem Location 8 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

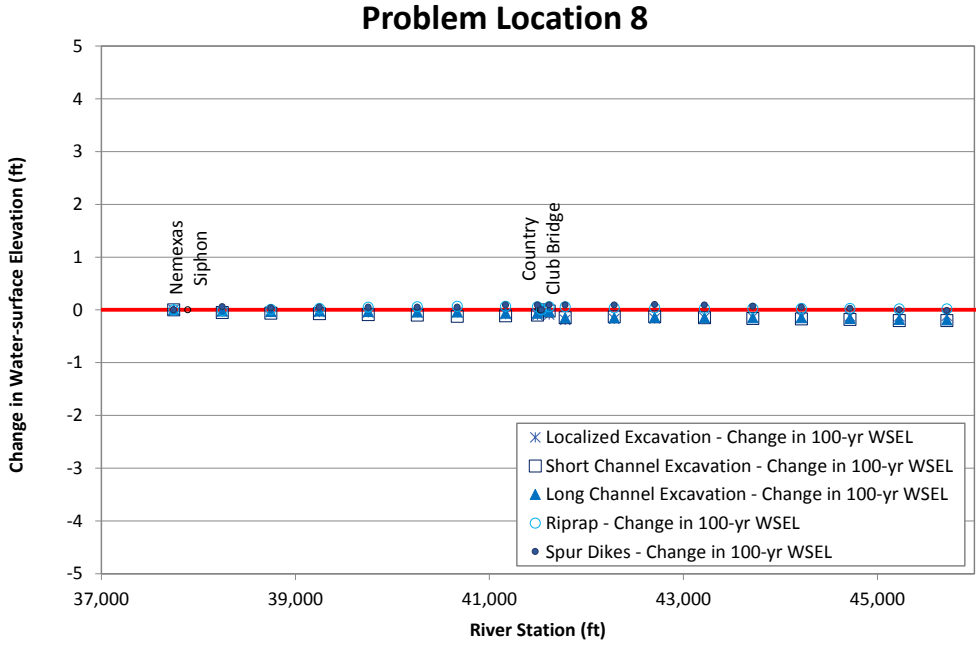


Figure N.32. Predicted change in long-term water-surface elevation at the 100-year peak flow relative to the base condition at Problem Location 8 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

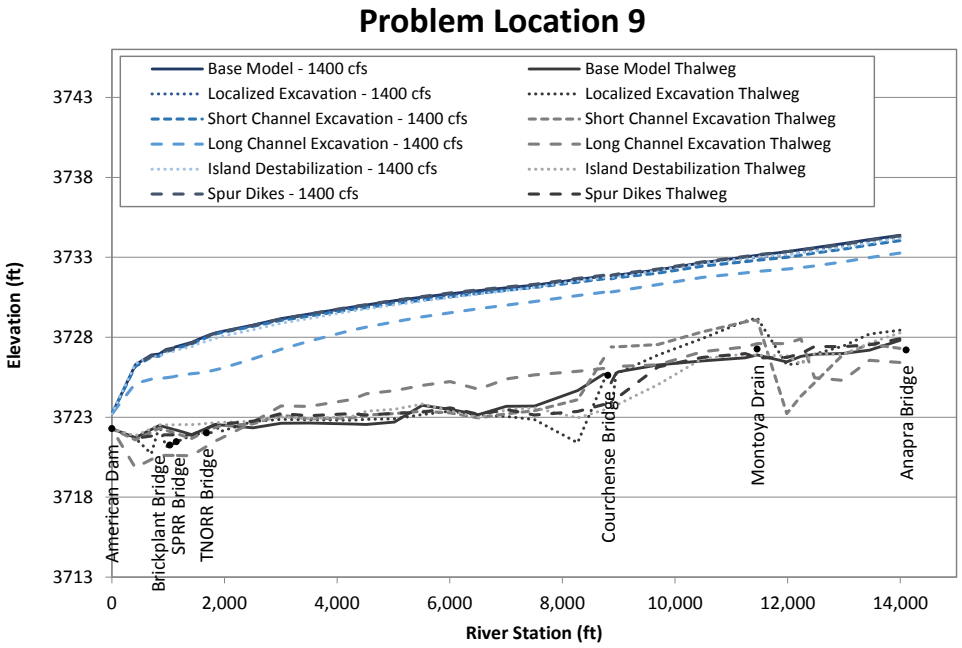


Figure N.33. Predicted water-surface profiles at 1,400 cfs at Problem Location 9 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

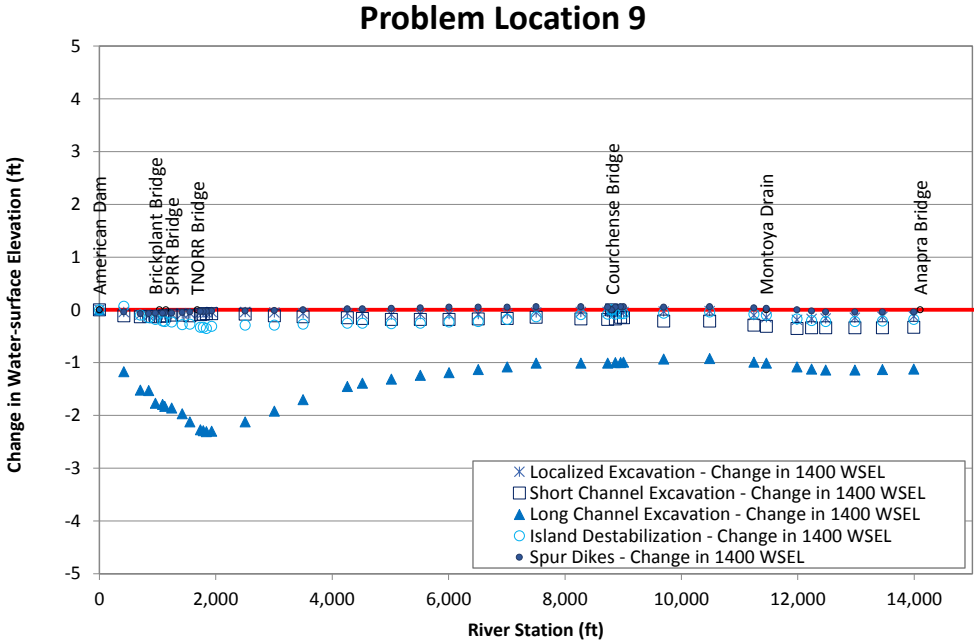


Figure N.34. Predicted change in long-term water-surface elevation at 1,400 cfs relative to the base condition at Problem Location 9 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

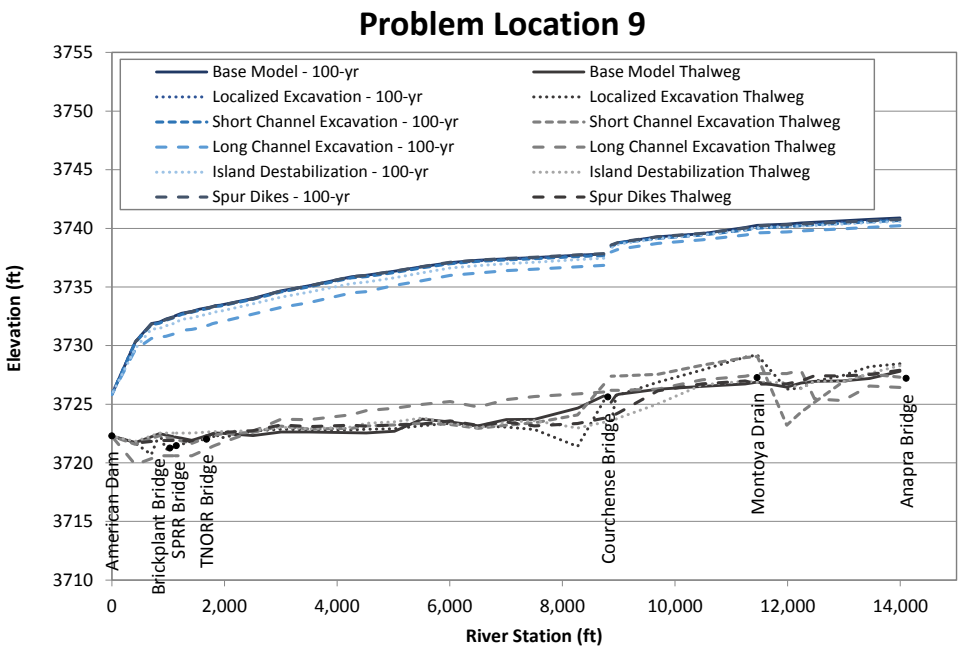


Figure N.35. Predicted water-surface profiles at the 100-year peak flow at Problem Location 9 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

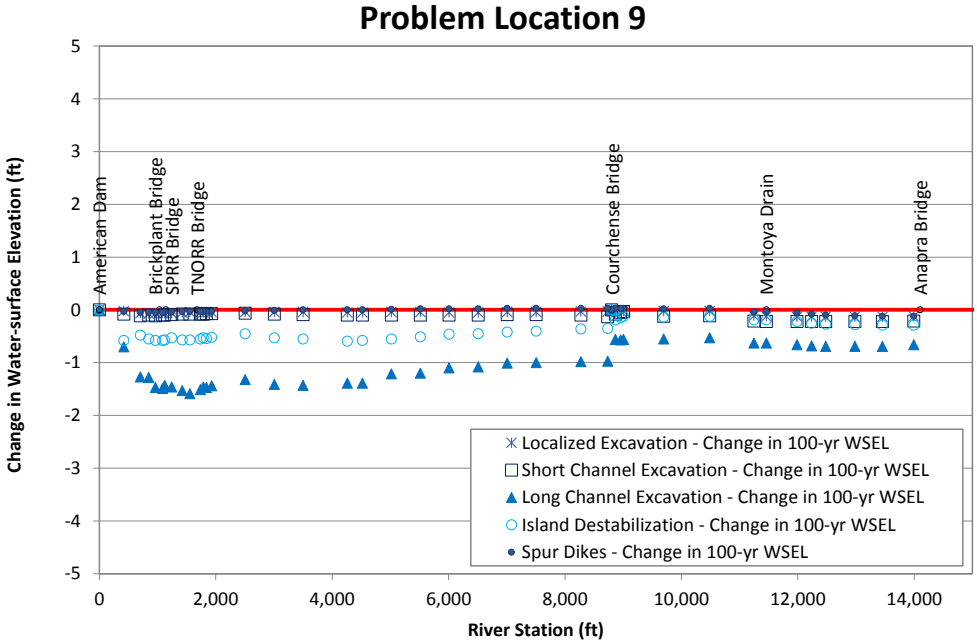


Figure N.36. Predicted change in long-term water-surface elevation at the 100-year peak flow relative to the base condition at Problem Location 9 for the alternatives that were evaluated with the steady-state hydraulic model compared to existing (base model) conditions.

Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project:
Final Report

APPENDIX O

Levee Freeboard Encroachment Profiles

October 20, 2015

Contract No. IBM09D0006
Order No. IBM14T0016

Appendix O

Levee Freeboard Encroachment Profiles

Page Intentionally Left Blank

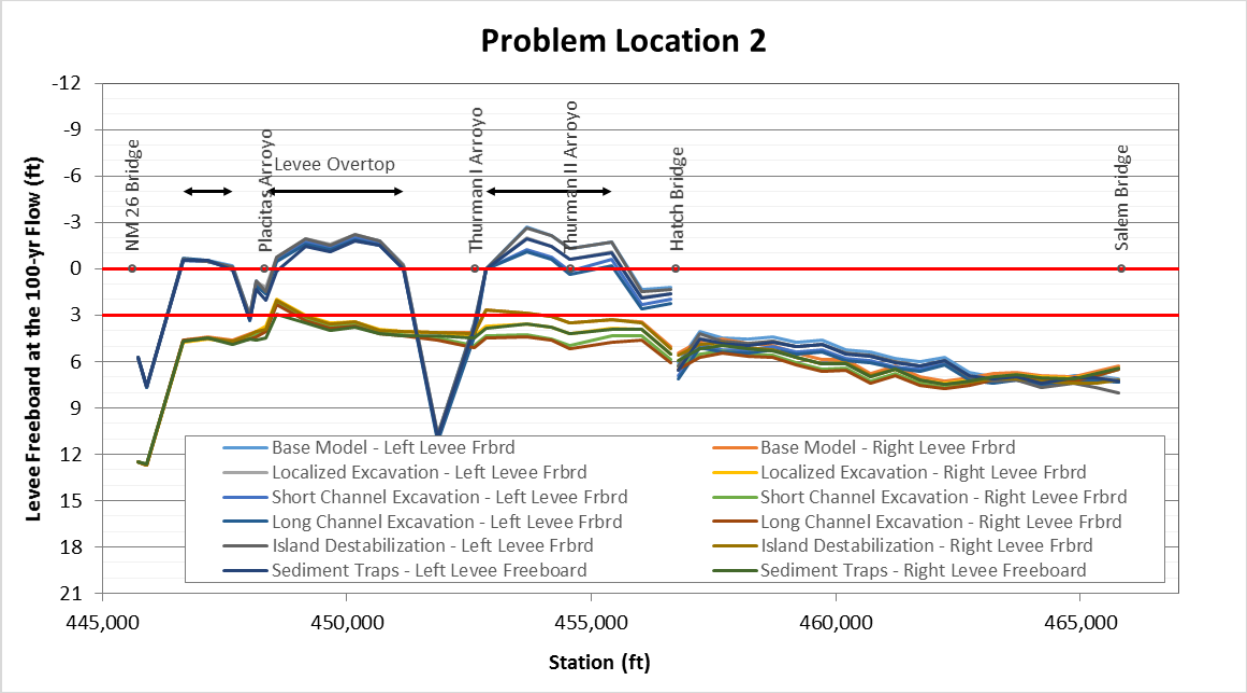


Figure O.1. Predicted levee freeboard during the 100-year flow at Problem Location 2 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

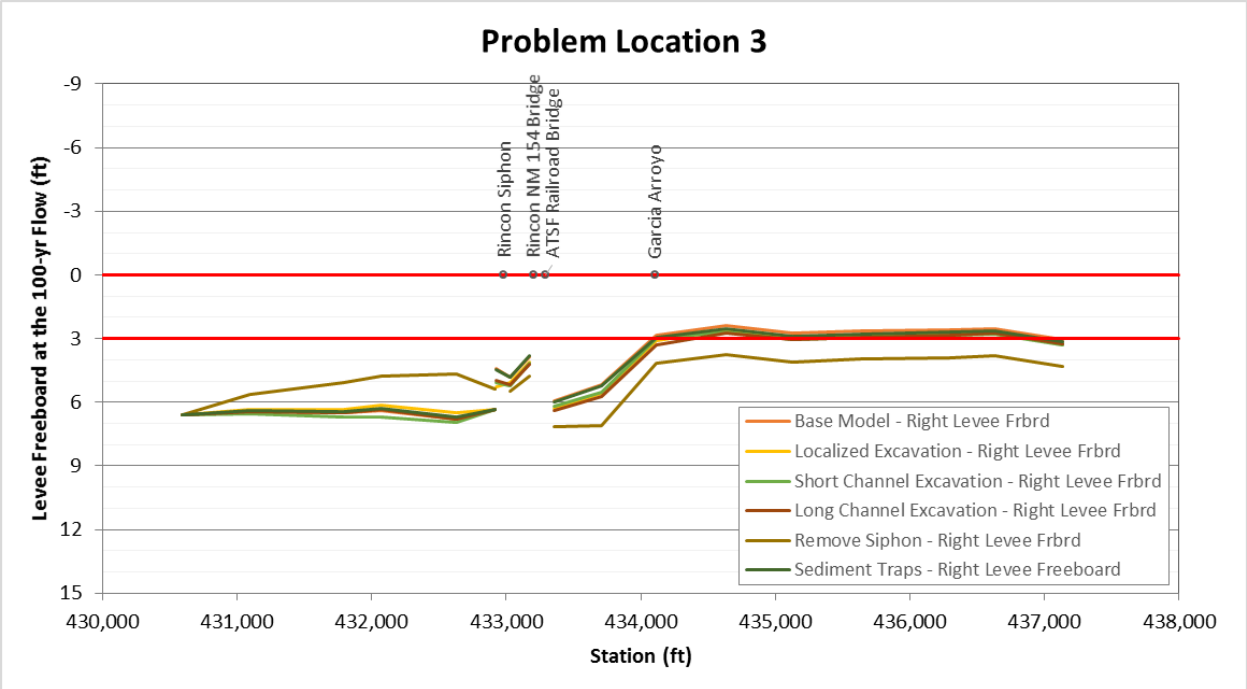


Figure O.2. Predicted levee freeboard during the 100-year flow at Problem Location 3 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

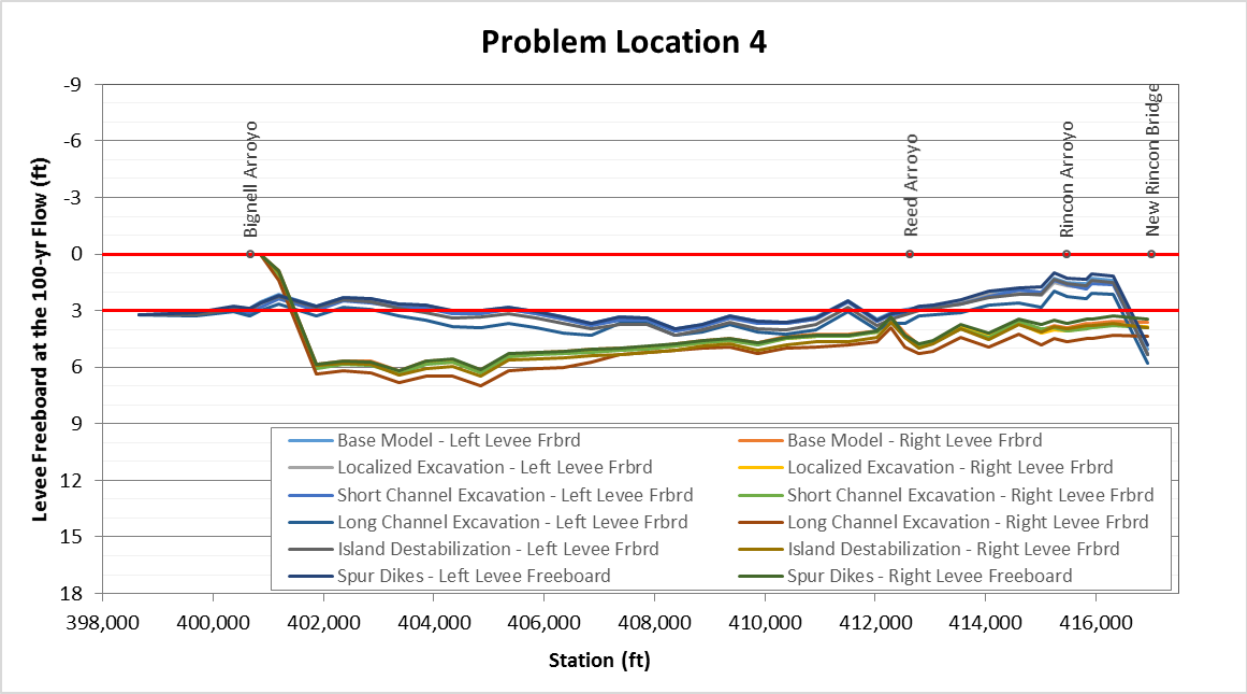


Figure O.3. Predicted levee freeboard during the 100-year flow at Problem Location 4 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

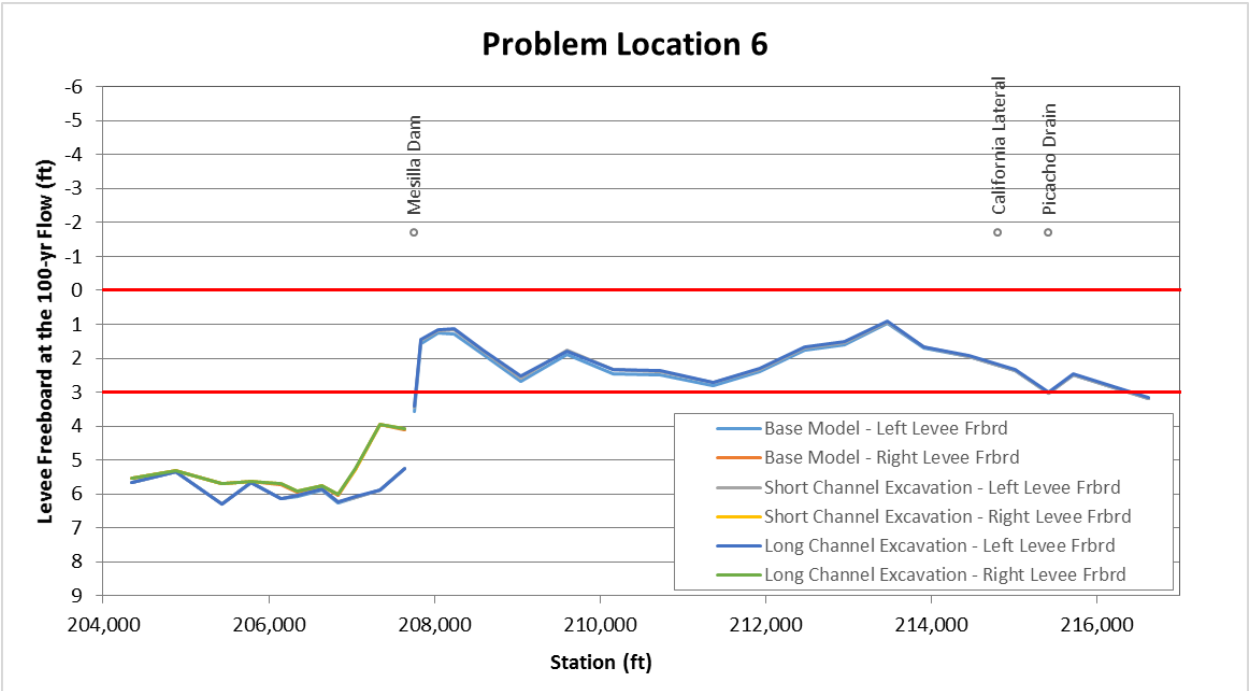


Figure O.4. Predicted levee freeboard during the 100-year flow at Problem Location 6 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

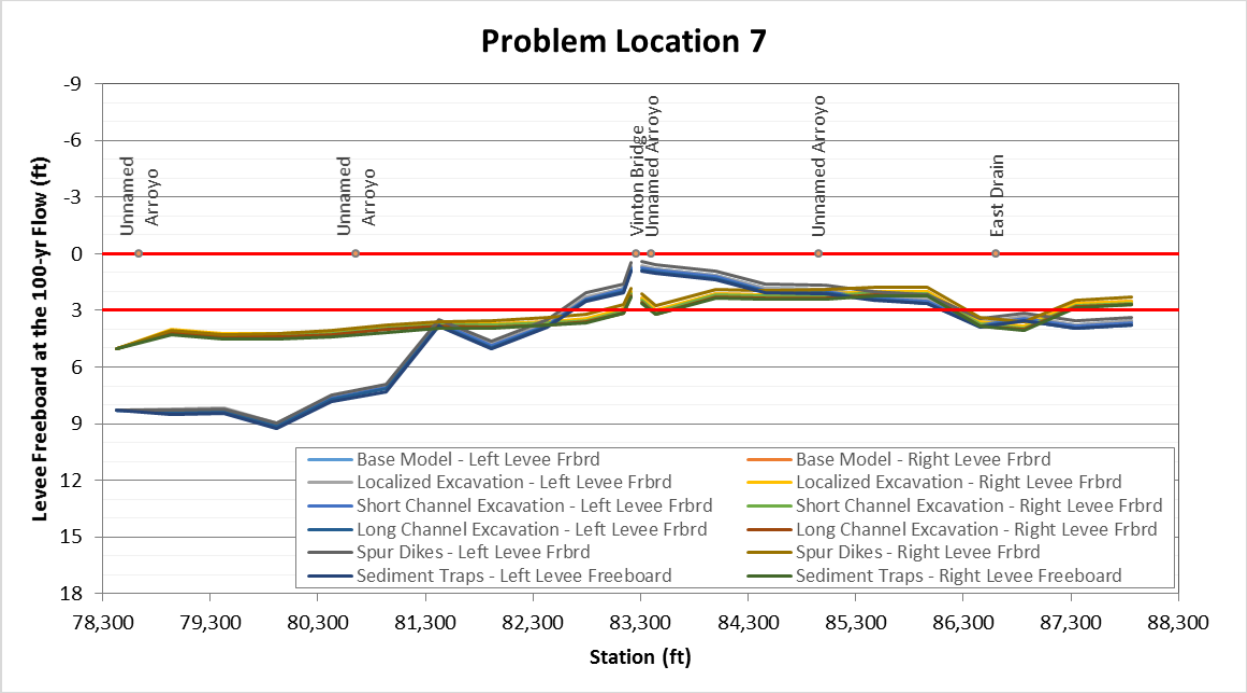


Figure O.5. Predicted levee freeboard during the 100-year flow at Problem Location 7 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

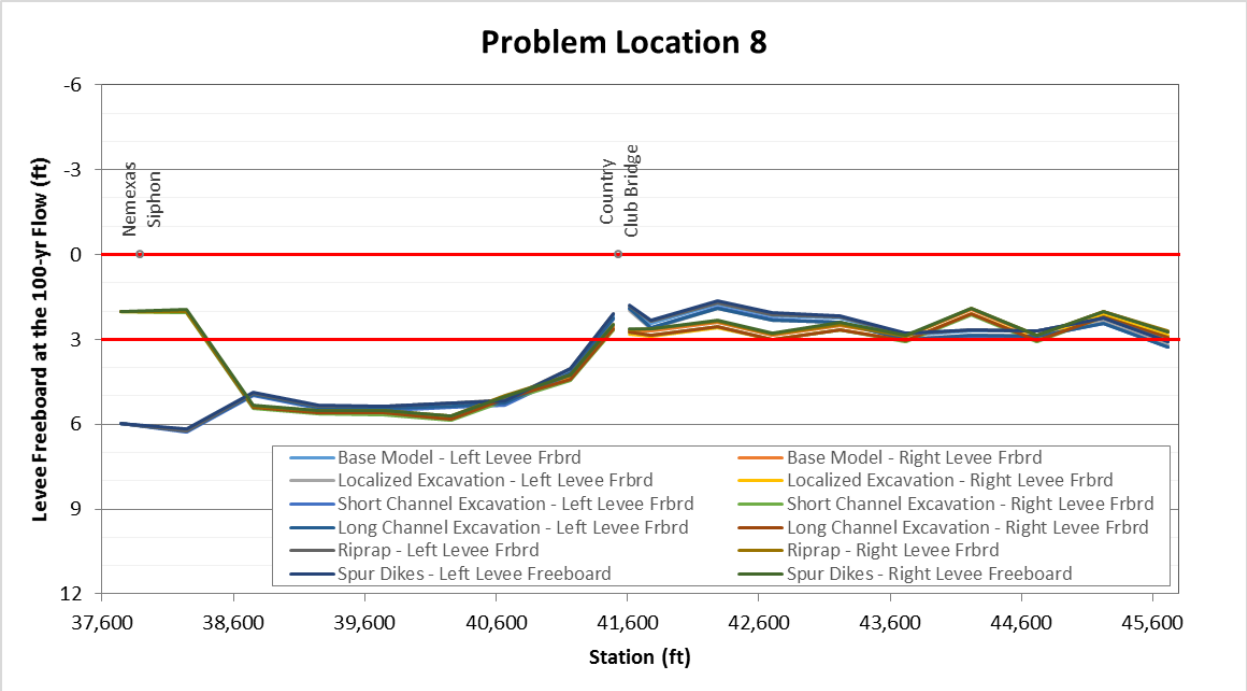


Figure O.6. Predicted levee freeboard during the 100-year flow at Problem Location 8 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

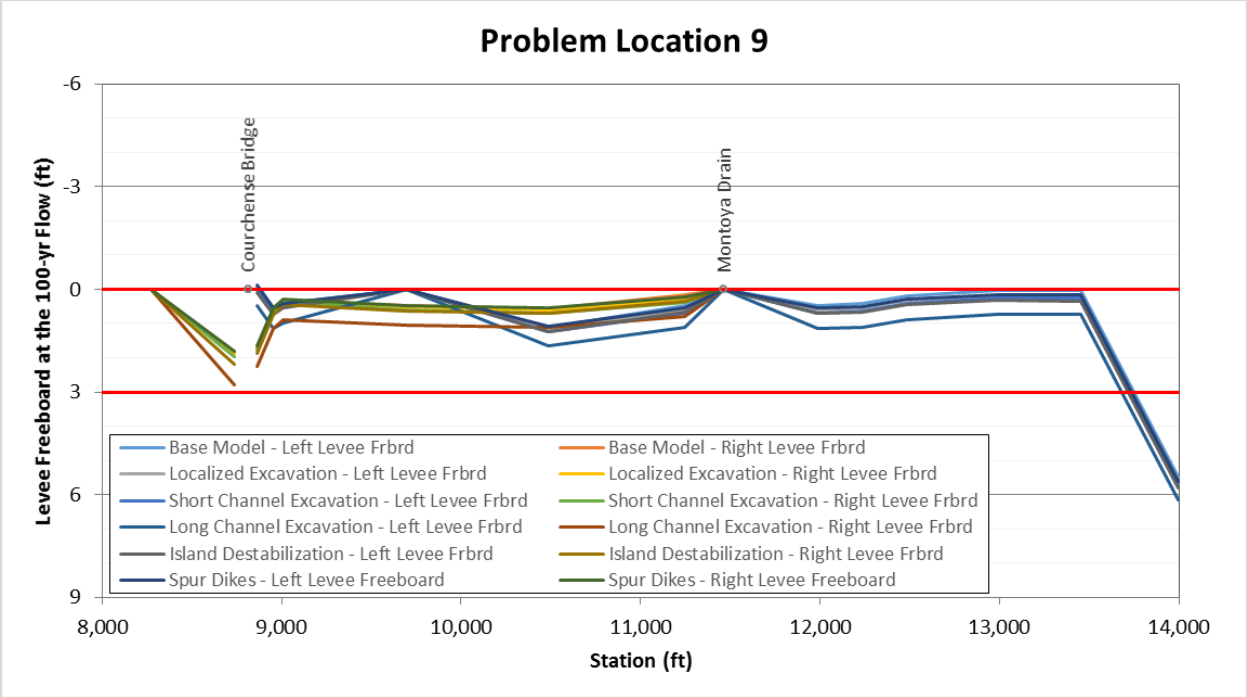


Figure O.7. Predicted levee freeboard during the 100-year flow at Problem Location 9 representing long-term conditions based on hydraulic modeling with the predicted geometry at the end of the sediment-transport simulations of the base and alternative conditions.

Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project:
Final Report

APPENDIX P

Cost Estimates

October 20, 2015

Contract No. IBM09D0006
Order No. IBM14T0016

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Annualized Costs by Problem Location Alternative*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

TOTAL ANNUAL COSTS BY PROBLEM LOCATION AND ALTERNATIVE

PROBLEM LOCATION 1: TIERRA BLANCA CREEK TO SIBLEY ARROYO

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Sediment Traps in Arroyos	Modification of the TB Vortex Weir
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$196,130	$462,974	$58,728	$706,400	$20,059
2	Planning, Engineering & Design (PED)	LS	1	$29,419	$69,446	$8,809	$105,960	$3,009
3	Construction Management (CM)	LS	1	$19,613	$46,297	$5,873	$70,640	$2,006
4	*Construction Subtotal*	*LS*	*1*	*$245,162*	*$578,717*	*$73,410*	*$883,000*	*$25,074*
5	Construction Contingency	LS	1	$58,839	$138,892	$17,618	$211,920	$6,018
6	*Total First Costs*	*LS*	*1*	*$304,001*	*$717,610*	*$91,028*	*$1,094,920*	*$31,092*
7	Annualized First Costs	LS	1	$12,700	$30,000	$3,800	$45,700	$1,300
8	Life Cycle O&M Costs	LS	1	$2,667,363	$4,120,468	$1,835,238	$4,415,001	$50,149
9	O&M Contingency	LS	1	$800,209	$1,236,140	$550,571	$1,324,500	$15,045
10	*O&M Total Costs*	*LS*	*1*	*$3,467,572*	*$5,356,608*	*$2,385,810*	*$5,739,501*	*$65,193*
11	Annualized O&M Costs	LS	1	$144,600	$223,300	$99,500	$239,300	$2,800
12	*Total Annualized Project Costs*	*LS*	*1*	*$157,300*	*$253,300*	*$103,300*	*$285,000*	*$4,100*

PROBLEM LOCATION 2: SALEM BRIDGE TO PLACITAS ARROYO

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Sediment Traps in Arroyos	Island Destabilization / Vegetation Removal
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$793,004	$1,188,484	$430,616	$465,231	$338,940
2	Planning, Engineering & Design (PED)	LS	1	$118,951	$178,273	$64,592	$69,785	$50,841
3	Construction Management (CM)	LS	1	$79,300	$118,848	$43,062	$46,523	$33,894
4	*Construction Subtotal*	*LS*	*1*	*$991,255*	*$1,485,605*	*$538,270*	*$581,538*	*$423,675*
5	Construction Contingency	LS	1	$237,901	$356,545	$129,185	$139,569	$101,682
6	*Total First Costs*	*LS*	*1*	*$1,229,157*	*$1,842,150*	*$667,455*	*$721,108*	*$525,357*
7	Annualized First Costs	LS	1	$51,300	$76,800	$27,900	$30,100	$21,900
8	Life Cycle O&M Costs	LS	1	$3,925,372	$5,764,148	$2,833,456	$1,116,554	$1,016,819
9	O&M Contingency	LS	1	$1,177,611	$1,729,244	$850,037	$334,966	$305,046
10	*O&M Total Costs*	*LS*	*1*	*$5,102,983*	*$7,493,393*	*$3,683,492*	*$1,451,520*	*$1,321,865*
11	Annualized O&M Costs	LS	1	$212,700	$312,400	$153,600	$60,500	$55,100
12	*Total Annualized Project Costs*	*LS*	*1*	*$264,000*	*$389,200*	*$181,500*	*$90,600*	*$77,000*

PROBLEM LOCATION 3: RINCON SIPHON A RESTORATION SITE TO RINCON SIPHON

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Sediment Traps in Arroyos	Replace Rincon Siphon with Flume
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$162,128	$342,192	$105,692	$99,764	$1,283,501
2	Planning, Engineering & Design (PED)	LS	1	$24,319	$51,329	$15,854	$14,965	$192,525
3	Construction Management (CM)	LS	1	$16,213	$34,219	$10,569	$9,976	$128,350
4	*Construction Subtotal*	*LS*	*1*	*$202,660*	*$427,740*	*$132,116*	*$124,705*	*$1,604,376*
5	Construction Contingency	LS	1	$48,638	$102,658	$31,708	$29,929	$385,050
6	*Total First Costs*	*LS*	*1*	*$251,299*	*$530,398*	*$163,823*	*$154,634*	*$1,989,426*
7	Annualized First Costs	LS	1	$10,500	$22,200	$6,900	$6,500	$83,000
8	Life Cycle O&M Costs	LS	1	$885,220	$1,591,194	$695,456	$140,069	$320,875
9	O&M Contingency	LS	1	$265,566	$477,358	$208,637	$42,021	$96,263
10	*O&M Total Costs*	*LS*	*1*	*$1,150,786*	*$2,068,552*	*$904,093*	*$182,089*	*$417,138*
11	Annualized O&M Costs	LS	1	$48,000	$86,300	$37,700	$7,600	$17,400
12	*Total Annualized Project Costs*	*LS*	*1*	*$58,500*	*$108,500*	*$44,600*	*$14,100*	*$100,400*

TOTAL ANNUAL COSTS BY PROBLEM LOCATION AND ALTERNATIVE

PROBLEM LOCATION 4: **RINCON ARROYO TO BIGNELL ARROYO**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Island Destabilization / Spur Dikes	Low-Elevation Spur Dikes
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$607,826	$2,064,157	$354,064	$428,803	$373,807
2	Planning, Engineering & Design (PED)	LS	1	$91,174	$309,624	$53,110	$64,320	$56,071
3	Construction Management (CM)	LS	1	$60,783	$206,416	$35,406	$42,880	$37,381
4	*Construction Subtotal*	*LS*	*1*	*$759,783*	*$2,580,197*	*$442,580*	*$536,003*	*$467,259*
5	Construction Contingency	LS	1	$182,348	$619,247	$106,219	$128,641	$112,142
6	*Total First Costs*	*LS*	*1*	*$942,131*	*$3,199,444*	*$548,800*	*$664,644*	*$579,401*
7	Annualized First Costs	LS	1	$39,300	$133,400	$22,900	$27,800	$24,200
8	Life Cycle O&M Costs	LS	1	$11,396,741	$9,598,332	$6,638,706	$1,286,408	$747,614
9	O&M Contingency	LS	1	$3,419,022	$2,879,500	$1,991,612	$385,922	$224,284
10	*O&M Total Costs*	*LS*	*1*	*$14,815,763*	*$12,477,832*	*$8,630,317*	*$1,672,331*	*$971,898*
11	Annualized O&M Costs	LS	1	$617,500	$520,100	$359,700	$69,700	$40,600
12	*Total Annualized Project Costs*	*LS*	*1*	*$656,800*	*$653,500*	*$382,600*	*$97,500*	*$64,800*

PROBLEM LOCATION 5: **ROCK CANYON TO BELOW RINCON/TONUCO DRAIN OUTLET**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Sediment Traps in Arroyos	Low-Elevation Spur Dikes
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$957,609	$957,609	$957,609	$957,609	$957,609
2	Planning, Engineering & Design (PED)	LS	1	$957,609	$957,609	$957,609	$957,609	$957,609
3	Construction Management (CM)	LS	1	$957,609	$957,609	$957,609	$957,609	$957,609
4	*Construction Subtotal*	*LS*	*1*	*$2,872,826*	*$2,872,826*	*$2,872,826*	*$2,872,826*	*$2,872,826*
5	Construction Contingency	LS	1	$957,609	$957,609	$957,609	$957,609	$957,609
6	*Total First Costs*	*LS*	*1*	*$3,830,434*	*$3,830,434*	*$3,830,434*	*$3,830,434*	*$3,830,434*
7	Annualized First Costs	LS	1	$159,700	$159,700	$159,700	$159,700	$159,700
8	Life Cycle O&M Costs	LS	1	$2,671,117	$2,025,190	$3,052,870	$297,412	$1,153,888
9	O&M Contingency	LS	1	$801,335	$607,557	$915,861	$89,224	$346,166
10	*O&M Total Costs*	*LS*	*1*	*$3,472,452*	*$2,632,747*	*$3,968,730*	*$386,636*	*$1,500,055*
11	Annualized O&M Costs	LS	1	$144,800	$109,800	$165,500	$16,200	$62,600
12	*Total Annualized Project Costs*	*LS*	*1*	*$304,500*	*$269,500*	*$325,200*	*$175,900*	*$222,300*

PROBLEM LOCATION 6: **PICACHO DRAIN TO BELOW MESILLA DAM**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives		Non-Sediment Removal Alternatives		
				Channel Excavation (Short)	Channel Excavation (Long)	New Check/Sluice Structures in Canals	Mesilla Dam Gate Automation	Installation of Vortex Tubes
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$332,117	$544,351	$2,127,960	$2,300,000	$272,550
2	Planning, Engineering & Design (PED)	LS	1	$49,817	$81,653	$319,194	$345,000	$40,883
3	Construction Management (CM)	LS	1	$33,212	$54,435	$212,796	$230,000	$27,255
4	*Construction Subtotal*	*LS*	*1*	*$415,146*	*$680,438*	*$2,659,950*	*$2,875,000*	*$340,688*
5	Construction Contingency	LS	1	$99,635	$163,305	$638,388	$690,000	$81,765
6	*Total First Costs*	*LS*	*1*	*$514,781*	*$843,744*	*$3,298,338*	*$3,565,000*	*$422,453*
7	Annualized First Costs	LS	1	$21,500	$35,200	$137,500	$148,600	$17,700
8	Life Cycle O&M Costs	LS	1	$23,580,275	$3,919,326	$319,194	$287,500	$136,275
9	O&M Contingency	LS	1	$7,074,083	$1,175,798	$95,758	$86,250	$40,883
10	*O&M Total Costs*	*LS*	*1*	*$30,654,358*	*$5,095,123*	*$414,952*	*$373,750*	*$177,158*
11	Annualized O&M Costs	LS	1	$1,277,600	$212,400	$17,300	$15,600	$7,400
12	*Total Annualized Project Costs*	*LS*	*1*	*$1,299,100*	*$247,600*	*$154,800*	*$164,200*	*$25,100*

TOTAL ANNUAL COSTS BY PROBLEM LOCATION AND ALTERNATIVE

PROBLEM LOCATION 7: **EAST DRAIN TO BELOW VINTON BRIDGE**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Sediment Traps in Arroyos	Low-Elevation Spur Dikes
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$357,561	$452,902	$41,281	$387,117	$409,567
2	Planning, Engineering & Design (PED)	LS	1	$53,634	$67,935	$6,192	$58,068	$61,435
3	Construction Management (CM)	LS	1	$35,756	$45,290	$4,128	$38,712	$40,957
4	*Construction Subtotal*	*LS*	*1*	*$446,951*	*$566,128*	*$51,601*	*$483,896*	*$511,958*
5	Construction Contingency	LS	1	$107,268	$135,871	$12,384	$116,135	$122,870
6	*Total First Costs*	*LS*	*1*	*$554,219*	*$701,998*	*$63,986*	*$600,031*	*$634,828*
7	Annualized First Costs	LS	1	$23,100	$29,300	$2,700	$25,100	$26,500
8	Life Cycle O&M Costs	LS	1	$2,302,692	$2,500,020	$774,018	$966,243	$819,134
9	O&M Contingency	LS	1	$690,808	$750,006	$232,205	$289,873	$245,740
10	*O&M Total Costs*	*LS*	*1*	*$2,993,500*	*$3,250,026*	*$1,006,224*	*$1,256,116*	*$1,064,874*
11	Annualized O&M Costs	LS	1	$124,800	$135,500	$42,000	$52,400	$44,400
12	*Total Annualized Project Costs*	*LS*	*1*	*$147,900*	*$164,800*	*$44,700*	*$77,500*	*$70,900*

PROBLEM LOCATION 8: **ABOVE COUNTRY CLUB BRIDGE TO NEMEXAS SIPHON**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Riprap in Narrow Floodplain Areas	Low-Elevation Spur Dikes
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$200,716	$402,811	$82,660	$268,008	$197,011
2	Planning, Engineering & Design (PED)	LS	1	$30,107	$60,422	$12,399	$40,201	$29,552
3	Construction Management (CM)	LS	1	$20,072	$40,281	$8,266	$26,801	$19,701
4	*Construction Subtotal*	*LS*	*1*	*$250,896*	*$503,513*	*$103,325*	*$335,009*	*$246,264*
5	Construction Contingency	LS	1	$60,215	$120,843	$24,798	$80,402	$59,103
6	*Total First Costs*	*LS*	*1*	*$311,110*	*$624,356*	*$128,123*	*$415,412*	*$305,367*
7	Annualized First Costs	LS	1	$13,000	$26,100	$5,400	$17,400	$12,800
8	Life Cycle O&M Costs	LS	1	$3,763,433	$4,108,667	$2,479,808	$201,006	$394,022
9	O&M Contingency	LS	1	$1,129,030	$1,232,600	$743,942	$60,302	$118,207
10	*O&M Total Costs*	*LS*	*1*	*$4,892,462*	*$5,341,267*	*$3,223,751*	*$261,307*	*$512,229*
11	Annualized O&M Costs	LS	1	$204,000	$222,700	$134,400	$10,900	$21,400
12	*Total Annualized Project Costs*	*LS*	*1*	*$217,000*	*$248,800*	*$139,800*	*$28,300*	*$34,200*

PROBLEM LOCATION 9: **MONTOYA DRAIN TO AMERICAN DAM**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Island Destabilization / Vegetation Removal	Low-Elevation Spur Dikes
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$362,602	$1,646,860	$145,432	$141,632	$150,219
2	Planning, Engineering & Design (PED)	LS	1	$54,390	$247,029	$21,815	$21,245	$22,533
3	Construction Management (CM)	LS	1	$36,260	$164,686	$14,543	$14,163	$15,022
4	*Construction Subtotal*	*LS*	*1*	*$453,253*	*$2,058,575*	*$181,790*	*$177,040*	*$187,774*
5	Construction Contingency	LS	1	$108,781	$494,058	$43,630	$42,490	$45,066
6	*Total First Costs*	*LS*	*1*	*$562,034*	*$2,552,634*	*$225,419*	*$219,529*	*$232,840*
7	Annualized First Costs	LS	1	$23,500	$106,400	$9,400	$9,200	$9,800
8	Life Cycle O&M Costs	LS	1	$4,583,295	$7,904,930	$10,398,379	$424,896	$300,439
9	O&M Contingency	LS	1	$1,374,989	$2,371,479	$3,119,514	$127,469	$90,132
10	*O&M Total Costs*	*LS*	*1*	*$5,958,284*	*$10,276,409*	*$13,517,893*	*$552,364*	*$390,570*
11	Annualized O&M Costs	LS	1	$248,400	$428,300	$563,400	$23,100	$16,300
12	*Total Annualized Project Costs*	*LS*	*1*	*$271,900*	*$534,700*	*$572,800*	*$32,300*	*$26,100*

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 1 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 1: **TIERRA BLANCA CREEK TO SIBLEY ARROYO**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Modification of the TB Vortex Weir	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$21,318	1	$50,323	1	$6,383	1	$76,783	1	$2,180
2	Site Access and Staging	LS	2.50%	1	$4,264	1	$10,065	1	$1,277	1	$15,357	1	$436
3	Clearing and Grubbing	ACRE	$2,000.00	2.6	$5,120	6.0	$12,000	2.4	$4,780	9.8	$19,600	1.0	$2,000
4	Excavation (Sediment Removal)	CY	$2.75	20,550	$56,513	48,520	$133,430	5,750	$15,813	0	$0	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	20,550	$78,090	48,520	$184,376	5,750	$21,850	0	$0	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	20,550	$30,825	48,520	$72,780	5,750	$8,625	0	$0	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	59,532	$253,011	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	360	$18,000	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	525	$39,375	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	560	$47,600	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	575	$17,250	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	440	$24,200	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	3,125	$10,938	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	350	$5,338	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	2,222	$14,443
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	29,475	$58,950	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	3	$120,000	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	50	$500
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	25	$500
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	0	$0
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$196,130	$462,974	$58,728	$706,400	$20,059
Planning, Engineering & Design (PED - 15%)	$29,419	$69,446	$8,809	$105,960	$3,009
Construction Management (CM - 10%)	$19,613	$46,297	$5,873	$70,640	$2,006
Sub-total Cost (1):	$245,162	$578,717	$73,410	$883,000	$25,074
Construction Continency (30%):	$58,839	$138,892	$17,618	$211,920	$6,018
Total Construction Cost:	**$304,001**	**$717,610**	**$91,028**	**$1,094,920**	**$31,092**

PROBLEM LOCATION 1: **TIERRA BLANCA CREEK TO SIBLEY ARROYO**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Modification of the TB Vortex Weir	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
3	O&M Year 3	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	0.0%	$0	0.0%	$0
6	O&M Year 6	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
9	O&M Year 9	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	25.0%	$176,600	50.0%	$10,030
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
15	O&M Year 15	LS	% of Const.	85.0%	$166,710	89.0%	$412,047	62.5%	$36,705	0.0%	$0	0.0%	$0
16	O&M Year 16	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	25.0%	$176,600	50.0%	$10,030
21	O&M Year 21	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	0.0%	$0	0.0%	$0
26	O&M Year 26	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
27	O&M Year 27	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	85.0%	$166,710	89.0%	$412,047	62.5%	$36,705	25.0%	$176,600	50.0%	$10,030
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
33	O&M Year 33	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	0.0%	$0	0.0%	$0
36	O&M Year 36	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
39	O&M Year 39	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	25.0%	$176,600	50.0%	$10,030
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
45	O&M Year 45	LS	% of Const.	85.0%	$166,710	89.0%	$412,047	62.5%	$36,705	0.0%	$0	0.0%	$0
46	O&M Year 46	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	25.0%	$176,600	50.0%	$10,030

Total O&M Cost per Location:	$2,667,363	$4,120,468	$1,835,238	$4,415,001	$50,149
O&M Continency (30%):	$800,209	$1,236,140	$550,571	$1,324,500	$15,045
Total O&M Cost:	**$3,467,572**	**$5,356,608**	**$2,385,810**	**$5,739,501**	**$65,193**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 2 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 2: **SALEM BRIDGE TO PLACITAS ARROYO**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Island Destabilization / Vegetation Removal	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$86,196	1	$129,183	1	$46,806	1	$50,569	1	$36,841
2	Site Access and Staging	LS	2.50%	1	$17,239	1	$25,837	1	$9,361	1	$10,114	1	$7,368
3	Clearing and Grubbing	ACRE	$2,000.00	4.4	$8,700	6.0	$12,000	1.4	$2,700	5.9	$11,800	34.7	$69,400
4	Excavation (Sediment Removal)	CY	$2.75	84,580	$232,595	126,890	$348,948	46,180	$126,995	0	$0	27,991	$76,976
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	84,580	$321,404	126,890	$482,182	46,180	$175,484	0	$0	27,991	$106,367
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	84,580	$126,870	126,890	$190,335	46,180	$69,270	0	$0	27,991	$41,987
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	33,982	$144,424	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	290	$14,500	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	325	$24,375	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	310	$26,350	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	305	$9,150	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	280	$15,400	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	0	$0	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	0	$0	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	19,275	$38,550	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	3	$120,000	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	0	$0
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$793,004	$1,188,484	$430,616	$465,231	$338,940
Planning, Engineering & Design (PED - 15%)	$118,951	$178,273	$64,592	$69,785	$50,841
Construction Management (CM - 10%)	$79,300	$118,848	$43,062	$46,523	$33,894
Sub-total Cost (1):	$991,255	$1,485,605	$538,270	$581,538	$423,675
Construction Continency (30%):	$237,901	$356,545	$129,185	$139,569	$101,682
Total Construction Cost:	**$1,229,157**	**$1,842,150**	**$667,455**	**$721,108**	**$525,357**

PROBLEM LOCATION 2: **SALEM BRIDGE TO PLACITAS ARROYO**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Island Destabilization / Vegetation Removal	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	25.0%	$84,735
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
6	O&M Year 6	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	30.0%	$139,569	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	25.0%	$84,735
9	O&M Year 9	LS	% of Const.	99.0%	$785,074	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	0.0%	$0	97.0%	$1,152,830	0.0%	$0	0.0%	$0	0.0%	$0
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	30.0%	$139,569	25.0%	$84,735
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
16	O&M Year 16	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	25.0%	$84,735
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	99.0%	$785,074	0.0%	$0	0.0%	$0	30.0%	$139,569	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	0.0%	$0	97.0%	$1,152,830	0.0%	$0	0.0%	$0	25.0%	$84,735
21	O&M Year 21	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	30.0%	$139,569	25.0%	$84,735
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
26	O&M Year 26	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	99.0%	$785,074	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	0.0%	$0	25.0%	$84,735
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	0.0%	$0	97.0%	$1,152,830	0.0%	$0	30.0%	$139,569	0.0%	$0
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	25.0%	$84,735
33	O&M Year 33	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	0.0%	$0	0.0%	$0
36	O&M Year 36	LS	% of Const.	99.0%	$785,074	0.0%	$0	0.0%	$0	30.0%	$139,569	25.0%	$84,735
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	0.0%	$0	97.0%	$1,152,830	0.0%	$0	0.0%	$0	25.0%	$84,735
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	30.0%	$139,569	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	25.0%	$84,735
45	O&M Year 45	LS	% of Const.	99.0%	$785,074	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
46	O&M Year 46	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	30.0%	$139,569	25.0%	$84,735
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	0.0%	$0	97.0%	$1,152,830	0.0%	$0	0.0%	$0	0.0%	$0

Total O&M Cost per Location:	$3,925,372	$5,764,148	$2,833,456	$1,116,554	$1,016,819
O&M Continency (30%):	$1,177,611	$1,729,244	$850,037	$334,966	$305,046
Total Construction Cost:	**$5,102,983**	**$7,493,393**	**$3,683,492**	**$1,451,520**	**$1,321,865**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 3 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 3: **RINCON SIPHON A RESTORATION SITE TO RINCON SIPHON**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Replace Rincon Siphon with Flume	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$17,623	1	$37,195	1	$11,488	1	$10,844	1	$139,511
2	Site Access and Staging	LS	2.50%	1	$3,525	1	$7,439	1	$2,298	1	$2,169	1	$27,902
3	Clearing and Grubbing	ACRE	$2,000.00	1.2	$2,360	2.4	$4,780	0.4	$700	0.6	$1,200	0.5	$1,000
4	Excavation (Sediment Removal)	CY	$2.75	17,220	$47,355	36,370	$100,018	11,330	$31,158	0	$0	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	17,220	$65,436	36,370	$138,206	11,330	$43,054	0	$0	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	17,220	$25,830	36,370	$54,555	11,330	$16,995	0	$0	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	2,765	$11,751	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	0	$0	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	95	$7,125	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	140	$11,900	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	110	$3,300	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	45	$2,475	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	0	$0	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	0	$0	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	4,500	$9,000	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	1	$40,000	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	3,000	$30,000
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	12,370	$247,400
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	1,675	$167,500
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	575	$30,188
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	800	$640,000
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	0	$0
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$162,128	$342,192	$105,692	$99,764	$1,283,501
Planning, Engineering & Design (PED - 15%)	$24,319	$51,329	$15,854	$14,965	$192,525
Construction Management (CM - 10%)	$16,213	$34,219	$10,569	$9,976	$128,350
Sub-total Cost (1):	$202,660	$427,740	$132,116	$124,705	$1,604,376
Construction Continency (30%):	$48,638	$102,658	$31,708	$29,929	$385,050
Total Construction Cost:	**$251,299**	**$530,398**	**$163,823**	**$154,634**	**$1,989,426**

PROBLEM LOCATION 3: **RINCON SIPHON A RESTORATION SITE TO RINCON SIPHON**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Replace Rincon Siphon with Flume	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
6	O&M Year 6	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	91.0%	$147,537	0.0%	$0	0.0%	$0	11.7%	$11,672	5.0%	$64,175
9	O&M Year 9	LS	% of Const.	0.0%	$0	93.0%	$318,239	0.0%	$0	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
16	O&M Year 16	LS	% of Const.	91.0%	$147,537	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	0.0%	$0	93.0%	$318,239	0.0%	$0	0.0%	$0	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	11.7%	$11,672	5.0%	$64,175
21	O&M Year 21	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	91.0%	$147,537	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
26	O&M Year 26	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	0.0%	$0	93.0%	$318,239	0.0%	$0	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	11.7%	$11,672	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	5.0%	$64,175
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	91.0%	$147,537	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
33	O&M Year 33	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	0.0%	$0	0.0%	$0
36	O&M Year 36	LS	% of Const.	0.0%	$0	93.0%	$318,239	0.0%	$0	11.7%	$11,672	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	91.0%	$147,537	0.0%	$0	0.0%	$0	11.7%	$11,672	5.0%	$64,175
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	0.0%	$0	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
45	O&M Year 45	LS	% of Const.	0.0%	$0	93.0%	$318,239	0.0%	$0	0.0%	$0	0.0%	$0
46	O&M Year 46	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	91.0%	$147,537	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	5.0%	$64,175

Total O&M Cost per Location:	$885,220	$1,591,194	$695,456	$140,069	$320,875
O&M Continency (30%):	$265,566	$477,358	$208,637	$42,021	$96,263
Total Construction Cost:	**$1,150,786**	**$2,068,552**	**$904,093**	**$182,089**	**$417,138**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 4 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 4: **RINCON ARROYO TO BIGNELL ARROYO**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Island Destabilization / Spur Dikes		Low-Elevation Spur Dikes	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$66,068	1	$224,365	1	$38,485	1	$46,609	1	$40,631
2	Site Access and Staging	LS	2.50%	1	$13,214	1	$44,873	1	$7,697	1	$9,322	1	$8,126
3	Clearing and Grubbing	ACRE	$2,000.00	1.5	$2,960	5.6	$11,120	0.8	$1,660	43.9	$87,800	1.0	$2,000
4	Excavation (Sediment Removal)	CY	$2.75	65,290	$179,548	221,590	$609,373	38,040	$104,610	35,413	$97,385	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	65,290	$248,102	221,590	$842,042	38,040	$144,552	35,413	$134,568	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	65,290	$97,935	221,590	$332,385	38,040	$57,060	35,413	$53,119	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	0	$0	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	0	$0	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	0	$0	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	0	$0	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	0	$0	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	0	$0	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	0	$0	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	0	$0	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	0	$0	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	4,245	$297,150
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	2,123	$21,230
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	849	$4,670
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$607,826	$2,064,157	$354,064	$428,803	$373,807
Planning, Engineering & Design (PED - 15%)	$91,174	$309,624	$53,110	$64,320	$56,071
Construction Management (CM - 10%)	$60,783	$206,416	$35,406	$42,880	$37,381
Sub-total Cost (1):	$759,783	$2,580,197	$442,580	$536,003	$467,259
Construction Continency (30%):	$182,348	$619,247	$106,219	$128,641	$112,142
Total Construction Cost:	**$942,131**	**$3,199,444**	**$548,800**	**$664,644**	**$579,401**

PROBLEM LOCATION 4: **RINCON ARROYO TO BIGNELL ARROYO**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Island Destabilization / Spur Dikes		Low-Elevation Spur Dikes	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$56,071
6	O&M Year 6	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
9	O&M Year 9	LS	% of Const.	0.0%	$0	93.0%	$1,919,666	0.0%	$0	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	25.0%	$93,452
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$56,071
16	O&M Year 16	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	75.0%	$455,870	93.0%	$1,919,666	75.0%	$265,548	0.0%	$0	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	25.0%	$93,452
21	O&M Year 21	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$56,071
26	O&M Year 26	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	0.0%	$0	93.0%	$1,919,666	0.0%	$0	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	25.0%	$93,452
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
33	O&M Year 33	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$56,071
36	O&M Year 36	LS	% of Const.	75.0%	$455,870	93.0%	$1,919,666	75.0%	$265,548	25.0%	$107,201	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	25.0%	$93,452
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
45	O&M Year 45	LS	% of Const.	0.0%	$0	93.0%	$1,919,666	0.0%	$0	0.0%	$0	15.0%	$56,071
46	O&M Year 46	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	25.0%	$93,452

Total O&M Cost per Location:	$11,396,741	$9,598,332	$6,638,706	$1,286,408	$747,614
O&M Continency (30%):	$3,419,022	$2,879,500	$1,991,612	$385,922	$224,284
Total Construction Cost:	**$14,815,763**	**$12,477,832**	**$8,630,317**	**$1,672,331**	**$971,898**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 5 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 5: **ROCK CANYON TO BELOW RINCON/TONUCO DRAIN OUTLET**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Low-Elevation Spur Dikes	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$101,873	1	$224,622	1	$72,138	1	$31,234	1	$62,711
2	Site Access and Staging	LS	2.50%	1	$20,375	1	$44,924	1	$14,428	1	$6,247	1	$12,542
3	Clearing and Grubbing	ACRE	$2,000.00	1.3	$2,580	5.4	$10,840	1.8	$3,620	2.9	$5,800	1.5	$3,000
4	Excavation (Sediment Removal)	CY	$2.75	100,920	$277,530	221,880	$610,170	71,240	$195,910	0	$0	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	100,920	$383,496	221,880	$843,144	71,240	$270,712	0	$0	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	100,920	$151,380	221,880	$332,820	71,240	$106,860	0	$0	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	14,162	$60,189	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	150	$7,500	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	245	$18,375	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	250	$21,250	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	210	$6,300	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	175	$9,625	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	860	$3,010	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	100	$1,525	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	18,150	$36,300	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	2	$80,000	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	6,553	$458,710
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	3,277	$32,770
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	1,311	$7,211
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$937,234	$2,066,520	$663,667	$287,355	$576,944
Planning, Engineering & Design (PED - 15%)	$140,585	$309,978	$99,550	$43,103	$86,542
Construction Management (CM - 10%)	$93,723	$206,652	$66,367	$28,735	$57,694
Sub-total Cost (1):	$1,171,542	$2,583,150	$829,584	$359,193	$721,180
Construction Continency (30%):	$281,170	$619,956	$199,100	$86,206	$173,083
Total Construction Cost:	**$1,452,713**	**$3,203,106**	**$1,028,684**	**$445,400**	**$894,263**

PROBLEM LOCATION 5: **ROCK CANYON TO BELOW RINCON/TONUCO DRAIN OUTLET**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Low-Elevation Spur Dikes	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$86,542
6	O&M Year 6	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
9	O&M Year 9	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	0.0%	$0	0.0%	$0	92.0%	$610,574	20.7%	$59,482	25.0%	$144,236
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
13	O&M Year 13	LS	% of Const.	95.0%	$890,372	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$86,542
16	O&M Year 16	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	0.0%	$0	0.0%	$0	92.0%	$610,574	20.7%	$59,482	25.0%	$144,236
21	O&M Year 21	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$86,542
26	O&M Year 26	LS	% of Const.	95.0%	$890,372	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	0.0%	$0	98.0%	$2,025,190	0.0%	$0	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	0.0%	$0	0.0%	$0	92.0%	$610,574	20.7%	$59,482	25.0%	$144,236
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
33	O&M Year 33	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$86,542
36	O&M Year 36	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	95.0%	$890,372	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	0.0%	$0	0.0%	$0	92.0%	$610,574	20.7%	$59,482	25.0%	$144,236
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
45	O&M Year 45	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$86,542
46	O&M Year 46	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	0.0%	$0	0.0%	$0	92.0%	$610,574	20.7%	$59,482	25.0%	$144,236

Total O&M Cost per Location:	$2,671,117	$2,025,190	$3,052,870	$297,412	$1,153,888
O&M Continency (30%):	$801,335	$607,557	$915,861	$89,224	$346,166
Total Construction Cost:	**$3,472,452**	**$2,632,747**	**$3,968,730**	**$386,636**	**$1,500,055**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 6 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 6: **PICACHO DRAIN TO BELOW MESILLA DAM**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives				Non-Sediment Removal Alternatives					
				Channel Excavation (Short)		Channel Excavation (Long)		New Check/Sluice Structures in Canals		Mesilla Dam Gate Automation		Installation of Vortex Tubes	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$36,100	1	$59,169	1	$231,300	1	$250,000	1	$29,625
2	Site Access and Staging	LS	2.50%	1	$7,220	1	$11,834	1	$46,260	1	$50,000	1	$5,925
3	Clearing and Grubbing	ACRE	$2,000.00	1.4	$2,700	2.5	$5,080	0.2	$400	0.0	$0	0.5	$1,000
4	Excavation (Sediment Removal)	CY	$2.75	35,540	$97,735	58,170	$159,968	0	$0	0	$0	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	35,540	$135,052	58,170	$221,046	0	$0	0	$0	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	35,540	$53,310	58,170	$87,255	0	$0	0	$0	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	0	$0	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	0	$0	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	0	$0	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	0	$0	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	0	$0	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	0	$0	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	0	$0	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	0	$0	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	0	$0	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	0	$0
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	300	$187,500
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	200	$5,000
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	800	$28,000
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	4	$8,000
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	5	$7,500
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	1	$800,000	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	1	$1,050,000	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	2	$2,000,000	0	$0

Total Construction Cost per Alternative:	$332,117	$544,351	$2,127,960	$2,300,000	$272,550
Planning, Engineering & Design (PED - 15%)	$49,817	$81,653	$319,194	$345,000	$40,883
Construction Management (CM - 10%)	$33,212	$54,435	$212,796	$230,000	$27,255
Sub-total Cost (1):	$415,146	$680,438	$2,659,950	$2,875,000	$340,688
Construction Continency (30%):	$99,635	$163,305	$638,388	$690,000	$81,765
Total Construction Cost:	**$514,781**	**$843,744**	**$3,298,338**	**$3,565,000**	**$422,453**

PROBLEM LOCATION 6: **PICACHO DRAIN TO BELOW MESILLA DAM**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives				Non-Sediment Removal Alternatives					
				Channel Excavation (Short)		Channel Excavation (Long)		New Check/Sluice Structures in Canals		Mesilla Dam Gate Automation		Installation of Vortex Tubes	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
5	O&M Year 5	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
6	O&M Year 6	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	0.0%	$0	0.0%	$0
7	O&M Year 7	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	142.0%	$471,606	0.0%	$0	2.5%	$53,199	0.0%	$0	0.0%	$0
9	O&M Year 9	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	2.5%	$57,500	10.0%	$27,255
11	O&M Year 11	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	0.0%	$0	0.0%	$0
13	O&M Year 13	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
16	O&M Year 16	LS	% of Const.	142.0%	$471,606	0.0%	$0	2.5%	$53,199	0.0%	$0	0.0%	$0
17	O&M Year 17	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	0.0%	$0	0.0%	$0
19	O&M Year 19	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	2.5%	$57,500	10.0%	$27,255
21	O&M Year 21	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	2.5%	$53,199	0.0%	$0	0.0%	$0
25	O&M Year 25	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
26	O&M Year 26	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
29	O&M Year 29	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	2.5%	$57,500	10.0%	$27,255
31	O&M Year 31	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	142.0%	$471,606	0.0%	$0	2.5%	$53,199	0.0%	$0	0.0%	$0
33	O&M Year 33	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
36	O&M Year 36	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	0.0%	$0	0.0%	$0
37	O&M Year 37	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	142.0%	$471,606	0.0%	$0	2.5%	$53,199	2.5%	$57,500	10.0%	$27,255
41	O&M Year 41	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	0.0%	$0	0.0%	$0
43	O&M Year 43	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
45	O&M Year 45	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
46	O&M Year 46	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	0.0%	$0	0.0%	$0
49	O&M Year 49	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	142.0%	$471,606	0.0%	$0	2.5%	$53,199	2.5%	$57,500	10.0%	$27,255

Total O&M Cost per Location:	$23,580,275	$3,919,326	$319,194	$287,500	$136,275
O&M Continency (30%):	$7,074,083	$1,175,798	$95,758	$86,250	$40,883
Total Construction Cost:	**$30,654,358**	**$5,095,123**	**$414,952**	**$373,750**	**$177,158**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 7 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 7: **EAST DRAIN TO BELOW VINTON BRIDGE**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Low-Elevation Spur Dikes	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$38,865	1	$49,229	1	$4,487	1	$42,078	1	$44,518
2	Site Access and Staging	LS	2.50%	1	$7,773	1	$9,846	1	$897	1	$8,416	1	$8,904
3	Clearing and Grubbing	ACRE	$2,000.00	2.3	$4,620	3.1	$6,140	0.5	$1,040	2.7	$5,400	1.1	$2,200
4	Excavation (Sediment Removal)	CY	$2.75	38,050	$104,638	48,160	$132,440	4,330	$11,908	0	$0	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	38,050	$144,590	48,160	$183,008	4,330	$16,454	0	$0	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	38,050	$57,075	48,160	$72,240	4,330	$6,495	0	$0	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	14,259	$60,601	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	0	$0	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	50	$3,750	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	260	$22,100	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	275	$8,250	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	245	$13,475	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	95	$6,650	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	1,360	$4,760	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	150	$2,288	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	24,675	$49,350	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	4	$160,000	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	4,651	$325,570
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	2,326	$23,260
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	930	$5,115
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$357,561	$452,902	$41,281	$387,117	$409,567
Planning, Engineering & Design (PED - 15%)	$53,634	$67,935	$6,192	$58,068	$61,435
Construction Management (CM - 10%)	$35,756	$45,290	$4,128	$38,712	$40,957
Sub-total Cost (1):	$446,951	$566,128	$51,601	$483,896	$511,958
Construction Continency (30%):	$107,268	$135,871	$12,384	$116,135	$122,870
Total Construction Cost:	**$554,219**	**$701,998**	**$63,986**	**$600,031**	**$634,828**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Low-Elevation Spur Dikes	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	0.0%	$0
4	O&M Year 4	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$61,435
6	O&M Year 6	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	15.6%	$60,390	0.0%	$0
7	O&M Year 7	LS	% of Const.	92.0%	$328,956	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	0.0%	$0	92.0%	$416,670	75.0%	$30,961	0.0%	$0	0.0%	$0
9	O&M Year 9	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	0.0%	$0
10	O&M Year 10	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	25.0%	$102,392
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	15.6%	$60,390	0.0%	$0
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	92.0%	$328,956	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	15.0%	$61,435
16	O&M Year 16	LS	% of Const.	0.0%	$0	92.0%	$416,670	75.0%	$30,961	0.0%	$0	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	15.6%	$60,390	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	25.0%	$102,392
21	O&M Year 21	LS	% of Const.	92.0%	$328,956	0.0%	$0	0.0%	$0	15.6%	$60,390	0.0%	$0
22	O&M Year 22	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	0.0%	$0	92.0%	$416,670	75.0%	$30,961	15.6%	$60,390	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$61,435
26	O&M Year 26	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	0.0%	$0
28	O&M Year 28	LS	% of Const.	92.0%	$328,956	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	15.6%	$60,390	25.0%	$102,392
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	0.0%	$0	92.0%	$416,670	75.0%	$30,961	0.0%	$0	0.0%	$0
33	O&M Year 33	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	0.0%	$0
34	O&M Year 34	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	92.0%	$328,956	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$61,435
36	O&M Year 36	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	15.6%	$60,390	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	0.0%	$0
40	O&M Year 40	LS	% of Const.	0.0%	$0	92.0%	$416,670	75.0%	$30,961	0.0%	$0	25.0%	$102,392
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	92.0%	$328,956	0.0%	$0	75.0%	$30,961	15.6%	$60,390	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
45	O&M Year 45	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	15.0%	$61,435
46	O&M Year 46	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	0.0%	$0	92.0%	$416,670	75.0%	$30,961	15.6%	$60,390	0.0%	$0
49	O&M Year 49	LS	% of Const.	92.0%	$328,956	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	25.0%	$102,392

Total O&M Cost per Location:	$2,302,692	$2,500,020	$774,018	$966,243	$819,134
O&M Continency (30%):	$690,808	$750,006	$232,205	$289,873	$245,740
Total Construction Cost:	**$2,993,500**	**$3,250,026**	**$1,006,224**	**$1,256,116**	**$1,064,874**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 8 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 8: **ABOVE COUNTRY CLUB BRIDGE TO NEMEXAS SIPHON**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Riprap in Narrow Floodplain Areas		Low-Elevation Spur Dikes	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$21,817	1	$43,784	1	$8,985	1	$29,131	1	$21,414
2	Site Access and Staging	LS	2.50%	1	$4,363	1	$8,757	1	$1,797	1	$5,826	1	$4,283
3	Clearing and Grubbing	ACRE	$2,000.00	0.7	$1,300	2.1	$4,120	0.6	$1,280	0.8	$1,600	0.5	$1,000
4	Excavation (Sediment Removal)	CY	$2.75	21,520	$59,180	43,000	$118,250	8,770	$24,118	0	$0	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	21,520	$81,776	43,000	$163,400	8,770	$33,326	0	$0	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	21,520	$32,280	43,000	$64,500	8,770	$13,155	0	$0	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	0	$0	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	0	$0	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	0	$0	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	0	$0	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	0	$0	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	0	$0	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	0	$0	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	0	$0	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	0	$0	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	2,238	$156,660
25	Over-excavation (Stone Placement)	CY	$10.00	0	$0	0	$0	0	$0	750	$7,500	1,119	$11,190
26	Compacted Backfill (Stone Placement)	CY	$5.50	0	$0	0	$0	0	$0	500	$2,750	448	$2,464
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	700	$28,000	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	2,760	$193,200	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$200,716	$402,811	$82,660	$268,008	$197,011
Planning, Engineering & Design (PED - 15%)	$30,107	$60,422	$12,399	$40,201	$29,552
Construction Management (CM - 10%)	$20,072	$40,281	$8,266	$26,801	$19,701
Sub-total Cost (1):	$250,896	$503,513	$103,325	$335,009	$246,264
Construction Continency (30%):	$60,215	$120,843	$24,798	$80,402	$59,103
Total Construction Cost:	**$311,110**	**$624,356**	**$128,123**	**$415,412**	**$305,367**

PROBLEM LOCATION 8: **ABOVE COUNTRY CLUB BRIDGE TO NEMEXAS SIPHON**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Riprap in Narrow Floodplain Areas		Low-Elevation Spur Dikes	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	15.0%	$29,552
6	O&M Year 6	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
9	O&M Year 9	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	15.0%	$40,201	25.0%	$49,253
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	15.0%	$29,552
16	O&M Year 16	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	15.0%	$40,201	25.0%	$49,253
21	O&M Year 21	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	15.0%	$29,552
26	O&M Year 26	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	15.0%	$40,201	25.0%	$49,253
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
33	O&M Year 33	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	15.0%	$29,552
36	O&M Year 36	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	15.0%	$40,201	25.0%	$49,253
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
45	O&M Year 45	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	15.0%	$29,552
46	O&M Year 46	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	15.0%	$40,201	25.0%	$49,253

Total O&M Cost per Location:	$3,763,433	$4,108,667	$2,479,808	$201,006	$394,022
O&M Continency (30%):	$1,129,030	$1,232,600	$743,942	$60,302	$118,207
Total Construction Cost:	**$4,892,462**	**$5,341,267**	**$3,223,751**	**$261,307**	**$512,229**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 9 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 9: **MONTOYA DRAIN TO AMERICAN DAM**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Island Destabilization / Vegetation Removal		Low-Elevation Spur Dikes	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$39,413	1	$179,007	1	$15,808	1	$15,395	1	$16,328
2	Site Access and Staging	LS	2.50%	1	$7,883	1	$35,801	1	$3,162	1	$3,079	1	$3,266
3	Clearing and Grubbing	ACRE	$2,000.00	4.2	$8,360	6.6	$13,240	0.2	$480	14.5	$29,000	0.4	$800
4	Excavation (Sediment Removal)	CY	$2.75	38,130	$104,858	176,250	$484,688	15,650	$43,038	11,697	$32,166	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	38,130	$144,894	176,250	$669,750	15,650	$59,470	11,697	$44,447	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	38,130	$57,195	176,250	$264,375	15,650	$23,475	11,697	$17,545	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	0	$0	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	0	$0	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	0	$0	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	0	$0	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	0	$0	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	0	$0	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	0	$0	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	0	$0	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	0	$0	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	1,706	$119,420
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	853	$8,530
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	341	$1,876
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$362,602	$1,646,860	$145,432	$141,632	$150,219
Planning, Engineering & Design (PED - 15%)	$54,390	$247,029	$21,815	$21,245	$22,533
Construction Management (CM - 10%)	$36,260	$164,686	$14,543	$14,163	$15,022
Sub-total Cost (1):	$453,253	$2,058,575	$181,790	$177,040	$187,774
Construction Continency (30%):	$108,781	$494,058	$43,630	$42,490	$45,066
Total Construction Cost:	**$562,034**	**$2,552,634**	**$225,419**	**$219,529**	**$232,840**

PROBLEM LOCATION 9: **MONTOYA DRAIN TO AMERICAN DAM**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Island Destabilization / Vegetation Removal		Low-Elevation Spur Dikes	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	15.0%	$22,533
6	O&M Year 6	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
9	O&M Year 9	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	0.0%	$0	96.0%	$1,580,986	143.0%	$207,968	0.0%	$0	25.0%	$37,555
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	15.0%	$22,533
16	O&M Year 16	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	0.0%	$0	96.0%	$1,580,986	143.0%	$207,968	25.0%	$35,408	25.0%	$37,555
21	O&M Year 21	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	15.0%	$22,533
26	O&M Year 26	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	79.0%	$286,456	96.0%	$1,580,986	143.0%	$207,968	0.0%	$0	25.0%	$37,555
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
33	O&M Year 33	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	15.0%	$22,533
36	O&M Year 36	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	0.0%	$0	96.0%	$1,580,986	143.0%	$207,968	25.0%	$35,408	25.0%	$37,555
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
45	O&M Year 45	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	15.0%	$22,533
46	O&M Year 46	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	0.0%	$0	96.0%	$1,580,986	143.0%	$207,968	0.0%	$0	25.0%	$37,555

Total O&M Cost per Location:	$4,583,295	$7,904,930	$10,398,379	$424,896	$300,439
O&M Continency (30%):	$1,374,989	$2,371,479	$3,119,514	$127,469	$90,132
Total Construction Cost:	**$5,958,284**	**$10,276,409**	**$13,517,893**	**$552,364**	**$390,570**

RIO GRANDE CANALIZATION PROJECT
UNIT COST ASSUMPTIONS

Date: 3-Aug-15

ITEM #	ITEM DESCRIPTION	UOM	UNIT COST	NOTES
1	Mobilization / Demobilization	%	12.5%	Assumes 12.5% of construction costs for mob/demob
2	Site Access and Staging	%	2.5%	Assumes 2.5% of construction costs for site access
3	Clearing and Grubbing	ACRE	$ 2,000	Assumes clearing of medium brush, including trees
4	Excavation (Sediment Removal)	CY	$ 2.75	Assumes dozers to excavate and place in stockpile
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$ 3.80	Assumes hauling 2-mi (roundtrip) on avg, to disposal site
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$ 1.50	Assumes excavating from stockpile and compacting at disposal site.
7	Excavation (Sediment Traps)	CY	$ 4.25	Assumes hydraulic exc (33% of quant.) and dozers for remaining
8	1-ft Rebar Mesh	LF	$ 50.00	Assumes 1' x 1' rebar (#4) mesh, 3' high, welded, with steel posts every 12-lf
9	8-in Rebar Mesh	LF	$ 75.00	Assumes 8" x 8" rebar (#4) mesh, 3' high, welded, with steel posts every 12-lf
10	6-in Rebar Mesh	LF	$ 85.00	Assumes 6" x 6" rebar (#4) mesh, 3' high, welded, with steel posts every 12-lf
11	4-in Wire Mesh	LF	$ 30.00	Assumes 4" x 4" wire mesh (1/8") dia., 3' high, with steel posts every 12-lf
12	2-in Wire Mesh	LF	$ 55.00	Assumes 2" x 2" wire mesh (1/8") dia., 3' high, with steel posts every 12-lf
13	1-in Wire Mesh	LF	$ 70.00	Assumes 1" x 1" wire mesh (1/8") dia., 3' high, with steel posts every 12-lf
14	Compacted Fill (Sediment Trap Berm)	CY	$ 3.50	Assumes using excavated material for berm, 3' high, 2:1 side slopes, no borrow
15	Rock Slope Protection (Sediment Trap Berm)	CY	$ 15.25	Assumes using rock from excavated materials, placed along 1 slope of berm
16	Pilot Channel Excavation	CY	$ 6.50	Assumes hydraulic excavators, material disposed on-site
17	Maintenance Road	SF	$ 2.00	Assumes 15' wide road, graded, compacted, with stabilizing material
18	Debris Rack	EA	$ 40,000	Assumes steel debris racks, field constructed, at every sediment trap
19	Structural Excavation	CY	$ 10.00	Assumes hydraulic excavators, material disposed on-site
20	Rock Removal	CY	$ 20.00	Assumes removal of loose rock and disposal on-site
21	Sheet Pile Wall Demolition	LF	$ 100	Assumes wall is 25-vlf deep, sheet piles would be removed and salvaged
22	Demo Existing Concrete Siphon	LF	$ 52.50	Assumes demo reinforced concrete box, haul materials off-site for disposal
23	Reinforced Concrete Box	CY	$ 800	Assumes reinforced concrete box, with grading and base layer
24	Spur Dike Stone	CY	$ 70.00	Includes material, delivery to project site, and placement
25	Over-excavation (Spur Dikes)	CY	$ 10.00	Assumes excavated material to be stockpiled on-site for re-use
26	Compacted Backfill (Spur Dikes)	CY	$ 5.50	Assumes re-use of previous excavated materials for backfill material
27	Bank Protection Bedding	CY	$ 40.00	Includes stone material, delivery and placement
28	Bank Protection Riprap	CY	$ 70.00	Includes stone material, delivery and placement
29	Concrete Sill	CY	$ 625	Assumes 1' thick concrete sill for vortex tube
30	Vortex Tubes	LF	$ 25.00	Assumes 8" diameter tubes placed in concrete sill
31	Escape Channels	LF	$ 35.00	Includes excavation, concrete channel, and backfill
32	Control Gate	EA	$ 2,000	Includes material and installation of 12" canal gate
33	12-in CMP Culvert	EA	$ 1,500	Assumes 12" CMP culvert with gravel bedding, earthwork elsehwere, 30-lf
34	Eastside Canal Overflow Check and Bypass	LS	$ 800,000	Includes all earthwork, concrete, gates, etc. for bypass construction
35	Westside Canal Overflow Check and Bypass	LS	$ 1,050,000	Includes all earthwork, concrete, gates, etc. for bypass construction
36	Mesilla Dam Gate Automation	EA	$ 1,000,000	Cost is a placeholder; awaiting detailed information and will be updated

DETAILED UNIT COST CALCULATIONS

ITEM NO.	COST ITEM DESCRIPTION / SUB-COST ITEMS	UOM	QUANTITY	UNIT COST	TOTAL COST
1	**Eastside Canal - New Check/Sluice Structures in Canals**	**LS**	**1**	**$ 776,011.88**	**$ 776,012**
	.01 Earthwork	LS	1	$ 14,636.88	$ 14,637
	a) Structural Excavation	*CY*	*550*	*$ 15.00*	*$ 8,250*
	b) Push to Stockpile	*CY*	*633*	*$ 2.50*	*$ 1,581*
	c) Haul to Disposal	*CY*	*633*	*$ 5.75*	*$ 3,637*
	d) Compacted Backfill	*CY*	*138*	*$ 8.50*	*$ 1,169*
	.02 Concrete	CY	330	$ 701.14	$ 231,375
	a) Base Layer	*CY*	*100*	*$ 40.00*	*$ 4,000*
	b) Structure Invert	*CY*	*125*	*$ 625.00*	*$ 78,125*
	c) Sideslopes	*CY*	*140*	*$ 675.00*	*$ 94,500*
	d) Gate Walls	*CY*	*60*	*$ 850.00*	*$ 51,000*
	e) Walkway	*CY*	*5*	*$ 750.00*	*$ 3,750*
	.03 Gates	LS	1	$ 530,000.00	$ 530,000
	a) Sluiceway Gate	*EA*	*4*	*$ 120,000.00*	*$ 480,000*
	b) Wasteway Gate	*EA*	*2*	*$ 25,000.00*	*$ 50,000*
					Rounded Unit Cost Used:
			Eastside Canal - New Check/Sluice Structures in Canals		***$ 800,000.00/EA***
2	**Westside Canal - New Check/Sluice Structures in Canals**	**LS**	**1**	**$ 1,049,862.50**	**$ 1,049,863**
	.01 Earthwork	LS	1	$ 26,612.50	$ 26,613
	a) Structural Excavation	*CY*	*1,000*	*$ 15.00*	*$ 15,000*
	b) Push to Stockpile	*CY*	*1,150*	*$ 2.50*	*$ 2,875*
	c) Haul to Disposal	*CY*	*1,150*	*$ 5.75*	*$ 6,613*
	d) Compacted Backfill	*CY*	*250*	*$ 8.50*	*$ 2,125*
	.02 Concrete	CY	510	$ 692.65	$ 353,250
	a) Base Layer	*CY*	*200*	*$ 40.00*	*$ 8,000*
	b) Structure Invert	*CY*	*250*	*$ 625.00*	*$ 156,250*
	c) Sideslopes	*CY*	*180*	*$ 675.00*	*$ 121,500*
	d) Gate Walls	*CY*	*75*	*$ 850.00*	*$ 63,750*
	e) Walkway	*CY*	*5*	*$ 750.00*	*$ 3,750*
	.03 Gates	LS	1	$ 670,000.00	$ 670,000
	a) Sluiceway Gate	*EA*	*4*	*$ 155,000.00*	*$ 620,000*
	b) Wasteway Gate	*EA*	*2*	*$ 25,000.00*	*$ 50,000*
					Rounded Unit Cost Used:
			Westside Canal - New Check/Sluice Structures in Canals		***$ 1,050,000.00/EA***

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Annualized Costs by Problem Location Alternative*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

TOTAL ANNUAL COSTS BY PROBLEM LOCATION AND ALTERNATIVE

PROBLEM LOCATION 1: **TIERRA BLANCA CREEK TO SIBLEY ARROYO**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Sediment Traps in Arroyos	Modification of the TB Vortex Weir
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$196,130	$462,974	$58,728	$706,400	$20,059
2	Planning, Engineering & Design (PED)	LS	1	$29,419	$69,446	$8,809	$105,960	$3,009
3	Construction Management (CM)	LS	1	$19,613	$46,297	$5,873	$70,640	$2,006
4	*Construction Subtotal*	*LS*	*1*	*$245,162*	*$578,717*	*$73,410*	*$883,000*	*$25,074*
5	Construction Contingency	LS	1	$58,839	$138,892	$17,618	$211,920	$6,018
6	*Total First Costs*	*LS*	*1*	*$304,001*	*$717,610*	*$91,028*	*$1,094,920*	*$31,092*
7	Annualized First Costs	LS	1	$12,700	$30,000	$3,800	$45,700	$1,300
8	Life Cycle O&M Costs	LS	1	$2,667,363	$4,120,468	$1,835,238	$4,415,001	$50,149
9	O&M Contingency	LS	1	$800,209	$1,236,140	$550,571	$1,324,500	$15,045
10	*O&M Total Costs*	*LS*	*1*	*$3,467,572*	*$5,356,608*	*$2,385,810*	*$5,739,501*	*$65,193*
11	Annualized O&M Costs	LS	1	$144,600	$223,300	$99,500	$239,300	$2,800
12	*Total Annualized Project Costs*	*LS*	*1*	*$157,300*	*$253,300*	*$103,300*	*$285,000*	*$4,100*

PROBLEM LOCATION 2: **SALEM BRIDGE TO PLACITAS ARROYO**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Sediment Traps in Arroyos	Island Destabilization / Vegetation Removal
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$793,004	$1,188,484	$430,616	$465,231	$338,940
2	Planning, Engineering & Design (PED)	LS	1	$118,951	$178,273	$64,592	$69,785	$50,841
3	Construction Management (CM)	LS	1	$79,300	$118,848	$43,062	$46,523	$33,894
4	*Construction Subtotal*	*LS*	*1*	*$991,255*	*$1,485,605*	*$538,270*	*$581,538*	*$423,675*
5	Construction Contingency	LS	1	$237,901	$356,545	$129,185	$139,569	$101,682
6	*Total First Costs*	*LS*	*1*	*$1,229,157*	*$1,842,150*	*$667,455*	*$721,108*	*$525,357*
7	Annualized First Costs	LS	1	$51,300	$76,800	$27,900	$30,100	$21,900
8	Life Cycle O&M Costs	LS	1	$3,925,372	$5,764,148	$2,833,456	$1,116,554	$1,016,819
9	O&M Contingency	LS	1	$1,177,611	$1,729,244	$850,037	$334,966	$305,046
10	*O&M Total Costs*	*LS*	*1*	*$5,102,983*	*$7,493,393*	*$3,683,492*	*$1,451,520*	*$1,321,865*
11	Annualized O&M Costs	LS	1	$212,700	$312,400	$153,600	$60,500	$55,100
12	*Total Annualized Project Costs*	*LS*	*1*	*$264,000*	*$389,200*	*$181,500*	*$90,600*	*$77,000*

PROBLEM LOCATION 3: **RINCON SIPHON A RESTORATION SITE TO RINCON SIPHON**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Sediment Traps in Arroyos	Replace Rincon Siphon with Flume
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$162,128	$342,192	$105,692	$99,764	$1,283,501
2	Planning, Engineering & Design (PED)	LS	1	$24,319	$51,329	$15,854	$14,965	$192,525
3	Construction Management (CM)	LS	1	$16,213	$34,219	$10,569	$9,976	$128,350
4	*Construction Subtotal*	*LS*	*1*	*$202,660*	*$427,740*	*$132,116*	*$124,705*	*$1,604,376*
5	Construction Contingency	LS	1	$48,638	$102,658	$31,708	$29,929	$385,050
6	*Total First Costs*	*LS*	*1*	*$251,299*	*$530,398*	*$163,823*	*$154,634*	*$1,989,426*
7	Annualized First Costs	LS	1	$10,500	$22,200	$6,900	$6,500	$83,000
8	Life Cycle O&M Costs	LS	1	$885,220	$1,591,194	$695,456	$140,069	$320,875
9	O&M Contingency	LS	1	$265,566	$477,358	$208,637	$42,021	$96,263
10	*O&M Total Costs*	*LS*	*1*	*$1,150,786*	*$2,068,552*	*$904,093*	*$182,089*	*$417,138*
11	Annualized O&M Costs	LS	1	$48,000	$86,300	$37,700	$7,600	$17,400
12	*Total Annualized Project Costs*	*LS*	*1*	*$58,500*	*$108,500*	*$44,600*	*$14,100*	*$100,400*

TOTAL ANNUAL COSTS BY PROBLEM LOCATION AND ALTERNATIVE

PROBLEM LOCATION 4: **RINCON ARROYO TO BIGNELL ARROYO**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Island Destabilization / Spur Dikes	Low-Elevation Spur Dikes
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$607,826	$2,064,157	$354,064	$428,803	$373,807
2	Planning, Engineering & Design (PED)	LS	1	$91,174	$309,624	$53,110	$64,320	$56,071
3	Construction Management (CM)	LS	1	$60,783	$206,416	$35,406	$42,880	$37,381
4	*Construction Subtotal*	*LS*	*1*	*$759,783*	*$2,580,197*	*$442,580*	*$536,003*	*$467,259*
5	Construction Contingency	LS	1	$182,348	$619,247	$106,219	$128,641	$112,142
6	*Total First Costs*	*LS*	*1*	*$942,131*	*$3,199,444*	*$548,800*	*$664,644*	*$579,401*
7	Annualized First Costs	LS	1	$39,300	$133,400	$22,900	$27,800	$24,200
8	Life Cycle O&M Costs	LS	1	$11,396,741	$9,598,332	$6,638,706	$1,286,408	$747,614
9	O&M Contingency	LS	1	$3,419,022	$2,879,500	$1,991,612	$385,922	$224,284
10	*O&M Total Costs*	*LS*	*1*	*$14,815,763*	*$12,477,832*	*$8,630,317*	*$1,672,331*	*$971,898*
11	Annualized O&M Costs	LS	1	$617,500	$520,100	$359,700	$69,700	$40,600
12	*Total Annualized Project Costs*	*LS*	*1*	*$656,800*	*$653,500*	*$382,600*	*$97,500*	*$64,800*

PROBLEM LOCATION 5: **ROCK CANYON TO BELOW RINCON/TONUCO DRAIN OUTLET**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Sediment Traps in Arroyos	Low-Elevation Spur Dikes
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$957,609	$957,609	$957,609	$957,609	$957,609
2	Planning, Engineering & Design (PED)	LS	1	$957,609	$957,609	$957,609	$957,609	$957,609
3	Construction Management (CM)	LS	1	$957,609	$957,609	$957,609	$957,609	$957,609
4	*Construction Subtotal*	*LS*	*1*	*$2,872,826*	*$2,872,826*	*$2,872,826*	*$2,872,826*	*$2,872,826*
5	Construction Contingency	LS	1	$957,609	$957,609	$957,609	$957,609	$957,609
6	*Total First Costs*	*LS*	*1*	*$3,830,434*	*$3,830,434*	*$3,830,434*	*$3,830,434*	*$3,830,434*
7	Annualized First Costs	LS	1	$159,700	$159,700	$159,700	$159,700	$159,700
8	Life Cycle O&M Costs	LS	1	$2,671,117	$2,025,190	$3,052,870	$297,412	$1,153,888
9	O&M Contingency	LS	1	$801,335	$607,557	$915,861	$89,224	$346,166
10	*O&M Total Costs*	*LS*	*1*	*$3,472,452*	*$2,632,747*	*$3,968,730*	*$386,636*	*$1,500,055*
11	Annualized O&M Costs	LS	1	$144,800	$109,800	$165,500	$16,200	$62,600
12	*Total Annualized Project Costs*	*LS*	*1*	*$304,500*	*$269,500*	*$325,200*	*$175,900*	*$222,300*

PROBLEM LOCATION 6: **PICACHO DRAIN TO BELOW MESILLA DAM**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives		Non-Sediment Removal Alternatives		
				Channel Excavation (Short)	Channel Excavation (Long)	New Check/Sluice Structures in Canals	Mesilla Dam Gate Automation	Installation of Vortex Tubes
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$332,117	$544,351	$2,127,960	$2,300,000	$272,550
2	Planning, Engineering & Design (PED)	LS	1	$49,817	$81,653	$319,194	$345,000	$40,883
3	Construction Management (CM)	LS	1	$33,212	$54,435	$212,796	$230,000	$27,255
4	*Construction Subtotal*	*LS*	*1*	*$415,146*	*$680,438*	*$2,659,950*	*$2,875,000*	*$340,688*
5	Construction Contingency	LS	1	$99,635	$163,305	$638,388	$690,000	$81,765
6	*Total First Costs*	*LS*	*1*	*$514,781*	*$843,744*	*$3,298,338*	*$3,565,000*	*$422,453*
7	Annualized First Costs	LS	1	$21,500	$35,200	$137,500	$148,600	$17,700
8	Life Cycle O&M Costs	LS	1	$23,580,275	$3,919,326	$319,194	$287,500	$136,275
9	O&M Contingency	LS	1	$7,074,083	$1,175,798	$95,758	$86,250	$40,883
10	*O&M Total Costs*	*LS*	*1*	*$30,654,358*	*$5,095,123*	*$414,952*	*$373,750*	*$177,158*
11	Annualized O&M Costs	LS	1	$1,277,600	$212,400	$17,300	$15,600	$7,400
12	*Total Annualized Project Costs*	*LS*	*1*	*$1,299,100*	*$247,600*	*$154,800*	*$164,200*	*$25,100*

TOTAL ANNUAL COSTS BY PROBLEM LOCATION AND ALTERNATIVE

PROBLEM LOCATION 7: **EAST DRAIN TO BELOW VINTON BRIDGE**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Sediment Traps in Arroyos	Low-Elevation Spur Dikes
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$357,561	$452,902	$41,281	$387,117	$409,567
2	Planning, Engineering & Design (PED)	LS	1	$53,634	$67,935	$6,192	$58,068	$61,435
3	Construction Management (CM)	LS	1	$35,756	$45,290	$4,128	$38,712	$40,957
4	*Construction Subtotal*	*LS*	*1*	*$446,951*	*$566,128*	*$51,601*	*$483,896*	*$511,958*
5	Construction Contingency	LS	1	$107,268	$135,871	$12,384	$116,135	$122,870
6	*Total First Costs*	*LS*	*1*	*$554,219*	*$701,998*	*$63,986*	*$600,031*	*$634,828*
7	Annualized First Costs	LS	1	$23,100	$29,300	$2,700	$25,100	$26,500
8	Life Cycle O&M Costs	LS	1	$2,302,692	$2,500,020	$774,018	$966,243	$819,134
9	O&M Contingency	LS	1	$690,808	$750,006	$232,205	$289,873	$245,740
10	*O&M Total Costs*	*LS*	*1*	*$2,993,500*	*$3,250,026*	*$1,006,224*	*$1,256,116*	*$1,064,874*
11	Annualized O&M Costs	LS	1	$124,800	$135,500	$42,000	$52,400	$44,400
12	*Total Annualized Project Costs*	*LS*	*1*	*$147,900*	*$164,800*	*$44,700*	*$77,500*	*$70,900*

PROBLEM LOCATION 8: **ABOVE COUNTRY CLUB BRIDGE TO NEMEXAS SIPHON**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Riprap in Narrow Floodplain Areas	Low-Elevation Spur Dikes
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$200,716	$402,811	$82,660	$268,008	$197,011
2	Planning, Engineering & Design (PED)	LS	1	$30,107	$60,422	$12,399	$40,201	$29,552
3	Construction Management (CM)	LS	1	$20,072	$40,281	$8,266	$26,801	$19,701
4	*Construction Subtotal*	*LS*	*1*	*$250,896*	*$503,513*	*$103,325*	*$335,009*	*$246,264*
5	Construction Contingency	LS	1	$60,215	$120,843	$24,798	$80,402	$59,103
6	*Total First Costs*	*LS*	*1*	*$311,110*	*$624,356*	*$128,123*	*$415,412*	*$305,367*
7	Annualized First Costs	LS	1	$13,000	$26,100	$5,400	$17,400	$12,800
8	Life Cycle O&M Costs	LS	1	$3,763,433	$4,108,667	$2,479,808	$201,006	$394,022
9	O&M Contingency	LS	1	$1,129,030	$1,232,600	$743,942	$60,302	$118,207
10	*O&M Total Costs*	*LS*	*1*	*$4,892,462*	*$5,341,267*	*$3,223,751*	*$261,307*	*$512,229*
11	Annualized O&M Costs	LS	1	$204,000	$222,700	$134,400	$10,900	$21,400
12	*Total Annualized Project Costs*	*LS*	*1*	*$217,000*	*$248,800*	*$139,800*	*$28,300*	*$34,200*

PROBLEM LOCATION 9: **MONTOYA DRAIN TO AMERICAN DAM**

Item No.	Item Description	UOM	Quantity	Sediment Removal Alternatives			Non-Sediment Removal Alternatives	
				Channel Excavation (Short)	Channel Excavation (Long)	Channel Excavation (Localized)	Island Destabilization / Vegetation Removal	Low-Elevation Spur Dikes
				Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
1	Total Construction Costs	LS	1	$362,602	$1,646,860	$145,432	$141,632	$150,219
2	Planning, Engineering & Design (PED)	LS	1	$54,390	$247,029	$21,815	$21,245	$22,533
3	Construction Management (CM)	LS	1	$36,260	$164,686	$14,543	$14,163	$15,022
4	*Construction Subtotal*	*LS*	*1*	*$453,253*	*$2,058,575*	*$181,790*	*$177,040*	*$187,774*
5	Construction Contingency	LS	1	$108,781	$494,058	$43,630	$42,490	$45,066
6	*Total First Costs*	*LS*	*1*	*$562,034*	*$2,552,634*	*$225,419*	*$219,529*	*$232,840*
7	Annualized First Costs	LS	1	$23,500	$106,400	$9,400	$9,200	$9,800
8	Life Cycle O&M Costs	LS	1	$4,583,295	$7,904,930	$10,398,379	$424,896	$300,439
9	O&M Contingency	LS	1	$1,374,989	$2,371,479	$3,119,514	$127,469	$90,132
10	*O&M Total Costs*	*LS*	*1*	*$5,958,284*	*$10,276,409*	*$13,517,893*	*$552,364*	*$390,570*
11	Annualized O&M Costs	LS	1	$248,400	$428,300	$563,400	$23,100	$16,300
12	*Total Annualized Project Costs*	*LS*	*1*	*$271,900*	*$534,700*	*$572,800*	*$32,300*	*$26,100*

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 1 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 1: **TIERRA BLANCA CREEK TO SIBLEY ARROYO**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Modification of the TB Vortex Weir	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$21,318	1	$50,323	1	$6,383	1	$76,783	1	$2,180
2	Site Access and Staging	LS	2.50%	1	$4,264	1	$10,065	1	$1,277	1	$15,357	1	$436
3	Clearing and Grubbing	ACRE	$2,000.00	2.6	$5,120	6.0	$12,000	2.4	$4,780	9.8	$19,600	1.0	$2,000
4	Excavation (Sediment Removal)	CY	$2.75	20,550	$56,513	48,520	$133,430	5,750	$15,813	0	$0	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	20,550	$78,090	48,520	$184,376	5,750	$21,850	0	$0	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	20,550	$30,825	48,520	$72,780	5,750	$8,625	0	$0	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	59,532	$253,011	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	360	$18,000	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	525	$39,375	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	560	$47,600	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	575	$17,250	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	440	$24,200	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	3,125	$10,938	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	350	$5,338	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	2,222	$14,443
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	29,475	$58,950	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	3	$120,000	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	50	$500
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	25	$500
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	0	$0
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$196,130	$462,974	$58,728	$706,400	$20,059
Planning, Engineering & Design (PED - 15%)	$29,419	$69,446	$8,809	$105,960	$3,009
Construction Management (CM - 10%)	$19,613	$46,297	$5,873	$70,640	$2,006
Sub-total Cost (1):	$245,162	$578,717	$73,410	$883,000	$25,074
Construction Continency (30%):	$58,839	$138,892	$17,618	$211,920	$6,018
Total Construction Cost:	**$304,001**	**$717,610**	**$91,028**	**$1,094,920**	**$31,092**

PROBLEM LOCATION 1: **TIERRA BLANCA CREEK TO SIBLEY ARROYO**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Modification of the TB Vortex Weir	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
3	O&M Year 3	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	0.0%	$0	0.0%	$0
6	O&M Year 6	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
9	O&M Year 9	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	25.0%	$176,600	50.0%	$10,030
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
15	O&M Year 15	LS	% of Const.	85.0%	$166,710	89.0%	$412,047	62.5%	$36,705	0.0%	$0	0.0%	$0
16	O&M Year 16	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	25.0%	$176,600	50.0%	$10,030
21	O&M Year 21	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	0.0%	$0	0.0%	$0
26	O&M Year 26	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
27	O&M Year 27	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	85.0%	$166,710	89.0%	$412,047	62.5%	$36,705	25.0%	$176,600	50.0%	$10,030
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
33	O&M Year 33	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	0.0%	$0	0.0%	$0
36	O&M Year 36	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
39	O&M Year 39	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	25.0%	$176,600	50.0%	$10,030
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
45	O&M Year 45	LS	% of Const.	85.0%	$166,710	89.0%	$412,047	62.5%	$36,705	0.0%	$0	0.0%	$0
46	O&M Year 46	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	85.0%	$166,710	0.0%	$0	62.5%	$36,705	25.0%	$176,600	0.0%	$0
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	62.5%	$36,705	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	0.0%	$0	89.0%	$412,047	62.5%	$36,705	25.0%	$176,600	50.0%	$10,030

Total O&M Cost per Location:	$2,667,363	$4,120,468	$1,835,238	$4,415,001	$50,149
O&M Continency (30%):	$800,209	$1,236,140	$550,571	$1,324,500	$15,045
Total O&M Cost:	**$3,467,572**	**$5,356,608**	**$2,385,810**	**$5,739,501**	**$65,193**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 2 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 2: **SALEM BRIDGE TO PLACITAS ARROYO**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Island Destabilization / Vegetation Removal	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$86,196	1	$129,183	1	$46,806	1	$50,569	1	$36,841
2	Site Access and Staging	LS	2.50%	1	$17,239	1	$25,837	1	$9,361	1	$10,114	1	$7,368
3	Clearing and Grubbing	ACRE	$2,000.00	4.4	$8,700	6.0	$12,000	1.4	$2,700	5.9	$11,800	34.7	$69,400
4	Excavation (Sediment Removal)	CY	$2.75	84,580	$232,595	126,890	$348,948	46,180	$126,995	0	$0	27,991	$76,976
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	84,580	$321,404	126,890	$482,182	46,180	$175,484	0	$0	27,991	$106,367
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	84,580	$126,870	126,890	$190,335	46,180	$69,270	0	$0	27,991	$41,987
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	33,982	$144,424	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	290	$14,500	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	325	$24,375	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	310	$26,350	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	305	$9,150	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	280	$15,400	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	0	$0	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	0	$0	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	19,275	$38,550	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	3	$120,000	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	0	$0
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$793,004	$1,188,484	$430,616	$465,231	$338,940
Planning, Engineering & Design (PED - 15%)	$118,951	$178,273	$64,592	$69,785	$50,841
Construction Management (CM - 10%)	$79,300	$118,848	$43,062	$46,523	$33,894
Sub-total Cost (1):	$991,255	$1,485,605	$538,270	$581,538	$423,675
Construction Continency (30%):	$237,901	$356,545	$129,185	$139,569	$101,682
Total Construction Cost:	**$1,229,157**	**$1,842,150**	**$667,455**	**$721,108**	**$525,357**

PROBLEM LOCATION 2: **SALEM BRIDGE TO PLACITAS ARROYO**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Island Destabilization / Vegetation Removal	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	25.0%	$84,735
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
6	O&M Year 6	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	30.0%	$139,569	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	25.0%	$84,735
9	O&M Year 9	LS	% of Const.	99.0%	$785,074	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	0.0%	$0	97.0%	$1,152,830	0.0%	$0	0.0%	$0	0.0%	$0
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	30.0%	$139,569	25.0%	$84,735
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
16	O&M Year 16	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	25.0%	$84,735
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	99.0%	$785,074	0.0%	$0	0.0%	$0	30.0%	$139,569	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	0.0%	$0	97.0%	$1,152,830	0.0%	$0	0.0%	$0	25.0%	$84,735
21	O&M Year 21	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	30.0%	$139,569	25.0%	$84,735
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
26	O&M Year 26	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	99.0%	$785,074	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	0.0%	$0	25.0%	$84,735
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	0.0%	$0	97.0%	$1,152,830	0.0%	$0	30.0%	$139,569	0.0%	$0
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	25.0%	$84,735
33	O&M Year 33	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	0.0%	$0	0.0%	$0
36	O&M Year 36	LS	% of Const.	99.0%	$785,074	0.0%	$0	0.0%	$0	30.0%	$139,569	25.0%	$84,735
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	0.0%	$0	97.0%	$1,152,830	0.0%	$0	0.0%	$0	25.0%	$84,735
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	30.0%	$139,569	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	25.0%	$84,735
45	O&M Year 45	LS	% of Const.	99.0%	$785,074	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
46	O&M Year 46	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	30.0%	$139,569	25.0%	$84,735
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$404,779	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	0.0%	$0	97.0%	$1,152,830	0.0%	$0	0.0%	$0	0.0%	$0

Total O&M Cost per Location:	$3,925,372	$5,764,148	$2,833,456	$1,116,554	$1,016,819
O&M Continency (30%):	$1,177,611	$1,729,244	$850,037	$334,966	$305,046
Total Construction Cost:	**$5,102,983**	**$7,493,393**	**$3,683,492**	**$1,451,520**	**$1,321,865**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 3 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 3: **RINCON SIPHON A RESTORATION SITE TO RINCON SIPHON**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Replace Rincon Siphon with Flume	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$17,623	1	$37,195	1	$11,488	1	$10,844	1	$139,511
2	Site Access and Staging	LS	2.50%	1	$3,525	1	$7,439	1	$2,298	1	$2,169	1	$27,902
3	Clearing and Grubbing	ACRE	$2,000.00	1.2	$2,360	2.4	$4,780	0.4	$700	0.6	$1,200	0.5	$1,000
4	Excavation (Sediment Removal)	CY	$2.75	17,220	$47,355	36,370	$100,018	11,330	$31,158	0	$0	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	17,220	$65,436	36,370	$138,206	11,330	$43,054	0	$0	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	17,220	$25,830	36,370	$54,555	11,330	$16,995	0	$0	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	2,765	$11,751	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	0	$0	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	95	$7,125	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	140	$11,900	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	110	$3,300	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	45	$2,475	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	0	$0	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	0	$0	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	4,500	$9,000	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	1	$40,000	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	3,000	$30,000
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	12,370	$247,400
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	1,675	$167,500
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	575	$30,188
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	800	$640,000
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	0	$0
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$162,128	$342,192	$105,692	$99,764	$1,283,501
Planning, Engineering & Design (PED - 15%)	$24,319	$51,329	$15,854	$14,965	$192,525
Construction Management (CM - 10%)	$16,213	$34,219	$10,569	$9,976	$128,350
Sub-total Cost (1):	$202,660	$427,740	$132,116	$124,705	$1,604,376
Construction Continency (30%):	$48,638	$102,658	$31,708	$29,929	$385,050
Total Construction Cost:	**$251,299**	**$530,398**	**$163,823**	**$154,634**	**$1,989,426**

PROBLEM LOCATION 3: **RINCON SIPHON A RESTORATION SITE TO RINCON SIPHON**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Replace Rincon Siphon with Flume	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
6	O&M Year 6	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	91.0%	$147,537	0.0%	$0	0.0%	$0	11.7%	$11,672	5.0%	$64,175
9	O&M Year 9	LS	% of Const.	0.0%	$0	93.0%	$318,239	0.0%	$0	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
16	O&M Year 16	LS	% of Const.	91.0%	$147,537	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	0.0%	$0	93.0%	$318,239	0.0%	$0	0.0%	$0	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	11.7%	$11,672	5.0%	$64,175
21	O&M Year 21	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	91.0%	$147,537	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
26	O&M Year 26	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	0.0%	$0	93.0%	$318,239	0.0%	$0	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	11.7%	$11,672	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	5.0%	$64,175
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	91.0%	$147,537	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
33	O&M Year 33	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	0.0%	$0	0.0%	$0
36	O&M Year 36	LS	% of Const.	0.0%	$0	93.0%	$318,239	0.0%	$0	11.7%	$11,672	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	91.0%	$147,537	0.0%	$0	0.0%	$0	11.7%	$11,672	5.0%	$64,175
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	0.0%	$0	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
45	O&M Year 45	LS	% of Const.	0.0%	$0	93.0%	$318,239	0.0%	$0	0.0%	$0	0.0%	$0
46	O&M Year 46	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	91.0%	$147,537	0.0%	$0	0.0%	$0	11.7%	$11,672	0.0%	$0
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	94.0%	$99,351	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	5.0%	$64,175

Total O&M Cost per Location:	$885,220	$1,591,194	$695,456	$140,069	$320,875
O&M Continency (30%):	$265,566	$477,358	$208,637	$42,021	$96,263
Total Construction Cost:	**$1,150,786**	**$2,068,552**	**$904,093**	**$182,089**	**$417,138**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 4 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 4: **RINCON ARROYO TO BIGNELL ARROYO**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Island Destabilization / Spur Dikes		Low-Elevation Spur Dikes	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$66,068	1	$224,365	1	$38,485	1	$46,609	1	$40,631
2	Site Access and Staging	LS	2.50%	1	$13,214	1	$44,873	1	$7,697	1	$9,322	1	$8,126
3	Clearing and Grubbing	ACRE	$2,000.00	1.5	$2,960	5.6	$11,120	0.8	$1,660	43.9	$87,800	1.0	$2,000
4	Excavation (Sediment Removal)	CY	$2.75	65,290	$179,548	221,590	$609,373	38,040	$104,610	35,413	$97,385	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	65,290	$248,102	221,590	$842,042	38,040	$144,552	35,413	$134,568	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	65,290	$97,935	221,590	$332,385	38,040	$57,060	35,413	$53,119	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	0	$0	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	0	$0	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	0	$0	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	0	$0	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	0	$0	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	0	$0	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	0	$0	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	0	$0	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	0	$0	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	4,245	$297,150
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	2,123	$21,230
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	849	$4,670
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$607,826	$2,064,157	$354,064	$428,803	$373,807
Planning, Engineering & Design (PED - 15%)	$91,174	$309,624	$53,110	$64,320	$56,071
Construction Management (CM - 10%)	$60,783	$206,416	$35,406	$42,880	$37,381
Sub-total Cost (1):	$759,783	$2,580,197	$442,580	$536,003	$467,259
Construction Continency (30%):	$182,348	$619,247	$106,219	$128,641	$112,142
Total Construction Cost:	**$942,131**	**$3,199,444**	**$548,800**	**$664,644**	**$579,401**

PROBLEM LOCATION 4: **RINCON ARROYO TO BIGNELL ARROYO**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Island Destabilization / Spur Dikes		Low-Elevation Spur Dikes	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$56,071
6	O&M Year 6	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
9	O&M Year 9	LS	% of Const.	0.0%	$0	93.0%	$1,919,666	0.0%	$0	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	25.0%	$93,452
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$56,071
16	O&M Year 16	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	75.0%	$455,870	93.0%	$1,919,666	75.0%	$265,548	0.0%	$0	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	25.0%	$93,452
21	O&M Year 21	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$56,071
26	O&M Year 26	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	0.0%	$0	93.0%	$1,919,666	0.0%	$0	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	25.0%	$93,452
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
33	O&M Year 33	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$56,071
36	O&M Year 36	LS	% of Const.	75.0%	$455,870	93.0%	$1,919,666	75.0%	$265,548	25.0%	$107,201	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	25.0%	$93,452
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
45	O&M Year 45	LS	% of Const.	0.0%	$0	93.0%	$1,919,666	0.0%	$0	0.0%	$0	15.0%	$56,071
46	O&M Year 46	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	25.0%	$107,201	0.0%	$0
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	75.0%	$455,870	0.0%	$0	75.0%	$265,548	0.0%	$0	25.0%	$93,452

Total O&M Cost per Location:	$11,396,741	$9,598,332	$6,638,706	$1,286,408	$747,614
O&M Continency (30%):	$3,419,022	$2,879,500	$1,991,612	$385,922	$224,284
Total Construction Cost:	**$14,815,763**	**$12,477,832**	**$8,630,317**	**$1,672,331**	**$971,898**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 5 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 5: **ROCK CANYON TO BELOW RINCON/TONUCO DRAIN OUTLET**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Low-Elevation Spur Dikes	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$101,873	1	$224,622	1	$72,138	1	$31,234	1	$62,711
2	Site Access and Staging	LS	2.50%	1	$20,375	1	$44,924	1	$14,428	1	$6,247	1	$12,542
3	Clearing and Grubbing	ACRE	$2,000.00	1.3	$2,580	5.4	$10,840	1.8	$3,620	2.9	$5,800	1.5	$3,000
4	Excavation (Sediment Removal)	CY	$2.75	100,920	$277,530	221,880	$610,170	71,240	$195,910	0	$0	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	100,920	$383,496	221,880	$843,144	71,240	$270,712	0	$0	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	100,920	$151,380	221,880	$332,820	71,240	$106,860	0	$0	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	14,162	$60,189	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	150	$7,500	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	245	$18,375	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	250	$21,250	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	210	$6,300	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	175	$9,625	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	860	$3,010	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	100	$1,525	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	18,150	$36,300	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	2	$80,000	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	6,553	$458,710
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	3,277	$32,770
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	1,311	$7,211
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$937,234	$2,066,520	$663,667	$287,355	$576,944
Planning, Engineering & Design (PED - 15%)	$140,585	$309,978	$99,550	$43,103	$86,542
Construction Management (CM - 10%)	$93,723	$206,652	$66,367	$28,735	$57,694
Sub-total Cost (1):	$1,171,542	$2,583,150	$829,584	$359,193	$721,180
Construction Continency (30%):	$281,170	$619,956	$199,100	$86,206	$173,083
Total Construction Cost:	**$1,452,713**	**$3,203,106**	**$1,028,684**	**$445,400**	**$894,263**

PROBLEM LOCATION 5: **ROCK CANYON TO BELOW RINCON/TONUCO DRAIN OUTLET**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Low-Elevation Spur Dikes	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$86,542
6	O&M Year 6	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
9	O&M Year 9	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	0.0%	$0	0.0%	$0	92.0%	$610,574	20.7%	$59,482	25.0%	$144,236
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
13	O&M Year 13	LS	% of Const.	95.0%	$890,372	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$86,542
16	O&M Year 16	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	0.0%	$0	0.0%	$0	92.0%	$610,574	20.7%	$59,482	25.0%	$144,236
21	O&M Year 21	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$86,542
26	O&M Year 26	LS	% of Const.	95.0%	$890,372	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	0.0%	$0	98.0%	$2,025,190	0.0%	$0	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	0.0%	$0	0.0%	$0	92.0%	$610,574	20.7%	$59,482	25.0%	$144,236
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
33	O&M Year 33	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$86,542
36	O&M Year 36	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	95.0%	$890,372	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	0.0%	$0	0.0%	$0	92.0%	$610,574	20.7%	$59,482	25.0%	$144,236
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
45	O&M Year 45	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$86,542
46	O&M Year 46	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	0.0%	$0	0.0%	$0	92.0%	$610,574	20.7%	$59,482	25.0%	$144,236

Total O&M Cost per Location:	$2,671,117	$2,025,190	$3,052,870	$297,412	$1,153,888
O&M Continency (30%):	$801,335	$607,557	$915,861	$89,224	$346,166
Total Construction Cost:	**$3,472,452**	**$2,632,747**	**$3,968,730**	**$386,636**	**$1,500,055**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 6 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 6: **PICACHO DRAIN TO BELOW MESILLA DAM**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives				Non-Sediment Removal Alternatives					
				Channel Excavation (Short)		Channel Excavation (Long)		New Check/Sluice Structures in Canals		Mesilla Dam Gate Automation		Installation of Vortex Tubes	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$36,100	1	$59,169	1	$231,300	1	$250,000	1	$29,625
2	Site Access and Staging	LS	2.50%	1	$7,220	1	$11,834	1	$46,260	1	$50,000	1	$5,925
3	Clearing and Grubbing	ACRE	$2,000.00	1.4	$2,700	2.5	$5,080	0.2	$400	0.0	$0	0.5	$1,000
4	Excavation (Sediment Removal)	CY	$2.75	35,540	$97,735	58,170	$159,968	0	$0	0	$0	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	35,540	$135,052	58,170	$221,046	0	$0	0	$0	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	35,540	$53,310	58,170	$87,255	0	$0	0	$0	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	0	$0	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	0	$0	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	0	$0	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	0	$0	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	0	$0	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	0	$0	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	0	$0	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	0	$0	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	0	$0	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	0	$0
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	300	$187,500
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	200	$5,000
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	800	$28,000
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	4	$8,000
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	5	$7,500
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	1	$800,000	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	1	$1,050,000	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	2	$2,000,000	0	$0

Total Construction Cost per Alternative:	$332,117	$544,351	$2,127,960	$2,300,000	$272,550
Planning, Engineering & Design (PED - 15%)	$49,817	$81,653	$319,194	$345,000	$40,883
Construction Management (CM - 10%)	$33,212	$54,435	$212,796	$230,000	$27,255
Sub-total Cost (1):	$415,146	$680,438	$2,659,950	$2,875,000	$340,688
Construction Continency (30%):	$99,635	$163,305	$638,388	$690,000	$81,765
Total Construction Cost:	**$514,781**	**$843,744**	**$3,298,338**	**$3,565,000**	**$422,453**

PROBLEM LOCATION 6: **PICACHO DRAIN TO BELOW MESILLA DAM**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives				Non-Sediment Removal Alternatives					
				Channel Excavation (Short)		Channel Excavation (Long)		New Check/Sluice Structures in Canals		Mesilla Dam Gate Automation		Installation of Vortex Tubes	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
5	O&M Year 5	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
6	O&M Year 6	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	0.0%	$0	0.0%	$0
7	O&M Year 7	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	142.0%	$471,606	0.0%	$0	2.5%	$53,199	0.0%	$0	0.0%	$0
9	O&M Year 9	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	2.5%	$57,500	10.0%	$27,255
11	O&M Year 11	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	0.0%	$0	0.0%	$0
13	O&M Year 13	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
16	O&M Year 16	LS	% of Const.	142.0%	$471,606	0.0%	$0	2.5%	$53,199	0.0%	$0	0.0%	$0
17	O&M Year 17	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	0.0%	$0	0.0%	$0
19	O&M Year 19	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	2.5%	$57,500	10.0%	$27,255
21	O&M Year 21	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	2.5%	$53,199	0.0%	$0	0.0%	$0
25	O&M Year 25	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
26	O&M Year 26	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
29	O&M Year 29	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	2.5%	$57,500	10.0%	$27,255
31	O&M Year 31	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	142.0%	$471,606	0.0%	$0	2.5%	$53,199	0.0%	$0	0.0%	$0
33	O&M Year 33	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
36	O&M Year 36	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	0.0%	$0	0.0%	$0
37	O&M Year 37	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	142.0%	$471,606	0.0%	$0	2.5%	$53,199	2.5%	$57,500	10.0%	$27,255
41	O&M Year 41	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	0.0%	$0	0.0%	$0
43	O&M Year 43	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
45	O&M Year 45	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
46	O&M Year 46	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	142.0%	$471,606	90.0%	$489,916	0.0%	$0	0.0%	$0	0.0%	$0
49	O&M Year 49	LS	% of Const.	142.0%	$471,606	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	142.0%	$471,606	0.0%	$0	2.5%	$53,199	2.5%	$57,500	10.0%	$27,255

Total O&M Cost per Location:	$23,580,275	$3,919,326	$319,194	$287,500	$136,275
O&M Continency (30%):	$7,074,083	$1,175,798	$95,758	$86,250	$40,883
Total Construction Cost:	**$30,654,358**	**$5,095,123**	**$414,952**	**$373,750**	**$177,158**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 7 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 7: **EAST DRAIN TO BELOW VINTON BRIDGE**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Low-Elevation Spur Dikes	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$38,865	1	$49,229	1	$4,487	1	$42,078	1	$44,518
2	Site Access and Staging	LS	2.50%	1	$7,773	1	$9,846	1	$897	1	$8,416	1	$8,904
3	Clearing and Grubbing	ACRE	$2,000.00	2.3	$4,620	3.1	$6,140	0.5	$1,040	2.7	$5,400	1.1	$2,200
4	Excavation (Sediment Removal)	CY	$2.75	38,050	$104,638	48,160	$132,440	4,330	$11,908	0	$0	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	38,050	$144,590	48,160	$183,008	4,330	$16,454	0	$0	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	38,050	$57,075	48,160	$72,240	4,330	$6,495	0	$0	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	14,259	$60,601	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	0	$0	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	50	$3,750	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	260	$22,100	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	275	$8,250	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	245	$13,475	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	95	$6,650	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	1,360	$4,760	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	150	$2,288	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	24,675	$49,350	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	4	$160,000	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	4,651	$325,570
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	2,326	$23,260
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	930	$5,115
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$357,561	$452,902	$41,281	$387,117	$409,567
Planning, Engineering & Design (PED - 15%)	$53,634	$67,935	$6,192	$58,068	$61,435
Construction Management (CM - 10%)	$35,756	$45,290	$4,128	$38,712	$40,957
Sub-total Cost (1):	$446,951	$566,128	$51,601	$483,896	$511,958
Construction Continency (30%):	$107,268	$135,871	$12,384	$116,135	$122,870
Total Construction Cost:	**$554,219**	**$701,998**	**$63,986**	**$600,031**	**$634,828**

PROBLEM LOCATION 7: **EAST DRAIN TO BELOW VINTON BRIDGE**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Sediment Traps in Arroyos		Low-Elevation Spur Dikes	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	0.0%	$0
4	O&M Year 4	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$61,435
6	O&M Year 6	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	15.6%	$60,390	0.0%	$0
7	O&M Year 7	LS	% of Const.	92.0%	$328,956	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	0.0%	$0	92.0%	$416,670	75.0%	$30,961	0.0%	$0	0.0%	$0
9	O&M Year 9	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	0.0%	$0
10	O&M Year 10	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	25.0%	$102,392
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	15.6%	$60,390	0.0%	$0
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	92.0%	$328,956	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	15.0%	$61,435
16	O&M Year 16	LS	% of Const.	0.0%	$0	92.0%	$416,670	75.0%	$30,961	0.0%	$0	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	15.6%	$60,390	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	25.0%	$102,392
21	O&M Year 21	LS	% of Const.	92.0%	$328,956	0.0%	$0	0.0%	$0	15.6%	$60,390	0.0%	$0
22	O&M Year 22	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	0.0%	$0	92.0%	$416,670	75.0%	$30,961	15.6%	$60,390	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$61,435
26	O&M Year 26	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	0.0%	$0
28	O&M Year 28	LS	% of Const.	92.0%	$328,956	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	15.6%	$60,390	25.0%	$102,392
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	0.0%	$0	92.0%	$416,670	75.0%	$30,961	0.0%	$0	0.0%	$0
33	O&M Year 33	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	0.0%	$0
34	O&M Year 34	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	92.0%	$328,956	0.0%	$0	0.0%	$0	0.0%	$0	15.0%	$61,435
36	O&M Year 36	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	15.6%	$60,390	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	0.0%	$0
40	O&M Year 40	LS	% of Const.	0.0%	$0	92.0%	$416,670	75.0%	$30,961	0.0%	$0	25.0%	$102,392
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	92.0%	$328,956	0.0%	$0	75.0%	$30,961	15.6%	$60,390	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
45	O&M Year 45	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	15.6%	$60,390	15.0%	$61,435
46	O&M Year 46	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	0.0%	$0	92.0%	$416,670	75.0%	$30,961	15.6%	$60,390	0.0%	$0
49	O&M Year 49	LS	% of Const.	92.0%	$328,956	0.0%	$0	0.0%	$0	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	0.0%	$0	0.0%	$0	75.0%	$30,961	0.0%	$0	25.0%	$102,392

Total O&M Cost per Location:	$2,302,692	$2,500,020	$774,018	$966,243	$819,134
O&M Continency (30%):	$690,808	$750,006	$232,205	$289,873	$245,740
Total Construction Cost:	**$2,993,500**	**$3,250,026**	**$1,006,224**	**$1,256,116**	**$1,064,874**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 8 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 8: **ABOVE COUNTRY CLUB BRIDGE TO NEMEXAS SIPHON**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Riprap in Narrow Floodplain Areas		Low-Elevation Spur Dikes	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$21,817	1	$43,784	1	$8,985	1	$29,131	1	$21,414
2	Site Access and Staging	LS	2.50%	1	$4,363	1	$8,757	1	$1,797	1	$5,826	1	$4,283
3	Clearing and Grubbing	ACRE	$2,000.00	0.7	$1,300	2.1	$4,120	0.6	$1,280	0.8	$1,600	0.5	$1,000
4	Excavation (Sediment Removal)	CY	$2.75	21,520	$59,180	43,000	$118,250	8,770	$24,118	0	$0	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	21,520	$81,776	43,000	$163,400	8,770	$33,326	0	$0	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	21,520	$32,280	43,000	$64,500	8,770	$13,155	0	$0	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	0	$0	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	0	$0	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	0	$0	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	0	$0	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	0	$0	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	0	$0	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	0	$0	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	0	$0	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	0	$0	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	2,238	$156,660
25	Over-excavation (Stone Placement)	CY	$10.00	0	$0	0	$0	0	$0	750	$7,500	1,119	$11,190
26	Compacted Backfill (Stone Placement)	CY	$5.50	0	$0	0	$0	0	$0	500	$2,750	448	$2,464
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	700	$28,000	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	2,760	$193,200	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$200,716	$402,811	$82,660	$268,008	$197,011
Planning, Engineering & Design (PED - 15%)	$30,107	$60,422	$12,399	$40,201	$29,552
Construction Management (CM - 10%)	$20,072	$40,281	$8,266	$26,801	$19,701
Sub-total Cost (1):	$250,896	$503,513	$103,325	$335,009	$246,264
Construction Continency (30%):	$60,215	$120,843	$24,798	$80,402	$59,103
Total Construction Cost:	**$311,110**	**$624,356**	**$128,123**	**$415,412**	**$305,367**

PROBLEM LOCATION 8: **ABOVE COUNTRY CLUB BRIDGE TO NEMEXAS SIPHON**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Riprap in Narrow Floodplain Areas		Low-Elevation Spur Dikes	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	15.0%	$29,552
6	O&M Year 6	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
9	O&M Year 9	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	15.0%	$40,201	25.0%	$49,253
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	15.0%	$29,552
16	O&M Year 16	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	15.0%	$40,201	25.0%	$49,253
21	O&M Year 21	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	15.0%	$29,552
26	O&M Year 26	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	15.0%	$40,201	25.0%	$49,253
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
33	O&M Year 33	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	15.0%	$29,552
36	O&M Year 36	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	15.0%	$40,201	25.0%	$49,253
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
45	O&M Year 45	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	15.0%	$29,552
46	O&M Year 46	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	75.0%	$150,537	85.0%	$342,389	60.0%	$49,596	0.0%	$0	0.0%	$0
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	60.0%	$49,596	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	75.0%	$150,537	0.0%	$0	60.0%	$49,596	15.0%	$40,201	25.0%	$49,253

Total O&M Cost per Location:	$3,763,433	$4,108,667	$2,479,808	$201,006	$394,022
O&M Continency (30%):	$1,129,030	$1,232,600	$743,942	$60,302	$118,207
Total Construction Cost:	**$4,892,462**	**$5,341,267**	**$3,223,751**	**$261,307**	**$512,229**

PROJECT: **Rio Grande Canalization Project - Alternative Cost Estimates**
DETAIL: *Problem Location 9 - Cost and Quantities*
COMPUTED BY: SKV
CHECKED BY: IGP

PROJECT NO: T33261
DATE: 8/25/2015

PROBLEM LOCATION 9: **MONTOYA DRAIN TO AMERICAN DAM**

CONSTRUCTION COSTS BY ALTERNATIVE

Item No.	Item Description	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Island Destabilization / Vegetation Removal		Low-Elevation Spur Dikes	
				Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost	Quant.	Total Cost
1	Mobilization / Demobilization	LS	12.50%	1	$39,413	1	$179,007	1	$15,808	1	$15,395	1	$16,328
2	Site Access and Staging	LS	2.50%	1	$7,883	1	$35,801	1	$3,162	1	$3,079	1	$3,266
3	Clearing and Grubbing	ACRE	$2,000.00	4.2	$8,360	6.6	$13,240	0.2	$480	14.5	$29,000	0.4	$800
4	Excavation (Sediment Removal)	CY	$2.75	38,130	$104,858	176,250	$484,688	15,650	$43,038	11,697	$32,166	0	$0
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$3.80	38,130	$144,894	176,250	$669,750	15,650	$59,470	11,697	$44,447	0	$0
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$1.50	38,130	$57,195	176,250	$264,375	15,650	$23,475	11,697	$17,545	0	$0
7	Excavation (Sediment Traps)	CY	$4.25	0	$0	0	$0	0	$0	0	$0	0	$0
8	1-ft Rebar Mesh (Sediment Trap)	LF	$50.00	0	$0	0	$0	0	$0	0	$0	0	$0
9	8-in Rebar Mesh (Sediment Trap)	LF	$75.00	0	$0	0	$0	0	$0	0	$0	0	$0
10	6-in Rebar Mesh (Sediment Trap)	LF	$85.00	0	$0	0	$0	0	$0	0	$0	0	$0
11	4-in Wire Mesh (Sediment Trap)	LF	$30.00	0	$0	0	$0	0	$0	0	$0	0	$0
12	2-in Wire Mesh (Sediment Trap)	LF	$55.00	0	$0	0	$0	0	$0	0	$0	0	$0
13	1-in Wire Mesh (Sediment Trap)	LF	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
14	Compacted Fill (Sediment Trap Berm)	CY	$3.50	0	$0	0	$0	0	$0	0	$0	0	$0
15	Rock Slope Protection (Sediment Trap Berm)	CY	$15.25	0	$0	0	$0	0	$0	0	$0	0	$0
16	Pilot Channel Excavation	CY	$6.50	0	$0	0	$0	0	$0	0	$0	0	$0
17	Maintenance Road	SF	$2.00	0	$0	0	$0	0	$0	0	$0	0	$0
18	Debris Rack	EA	$40,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
19	Structural Excavation	CY	$10.00	0	$0	0	$0	0	$0	0	$0	0	$0
20	Rock Removal	CY	$20.00	0	$0	0	$0	0	$0	0	$0	0	$0
21	Sheet Pile Wall Demolition	LF	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0
22	Demo Existing Siphon	LF	$52.50	0	$0	0	$0	0	$0	0	$0	0	$0
23	Reinforced Concrete Box	CY	$800.00	0	$0	0	$0	0	$0	0	$0	0	$0
24	Spur Dike Stone	CY	$70.00	0	$0	0	$0	0	$0	0	$0	1,706	$119,420
25	Over-excavation (Spur Dikes)	CY	$10.00	0	$0	0	$0	0	$0	0	$0	853	$8,530
26	Compacted Backfill (Spur Dikes)	CY	$5.50	0	$0	0	$0	0	$0	0	$0	341	$1,876
27	Bank Protection Bedding	CY	$40.00	0	$0	0	$0	0	$0	0	$0	0	$0
28	Bank Protection Riprap	CY	$70.00	0	$0	0	$0	0	$0	0	$0	0	$0
29	Concrete Sill	CY	$625.00	0	$0	0	$0	0	$0	0	$0	0	$0
30	Vortex Tube	LF	$25.00	0	$0	0	$0	0	$0	0	$0	0	$0
31	Escape Channels	LF	$35.00	0	$0	0	$0	0	$0	0	$0	0	$0
32	Control Gate	EA	$2,000.00	0	$0	0	$0	0	$0	0	$0	0	$0
33	12-in CMP Culvert	EA	$1,500.00	0	$0	0	$0	0	$0	0	$0	0	$0
34	Eastside Canal Overflow Check and Bypass	EA	$800,000	0	$0	0	$0	0	$0	0	$0	0	$0
35	Westside Canal Overflow Check and Bypass	EA	$1,050,000	0	$0	0	$0	0	$0	0	$0	0	$0
36	Mesilla Dam Gate Automation	EA	$1,000,000	0	$0	0	$0	0	$0	0	$0	0	$0

Total Construction Cost per Alternative:	$362,602	$1,646,860	$145,432	$141,632	$150,219
Planning, Engineering & Design (PED - 15%)	$54,390	$247,029	$21,815	$21,245	$22,533
Construction Management (CM - 10%)	$36,260	$164,686	$14,543	$14,163	$15,022
Sub-total Cost (1):	$453,253	$2,058,575	$181,790	$177,040	$187,774
Construction Continency (30%):	$108,781	$494,058	$43,630	$42,490	$45,066
Total Construction Cost:	**$562,034**	**$2,552,634**	**$225,419**	**$219,529**	**$232,840**

PROBLEM LOCATION 9: **MONTOYA DRAIN TO AMERICAN DAM**

O&M COSTS BY ALTERNATIVE

Year	O&M Year	UOM	Unit Cost	Sediment Removal Alternatives						Non-Sediment Removal Alternatives			
				Channel Excavation (Short)		Channel Excavation (Long)		Channel Excavation (Localized)		Island Destabilization / Vegetation Removal		Low-Elevation Spur Dikes	
				O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost	O&M %	Total Cost
1	O&M Year 1	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
2	O&M Year 2	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
3	O&M Year 3	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
4	O&M Year 4	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
5	O&M Year 5	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	15.0%	$22,533
6	O&M Year 6	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
7	O&M Year 7	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
8	O&M Year 8	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
9	O&M Year 9	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
10	O&M Year 10	LS	% of Const.	0.0%	$0	96.0%	$1,580,986	143.0%	$207,968	0.0%	$0	25.0%	$37,555
11	O&M Year 11	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
12	O&M Year 12	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
13	O&M Year 13	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
14	O&M Year 14	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
15	O&M Year 15	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	15.0%	$22,533
16	O&M Year 16	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
17	O&M Year 17	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
18	O&M Year 18	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
19	O&M Year 19	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
20	O&M Year 20	LS	% of Const.	0.0%	$0	96.0%	$1,580,986	143.0%	$207,968	25.0%	$35,408	25.0%	$37,555
21	O&M Year 21	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
22	O&M Year 22	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
23	O&M Year 23	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
24	O&M Year 24	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
25	O&M Year 25	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	15.0%	$22,533
26	O&M Year 26	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
27	O&M Year 27	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
28	O&M Year 28	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
29	O&M Year 29	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
30	O&M Year 30	LS	% of Const.	79.0%	$286,456	96.0%	$1,580,986	143.0%	$207,968	0.0%	$0	25.0%	$37,555
31	O&M Year 31	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
32	O&M Year 32	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
33	O&M Year 33	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
34	O&M Year 34	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
35	O&M Year 35	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	15.0%	$22,533
36	O&M Year 36	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
37	O&M Year 37	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
38	O&M Year 38	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
39	O&M Year 39	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
40	O&M Year 40	LS	% of Const.	0.0%	$0	96.0%	$1,580,986	143.0%	$207,968	25.0%	$35,408	25.0%	$37,555
41	O&M Year 41	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
42	O&M Year 42	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
43	O&M Year 43	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
44	O&M Year 44	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
45	O&M Year 45	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	0.0%	$0	15.0%	$22,533
46	O&M Year 46	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
47	O&M Year 47	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
48	O&M Year 48	LS	% of Const.	79.0%	$286,456	0.0%	$0	143.0%	$207,968	25.0%	$35,408	0.0%	$0
49	O&M Year 49	LS	% of Const.	0.0%	$0	0.0%	$0	143.0%	$207,968	0.0%	$0	0.0%	$0
50	O&M Year 50	LS	% of Const.	0.0%	$0	96.0%	$1,580,986	143.0%	$207,968	0.0%	$0	25.0%	$37,555

Total O&M Cost per Location:	$4,583,295	$7,904,930	$10,398,379	$424,896	$300,439
O&M Continency (30%):	$1,374,989	$2,371,479	$3,119,514	$127,469	$90,132
Total Construction Cost:	**$5,958,284**	**$10,276,409**	**$13,517,893**	**$552,364**	**$390,570**

RIO GRANDE CANALIZATION PROJECT
UNIT COST ASSUMPTIONS

Date: 3-Aug-15

ITEM #	ITEM DESCRIPTION	UOM	UNIT COST	NOTES
1	Mobilization / Demobilization	%	12.5%	Assumes 12.5% of construction costs for mob/demob
2	Site Access and Staging	%	2.5%	Assumes 2.5% of construction costs for site access
3	Clearing and Grubbing	ACRE	$ 2,000	Assumes clearing of medium brush, including trees
4	Excavation (Sediment Removal)	CY	$ 2.75	Assumes dozers to excavate and place in stockpile
5	Load/Haul to Local Disposal Site (Sediment Removal)	CY	$ 3.80	Assumes hauling 2-mi (roundtrip) on avg, to disposal site
6	Compacted Fill at Disposal Site (Sediment Removal)	CY	$ 1.50	Assumes excavating from stockpile and compacting at disposal site.
7	Excavation (Sediment Traps)	CY	$ 4.25	Assumes hydraulic exc (33% of quant.) and dozers for remaining
8	1-ft Rebar Mesh	LF	$ 50.00	Assumes 1' x 1' rebar (#4) mesh, 3' high, welded, with steel posts every 12-lf
9	8-in Rebar Mesh	LF	$ 75.00	Assumes 8" x 8" rebar (#4) mesh, 3' high, welded, with steel posts every 12-lf
10	6-in Rebar Mesh	LF	$ 85.00	Assumes 6" x 6" rebar (#4) mesh, 3' high, welded, with steel posts every 12-lf
11	4-in Wire Mesh	LF	$ 30.00	Assumes 4" x 4" wire mesh (1/8") dia., 3' high, with steel posts every 12-lf
12	2-in Wire Mesh	LF	$ 55.00	Assumes 2" x 2" wire mesh (1/8") dia., 3' high, with steel posts every 12-lf
13	1-in Wire Mesh	LF	$ 70.00	Assumes 1" x 1" wire mesh (1/8") dia., 3' high, with steel posts every 12-lf
14	Compacted Fill (Sediment Trap Berm)	CY	$ 3.50	Assumes using excavated material for berm, 3' high, 2:1 side slopes, no borrow
15	Rock Slope Protection (Sediment Trap Berm)	CY	$ 15.25	Assumes using rock from excavated materials, placed along 1 slope of berm
16	Pilot Channel Excavation	CY	$ 6.50	Assumes hydraulic excavators, material disposed on-site
17	Maintenance Road	SF	$ 2.00	Assumes 15' wide road, graded, compacted, with stabilizing material
18	Debris Rack	EA	$ 40,000	Assumes steel debris racks, field constructed, at every sediment trap
19	Structural Excavation	CY	$ 10.00	Assumes hydraulic excavators, material disposed on-site
20	Rock Removal	CY	$ 20.00	Assumes removal of loose rock and disposal on-site
21	Sheet Pile Wall Demolition	LF	$ 100	Assumes wall is 25-vlf deep, sheet piles would be removed and salvaged
22	Demo Existing Concrete Siphon	LF	$ 52.50	Assumes demo reinforced concrete box, haul materials off-site for disposal
23	Reinforced Concrete Box	CY	$ 800	Assumes reinforced concrete box, with grading and base layer
24	Spur Dike Stone	CY	$ 70.00	Includes material, delivery to project site, and placement
25	Over-excavation (Spur Dikes)	CY	$ 10.00	Assumes excavated material to be stockpiled on-site for re-use
26	Compacted Backfill (Spur Dikes)	CY	$ 5.50	Assumes re-use of previous excavated materials for backfill material
27	Bank Protection Bedding	CY	$ 40.00	Includes stone material, delivery and placement
28	Bank Protection Riprap	CY	$ 70.00	Includes stone material, delivery and placement
29	Concrete Sill	CY	$ 625	Assumes 1' thick concrete sill for vortex tube
30	Vortex Tubes	LF	$ 25.00	Assumes 8" diameter tubes placed in concrete sill
31	Escape Channels	LF	$ 35.00	Includes excavation, concrete channel, and backfill
32	Control Gate	EA	$ 2,000	Includes material and installation of 12" canal gate
33	12-in CMP Culvert	EA	$ 1,500	Assumes 12" CMP culvert with gravel bedding, earthwork elsehwere, 30-lf
34	Eastside Canal Overflow Check and Bypass	LS	$ 800,000	Includes all earthwork, concrete, gates, etc. for bypass construction
35	Westside Canal Overflow Check and Bypass	LS	$ 1,050,000	Includes all earthwork, concrete, gates, etc. for bypass construction
36	Mesilla Dam Gate Automation	EA	$ 1,000,000	Cost is a placeholder; awaiting detailed information and will be updated

DETAILED UNIT COST CALCULATIONS

Date: 3-Aug-15

ITEM NO.	COST ITEM DESCRIPTION / SUB-COST ITEMS	UOM	QUANTITY	UNIT COST	TOTAL COST
1	**Eastside Canal - New Check/Sluice Structures in Canals**	**LS**	**1**	**$ 776,011.88**	**$ 776,012**
	.01 Earthwork	LS	1	$ 14,636.88	$ 14,637
	a) Structural Excavation	*CY*	*550*	*$ 15.00*	*$ 8,250*
	b) Push to Stockpile	*CY*	*633*	*$ 2.50*	*$ 1,581*
	c) Haul to Disposal	*CY*	*633*	*$ 5.75*	*$ 3,637*
	d) Compacted Backfill	*CY*	*138*	*$ 8.50*	*$ 1,169*
	.02 Concrete	CY	330	$ 701.14	$ 231,375
	a) Base Layer	*CY*	*100*	*$ 40.00*	*$ 4,000*
	b) Structure Invert	*CY*	*125*	*$ 625.00*	*$ 78,125*
	c) Sideslopes	*CY*	*140*	*$ 675.00*	*$ 94,500*
	d) Gate Walls	*CY*	*60*	*$ 850.00*	*$ 51,000*
	e) Walkway	*CY*	*5*	*$ 750.00*	*$ 3,750*
	.03 Gates	LS	1	$ 530,000.00	$ 530,000
	a) Sluiceway Gate	*EA*	*4*	*$ 120,000.00*	*$ 480,000*
	b) Wasteway Gate	*EA*	*2*	*$ 25,000.00*	*$ 50,000*
					Rounded Unit Cost Used:
		Eastside Canal - New Check/Sluice Structures in Canals			***$ 800,000.00/EA***
2	**Westside Canal - New Check/Sluice Structures in Canals**	**LS**	**1**	**$ 1,049,862.50**	**$ 1,049,863**
	.01 Earthwork	LS	1	$ 26,612.50	$ 26,613
	a) Structural Excavation	*CY*	*1,000*	*$ 15.00*	*$ 15,000*
	b) Push to Stockpile	*CY*	*1,150*	*$ 2.50*	*$ 2,875*
	c) Haul to Disposal	*CY*	*1,150*	*$ 5.75*	*$ 6,613*
	d) Compacted Backfill	*CY*	*250*	*$ 8.50*	*$ 2,125*
	.02 Concrete	CY	510	$ 692.65	$ 353,250
	a) Base Layer	*CY*	*200*	*$ 40.00*	*$ 8,000*
	b) Structure Invert	*CY*	*250*	*$ 625.00*	*$ 156,250*
	c) Sideslopes	*CY*	*180*	*$ 675.00*	*$ 121,500*
	d) Gate Walls	*CY*	*75*	*$ 850.00*	*$ 63,750*
	e) Walkway	*CY*	*5*	*$ 750.00*	*$ 3,750*
	.03 Gates	LS	1	$ 670,000.00	$ 670,000
	a) Sluiceway Gate	*EA*	*4*	*$ 155,000.00*	*$ 620,000*
	b) Wasteway Gate	*EA*	*2*	*$ 25,000.00*	*$ 50,000*
					Rounded Unit Cost Used:
		Westside Canal - New Check/Sluice Structures in Canals			***$ 1,050,000.00/EA***

Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project:
Final Report

APPENDIX Q

Parameter Scoring Development for the Alternatives

October 20, 2015

Contract No. IBM09D0006
Order No. IBM14T0016

Appendix Q

Parameter Scoring Development for the Alternatives

Page Intentionally Left Blank

Table Q.1. Scoring of benefits and consequences related to reduction to water-surface elevation.

Problem Location	Alternative Condition	Average Change, Normal Operating Flows		Average Change, 100-year Flood		Maximum Change, Normal Operating Flows		Maximum Change, 100-year Flood		Net Benefit	Net Conse-quence
		Benefit Score	Conseq. Score	Benefit Score	Conseq. Score	Benefit Score	Conseq. Score	Benefit Score	Conseq. Score		
1	Localized Excavation	6	0	5	0	1.75	0.5	1.00	0.50	5.5	0.4
	Short Channel Excavation	7	0	3	0	1.75	0.25	0.8	0.50	5.0	0.3
	Long Channel Excavation	9	0	4	0	2.5	0	1.5	0.50	6.8	0.2
	Modified Vortex Weir	4	0	0	1	1.5	2.5	0.3	1.00	2.3	1.8
	Sediment Traps	9	0	4	0	2.5	0	1.0	0.25	6.6	0.1
2	Localized Excavation	4	0	4	0	1.25	0	1.5	2.00	4.3	0.8
	Short Channel Excavation	7	0	5	0	1.75	0.25	1.8	0.50	6.2	0.3
	Long Channel Excavation	8	0	6	0	2	0	1.8	0.25	7.1	0.1
	Island Destabilization	8	0	3	0	2	0	1.3	0.75	5.7	0.3
	Sediment Traps	8	0	4	0	2.5	0.25	1.5	0.25	6.4	0.2
3	Localized Excavation	3	0	3	0	0.75	2.5	1.3	1.75	3.2	1.7
	Short Channel Excavation	4	0	4	0	1	1	1.0	0.00	4.0	0.4
	Long Channel Excavation	4	0	4	0	1	0.25	1.0	0.25	4.0	0.2
	Remove Siphon	10	0	8	0	2.5	0	1.8	2.50	8.9	1.0
	Sediment Traps	1	0	1	0	0.75	1.25	0.5	0.75	1.3	0.8
4	Localized Excavation	4	0	3	0	1	0	0.8	0.00	3.5	0.0
	Short Channel Excavation	4	0	3	0	1	0	0.8	0.25	3.5	0.1
	Long Channel Excavation	8	0	5	0	1.75	0	1.3	0.00	6.4	0.0
	Island Destabilization	0	0	4	0	0.5	2.25	0.8	0.00	2.1	0.9
	Spur Dikes	0	0	0	2	0.5	1.75	0.5	1.75	0.4	2.2
5	Localized Excavation	4	0	2	0	1.25	0	0.5	0.00	3.1	0.0
	Short Channel Excavation	5	0	3	0	1.5	0	0.8	0.00	4.1	0.0
	Long Channel Excavation	8	0	4	0	1.75	0	0.8	0.00	5.8	0.0
	Spur Dikes	0	0	0	2	0.5	2.25	0.3	0.75	0.3	2.0
	Sediment Traps	4	0	2	0	1	0.25	0.3	0.25	2.9	0.2
6	Short Channel Excavation	1	0	0	2	0.25	2.25	0.0	0.75	0.5	2.0
	Long Channel Excavation	0	0	0	2	0.5	2.5	0.0	1.00	0.2	2.2
7	Localized Excavation	0	0	0	1	0.25	2	0.0	0.75	0.1	1.5
	Short Channel Excavation	3	0	2	0	0.75	0	0.5	0.00	2.5	0.0
	Long Channel Excavation	4	0	3	0	1	0	0.5	0.00	3.4	0.0
	Spur Dikes	0	0	0	4	0	2.25	0.0	1.50	0.0	3.1
	Sediment Traps	6	0	5	0	1.5	0	0.5	0.00	5.2	0.0
8	Localized Excavation	4	0	3	0	0.75	0	0.5	0.00	3.3	0.0
	Short Channel Excavation	4	0	3	0	0.75	0	0.5	0.00	3.3	0.0
	Long Channel Excavation	4	0	2	0	0.75	0	0.5	0.00	2.9	0.0
	Riprap	0	0	0	1	0.25	0.5	0.3	0.50	0.2	0.8
	Spur Dikes	2	0	0	2	0.5	0.25	0.3	0.50	1.1	1.1
9	Localized Excavation	2	0	2	0	0.5	0	0.5	0.00	2.0	0.0
	Short Channel Excavation	3	0	3	0	0.75	0	0.5	0.00	2.9	0.0
	Long Channel Excavation	8	0	10	0	2	0	1.8	0.00	8.7	0.0
	Island Destabilization	3	0	7	0	0.75	0.5	1.0	0.00	4.7	0.2
	Spur Dikes	1	0	1	0	0.25	0.5	0.5	0.25	1.1	0.3

Table Q.2. Scoring of benefits and consequences related to reduction to groundwater level.

Problem Location	Comment	Alternative Condition	General Change (Salinity Effects)		Change at Drains		Change at Restoration Sites		Net Score	
			Benefit	Conseq.	Benefit	Conseq.	Benefit	Conseq.	Net Benefit	Net Conseq.
1	No Drains, No Rest. Sites	Localized Excavation	6	0	0	0	0	0	2.0	0.0
		Short Channel Excavation	7	0	0	0	0	0	2.3	0.0
		Long Channel Excavation	9	0	0	0	0	0	3.0	0.0
		Modified Vortex Weir	4	0	0	0	0	0	1.3	0.0
		Sediment Traps	9	0	0	0	0	0	3.0	0.0
2	Drains & Rest. Sites	Localized Excavation	4	0	4	0	0	4	2.7	1.3
		Short Channel Excavation	7	0	7	0	0	7	4.7	2.3
		Long Channel Excavation	8	0	8	0	0	8	5.3	2.7
		Island Destabilization	8	0	8	0	0	8	5.3	2.7
		Sediment Traps	8	0	8	0	0	8	5.3	2.7
3	Drains & Rest. Sites	Localized Excavation	3	0	3	0	0	3	2.0	1.0
		Short Channel Excavation	4	0	4	0	0	4	2.7	1.3
		Long Channel Excavation	4	0	4	0	0	4	2.7	1.3
		Remove Siphon	10	0	10	0	0	10	6.7	3.3
		Sediment Traps	1	0	1	0	0	1	0.7	0.3
4	Drains, No Rest. Sites	Localized Excavation	4	0	4	0	0	0	2.7	0.0
		Short Channel Excavation	4	0	4	0	0	0	2.7	0.0
		Long Channel Excavation	8	0	8	0	0	0	5.3	0.0
		Island Destabilization	0	2	0	2	0	0	0.0	1.3
		Spur Dikes	0	1	0	1	0	0	0.0	0.7
5	Drains & Rest. Sites	Localized Excavation	4	0	4	0	0	4	2.7	1.3
		Short Channel Excavation	5	0	5	0	0	5	3.3	1.7
		Long Channel Excavation	8	0	8	0	0	8	5.3	2.7
		Spur Dikes	0	1	0	1	1	0	0.3	0.7
		Sediment Traps	4	0	4	0	0	4	2.7	1.3
6	Drains & Rest. Sites	Short Channel Excavation	1	0	1	0	0	1	0.7	0.3
		Long Channel Excavation	0	1	0	1	1	0	0.3	0.7
7	Drains & Rest. Sites	Localized Excavation	0	2	0	2	2	0	0.7	1.3
		Short Channel Excavation	3	0	3	0	0	3	2.0	1.0
		Long Channel Excavation	4	0	4	0	0	4	2.7	1.3
		Spur Dikes	0	5	0	5	5	0	1.7	3.3
		Sediment Traps	6	0	6	0	0	6	4.0	2.0
8	No Drains, Rest. Sites	Localized Excavation	4	0	0	0	0	4	1.3	1.3
		Short Channel Excavation	4	0	0	0	0	4	1.3	1.3
		Long Channel Excavation	4	0	0	0	0	4	1.3	1.3
		Riprap	0	1	0	0	1	0	0.3	0.3
		Spur Dikes	2	0	0	0	0	2	0.7	0.7
9	Drain, No Rest. Sites	Localized Excavation	2	0	2	0	0	0	1.3	0.0
		Short Channel Excavation	3	0	3	0	0	0	2.0	0.0
		Long Channel Excavation	8	0	8	0	0	0	5.3	0.0
		Island Destabilization	3	0	3	0	0	0	2.0	0.0
		Spur Dikes	1	0	1	0	0	0	0.7	0.0

Table Q.3. Scoring of benefits and consequences related to aggradation/degradation and sediment loading.

Problem Location	Alternative Condition	Aggradation Within Extent of Problem Location		Aggradation over Model Reach		Cumulative Downstream Sediment Load		Net Score	
		Benefit Score	Conseq. Score	Benefit Score	Conseq. Score	Benefit Score	Conseq. Score	Net Benefit	Net Conseq.
1	Localized Excavation	3	0	2	0	0	3.5	2.0	1.4
	Short Channel Excavation	2	0	2	0	0	3.5	1.6	1.4
	Long Channel Excavation	3	0	3	0	0	5	2.4	2.0
	Modified Vortex Weir	1	0	1	0	0	0.5	0.8	0.2
	Sediment Traps	8	0	7	0	0	4.5	6.0	1.8
2	Localized Excavation	3	0	3	0	0	3	2.4	1.2
	Short Channel Excavation	5	0	3	0	0	4.5	3.2	1.8
	Long Channel Excavation	3	0	3	0	0	4	2.4	1.6
	Island Destabilization	1	0	0	1	2	0	1.2	0.4
	Sediment Traps	9	0	9	0	0	5	7.2	2.0
3	Localized Excavation	7	0	2	0	0	1.5	3.6	0.6
	Short Channel Excavation	0	4	0	1	1	0	0.4	2.0
	Long Channel Excavation	0	10	0	2	1.5	0	0.6	4.8
	Remove Siphon	10	0	2	0	0	3.5	4.8	1.4
	Sediment Traps	8	0	4	0	0	0.5	4.8	0.2
4	Localized Excavation	0	1	1	0	0	1	0.4	0.8
	Short Channel Excavation	0	3	0	1	0.5	0	0.2	1.6
	Long Channel Excavation	0	5	0	2	2	0	0.8	2.8
	Island Destabilization	0	1	0	1	1	0	0.4	0.8
	Spur Dikes	2	0	1	0	0	0.5	1.2	0.2
5	Localized Excavation	0	7	0	3	1	0	0.4	4.0
	Short Channel Excavation	0	7	1	0	0	0.5	0.4	3.0
	Long Channel Excavation	0	10	0	7	3	0	1.2	6.8
	Spur Dikes	3	0	1	0	0	0.5	1.6	0.2
	Sediment Traps	4	0	5	0	0	0.5	3.6	0.2
6	Short Channel Excavation	0	5	0	4	1.5	0	0.6	3.6
	Long Channel Excavation	0	7	0	6	1.5	0	0.6	5.2
7	Localized Excavation	0	3	1	0	0	0.5	0.4	1.4
	Short Channel Excavation	0	7	1	0	0	0.5	0.4	3.0
	Long Channel Excavation	0	7	2	0	0	0.5	0.8	3.0
	Spur Dikes	4	0	3	0	0	0.5	2.8	0.2
	Sediment Traps	9	0	10	0	0	2.5	7.6	1.0
8	Localized Excavation	0	7	0	3	1.5	0	0.6	4.0
	Short Channel Excavation	0	9	0	4	2	0	0.8	5.2
	Long Channel Excavation	0	10	0	6	3	0	1.2	6.4
	Riprap	1	0	1	0	0	0.5	0.8	0.2
	Spur Dikes	3	0	0	5	2	0	2.0	2.0
9	Localized Excavation	0	3	0	1	1.5	0	0.6	1.6
	Short Channel Excavation	0	3	0	1	2	0	0.8	1.6
	Long Channel Excavation	0	6	0	4	5	0	2.0	4.0
	Island Destabilization	0	2	0	1	2	0	0.8	1.2
	Spur Dikes	0	1	1	0	0	1	0.4	0.8

Table Q.4. Scoring of benefits related to improved irrigation return flows.

Problem Location	Comment	Alternative Condition	Initial WSE Change Score	Long-term WSE Change Score	Net Benefit Score
1	No Drains, No Rest. Sites	Localized Excavation	0	0	0.0
		Short Channel Excavation	0	0	0.0
		Long Channel Excavation	0	0	0.0
		Modified Vortex Weir	0	0	0.0
		Sediment Traps	0	0	0.0
2	Drains & Rest. Sites	Localized Excavation	4	4	4.0
		Short Channel Excavation	7	5	6.0
		Long Channel Excavation	8	7	7.5
		Island Destabilization	8	3	5.5
		Sediment Traps	8	0	4.0
3	Drains & Rest. Sites	Localized Excavation	3	6	4.5
		Short Channel Excavation	4	7	5.5
		Long Channel Excavation	4	8	6.0
		Remove Siphon	10	8	9.0
		Sediment Traps	1	0	0.5
4	Drains, No Rest. Sites	Localized Excavation	4	4	4.0
		Short Channel Excavation	4	5	4.5
		Long Channel Excavation	8	9	8.5
		Island Destabilization	0	0	0.0
		Spur Dikes	0	0	0.0
5	Drains & Rest. Sites	Localized Excavation	4	4	4.0
		Short Channel Excavation	5	5	5.0
		Long Channel Excavation	8	8	8.0
		Spur Dikes	0	0	0.0
		Sediment Traps	4	0	2.0
6	Drains & Rest. Sites	Short Channel Excavation	1	7	4.0
		Long Channel Excavation	0	8	4.0
7	Drains & Rest. Sites	Localized Excavation	0	2	1.0
		Short Channel Excavation	3	5	4.0
		Long Channel Excavation	4	6	5.0
		Spur Dikes	0	0	0.0
		Sediment Traps	6	0	3.0
8	No Drains, Rest. Sites	Localized Excavation	0	0	0.0
		Short Channel Excavation	0	0	0.0
		Long Channel Excavation	0	0	0.0
		Riprap	0	0	0.0
		Spur Dikes	0	0	0.0
9	Drain, No Rest. Sites	Localized Excavation	2	4	3.0
		Short Channel Excavation	3	5	4.0
		Long Channel Excavation	8	9	8.5
		Island Destabilization	3	4	3.5
		Spur Dikes	1	0	0.5

Table Q.5. Scoring of durability benefits.

Problem Location	Alternative Condition	Maintenance Pd (yrs)	Benefit Score
1	Localized Excavation	1.6	2.0
	Short Channel Excavation	3.5	4.0
	Long Channel Excavation	5.6	6.0
	Modified Vortex Weir	10.0	9.0
	Sediment Traps	2.9	3.0
2	Localized Excavation	7.5	7.0
	Short Channel Excavation	9.1	8.0
	Long Channel Excavation	10.3	9.0
	Island Destabilization	4.0	5.0
	Sediment Traps	6.2	7.0
3	Localized Excavation	7.8	7.0
	Short Channel Excavation	8.8	8.0
	Long Channel Excavation	9.7	8.0
	Remove Siphon	2.0	3.0
	Sediment Traps	4.0	5.0
4	Localized Excavation	2.7	3.0
	Short Channel Excavation	2.7	3.0
	Long Channel Excavation	9.7	8.0
	Island Destabilization	4.0	5.0
	Spur Dikes	3.0	4.0
5	Localized Excavation	10.9	9.0
	Short Channel Excavation	13.7	9.0
	Long Channel Excavation	27.7	10.0
	Spur Dikes	3.0	4.0
	Sediment Traps	12.1	9.0
6	Short Channel Excavation	0.7	1.0
	Long Channel Excavation	6.7	7.0
	Sluiceway and Check Stru	1.0	2.0
	Gate Automation	1.0	2.0
	Vortex Tubes	1.0	2.0
7	Localized Excavation	2.7	3.0
	Short Channel Excavation	7.6	7.0
	Long Channel Excavation	8.7	8.0
	Spur Dikes	3.0	4.0
	Sediment Traps	4.3	5.0
8	Localized Excavation	1.7	2.0
	Short Channel Excavation	2.7	3.0
	Long Channel Excavation	4.7	5.0
	Riprap	10.0	9.0
	Spur Dikes	3.0	4.0
9	Localized Excavation	0.7	1.0
	Short Channel Excavation	3.8	4.0
	Long Channel Excavation	10.4	9.0
	Island Destabilization	4.0	5.0
	Spur Dikes	3.0	4.0

Table Q.6. Scoring of total annualized project costs.

Problem Location	Alt. Description	Annual Project Cost	Cost Score
1	Channel Excavation (Short)	$ 157,300	2.1
1	Channel Excavation (Long)	$ 253,300	3.4
1	Channel Excavation (Localized)	$ 103,300	1.4
1	Sediment Traps in Arroyos	$ 285,000	3.9
1	Modification of the TB Vortex Weir	$ 4,100	0.0
2	Channel Excavation (Short)	$ 264,000	3.6
2	Channel Excavation (Long)	$ 389,200	5.3
2	Channel Excavation (Localized)	$ 181,500	2.4
2	Sediment Traps in Arroyos	$ 90,600	1.2
2	Island Destabilization / Vegetation Removal	$ 77,000	1.0
3	Channel Excavation (Short)	$ 58,500	0.8
3	Channel Excavation (Long)	$ 108,500	1.4
3	Channel Excavation (Localized)	$ 44,600	0.6
3	Sediment Traps in Arroyos	$ 14,100	0.1
3	Replace Rincon Siphon with Flume	$ 100,400	1.3
4	Channel Excavation (Short)	$ 656,800	9.0
4	Channel Excavation (Long)	$ 653,500	9.0
4	Channel Excavation (Localized)	$ 382,600	5.2
4	Island Destabilization / Spur Dikes	$ 97,500	1.3
4	Low-Elevation Spur Dikes	$ 64,800	0.8
5	Channel Excavation (Short)	$ 304,500	4.1
5	Channel Excavation (Long)	$ 269,500	3.7
5	Channel Excavation (Localized)	$ 325,200	4.4
5	Sediment Traps in Arroyos	$ 175,900	2.4
5	Low-Elevation Spur Dikes	$ 222,300	3.0
6	Channel Excavation (Short)	$ 1,299,100	10.0
6	Channel Excavation (Long)	$ 247,600	3.4
6	New Check/Sluice Structures in Canals	$ 154,800	2.1
6	Mesilla Dam Gate Automation	$ 164,200	2.2
6	Installation of Vortex Tubes	$ 25,100	0.3
7	Channel Excavation (Short)	$ 147,900	2.0
7	Channel Excavation (Long)	$ 164,800	2.2
7	Channel Excavation (Localized)	$ 44,700	0.6
7	Sediment Traps in Arroyos	$ 77,500	1.0
7	Low-Elevation Spur Dikes	$ 70,900	0.9
8	Channel Excavation (Short)	$ 217,000	2.9
8	Channel Excavation (Long)	$ 248,800	3.4
8	Channel Excavation (Localized)	$ 139,800	1.9
8	Riprap in Narrow Floodplain Areas	$ 28,300	0.3
8	Low-Elevation Spur Dikes	$ 34,200	0.4
9	Channel Excavation (Short)	$ 271,900	3.7
9	Channel Excavation (Long)	$ 534,700	7.3
9	Channel Excavation (Localized)	$ 572,800	7.8
9	Island Destabilization / Vegetation Removal	$ 32,300	0.4
9	Low-Elevation Spur Dikes	$ 26,100	0.3

Table Q.7. Scoring of benefits and consequences related to levee freeboard.

Problem Location	Alternative Condition	Average Change in Left Levee Freeboard		Average Change in Right Levee Freeboard		Maximum Change in Left Levee Freeboard		Maximum Change in Right Levee Freeboard		Net benefit	Net Conse-quence
		Benefit Score	Conseq. Score	Benefit Score	Conseq. Score	Benefit Score	Conseq. Score	Benefit Score	Conseq. Score		
1	Localized Excavation	0	0	0	0	0	0	0	0	0	0
	Short Channel Excavation	0	0	0	0	0	0	0	0	0	0
	Long Channel Excavation	0	0	0	0	0	0	0	0	0	0
	Modified Vortex Weir	0	0	0	0	0	0	0	0	0	0
	Sediment Traps	0	0	0	0	0	0	0	0	0	0
2	Localized Excavation	5	0	8	0	1.75	1.5	2.25	0.5	6.8	0.8
	Short Channel Excavation	7	0	10	0	2.25	0.5	2.5	0	8.7	0.2
	Long Channel Excavation	8	0	10	0	2.5	0.5	2.5	0	9.2	0.2
	Island Destabilization	3	0	0	1	0.75	0.75	0.5	0.5	1.7	0.9
	Sediment Traps	7	0	9	0	2	0	2.25	0	8.1	0
3	Localized Excavation	0	0	6	0	0	0	1.25	0	2.9	0
	Short Channel Excavation	0	0	7	0	0	0	1.5	0	3.4	0
	Long Channel Excavation	0	0	7	0	0	0	1.5	0	3.4	0
	Remove Siphon	0	0	10	0	0	0	2.25	0	4.9	0
	Sediment Traps	0	0	3	0	0	0	1	0	1.6	0
4	Localized Excavation	4	0	5	0	1.5	0	1	0	4.6	0
	Short Channel Excavation	5	0	6	0	1.5	0.5	1.25	0	5.5	0.2
	Long Channel Excavation	8	0	7	0	2	0	1.5	0	7.4	0
	Island Destabilization	5	0	3	0	1.5	0	0.5	0	4	0
	Spur Dikes	0	3	3	0	0.75	1.5	0.5	0	1.7	1.8
5	Localized Excavation	0	0	0	0	0	0	0	0	0	0
	Short Channel Excavation	0	0	0	0	0	0	0	0	0	0
	Long Channel Excavation	0	0	0	0	0	0	0	0	0	0
	Spur Dikes	0	0	0	0	0	0	0	0	0	0
	Sediment Traps	0	0	0	0	0	0	0	0	0	0
6	Short Channel Excavation	0	3	0	0	0	0.75	0	0	0	1.5
	Long Channel Excavation	0	3	0	0	0	1	0	0	0	1.6
7	Localized Excavation	0	3	0	3	0	0.5	0	0.5	0	2.8
	Short Channel Excavation	3	0	3	0	0.5	0	0.75	0	2.9	0
	Long Channel Excavation	5	0	5	0	1	0	1	0	4.8	0
	Spur Dikes	0	6	0	6	0	1.5	0	1.5	0	6
	Sediment Traps	6	0	6	0	1.25	0	1.25	0	5.8	0
8	Localized Excavation	4	0	3	0	1	0	1	0	3.6	0
	Short Channel Excavation	4	0	4	0	1.25	0	1.25	0	4.2	0
	Long Channel Excavation	4	0	3	0	1	0	1	0	3.6	0
	Riprap	0	3	0	3	0	0.5	0.5	0.5	0.2	2.8
	Spur Dikes	0	3	0	3	0	0.5	0.5	0.5	0.2	2.8
9	Localized Excavation	3	0	3	0	0.75	0	0.75	0	3	0
	Short Channel Excavation	5	0	3	0	1.25	0	1.25	0	4.2	0
	Long Channel Excavation	8	0	8	0	1.75	0	2	0	7.9	0
	Island Destabilization	6	0	5	0	1.5	0	1.5	0	5.6	0
	Spur Dikes	3	0	0	3	0.75	0.5	0.5	0.5	1.7	1.6

Table Q.8. Scoring of increased bank erosion potential.

Problem Location	Alternative Condition	Max. Shear Increase (psf)	Conseq. Score
1	Localized Excavation	1.2	10.0
	Short Channel Excavation	0.5	6.0
	Long Channel Excavation	0.2	3.0
	Modified Vortex Weir	0.3	3.0
	Sediment Traps	0.7	8.0
2	Localized Excavation	0.4	4.0
	Short Channel Excavation	0.2	2.0
	Long Channel Excavation	0.4	5.0
	Island Destabilization	0.4	5.0
	Sediment Traps	0.0	0.0
3	Localized Excavation	0.1	2.0
	Short Channel Excavation	0.2	2.0
	Long Channel Excavation	0.1	1.0
	Remove Siphon	1.5	10.0
	Sediment Traps	0.04	0.0
4	Localized Excavation	0.0	0.0
	Short Channel Excavation	0.5	5.0
	Long Channel Excavation	0.2	2.0
	Island Destabilization	0.1	1.0
	Spur Dikes	0.3	4.0
5	Localized Excavation	0.1	2.0
	Short Channel Excavation	0.1	1.0
	Long Channel Excavation	0.2	2.0
	Spur Dikes	0.0	0.0
	Sediment Traps	0.1	2.0
6	Short Channel Excavation	0.0	0.0
	Long Channel Excavation	0.0	0.0
	Sluiceway and Check Stru	0.0	0.0
	Gate Automation	0.0	0.0
	Vortex Tubes	0.0	0.0
7	Localized Excavation	0.6	7.0
	Short Channel Excavation	0.0	0.0
	Long Channel Excavation	0.1	2.0
	Spur Dikes	0.1	1.0
	Sediment Traps	0.3	3.0
8	Localized Excavation	0.0	0.0
	Short Channel Excavation	0.0	0.0
	Long Channel Excavation	0.0	0.0
	Riprap	0.0	0.0
	Spur Dikes	0.0	0.0
9	Localized Excavation	0.0	0.0
	Short Channel Excavation	0.1	1.0
	Long Channel Excavation	0.1	2.0
	Island Destabilization	0.0	0.0
	Spur Dikes	0.0	0.0

Table Q.9. Scoring of additional restoration and site-specific benefits and consequences.

Problem Location	Alternative Condition	Additional Restoration Benefits	Additional Site Specific Benefits	Additional Restoration Consequences	Additional Site Specific Consequences
1	Localized Excavation	0	0	2.5	0.0
	Short Channel Excavation	0	0	2.5	0.0
	Long Channel Excavation	0	0	2.5	0.0
	Modified Vortex Weir	0	7.5	0.0	0.0
	Sediment Traps	5	0	0.0	0.0
2	Localized Excavation	0	0	2.5	0.0
	Short Channel Excavation	0	0	2.5	0.0
	Long Channel Excavation	0	0	2.5	0.0
	Island Destabilization	0	7.5	2.5	0.0
	Sediment Traps	5	0	2.5	0.0
3	Localized Excavation	0	0	2.5	0.0
	Short Channel Excavation	0	0	2.5	0.0
	Long Channel Excavation	0	0	2.5	0.0
	Remove Siphon	2.5	0	7.5	10.0
	Sediment Traps	5	0	0.0	0.0
4	Localized Excavation	0	0	2.5	0.0
	Short Channel Excavation	0	0	2.5	0.0
	Long Channel Excavation	0	0	2.5	0.0
	Island Destabilization	0	7.5	2.5	0.0
	Spur Dikes	2.5	5	0.0	0.0
5	Localized Excavation	0	0	2.5	0.0
	Short Channel Excavation	0	0	2.5	0.0
	Long Channel Excavation	0	0	2.5	0.0
	Spur Dikes	2.5	5	0.0	0.0
	Sediment Traps	5	0	0.0	0.0
6	Short Channel Excavation	0	0	2.5	0.0
	Long Channel Excavation	0	0	2.5	0.0
	Sluiceway and Check Stru	0	5	0.0	0.0
	Gate Automation	0	10	0.0	0.0
	Vortex Tubes	0	5	0.0	0.0
7	Localized Excavation	0	0	2.5	0.0
	Short Channel Excavation	0	0	2.5	0.0
	Long Channel Excavation	0	0	2.5	0.0
	Spur Dikes	2.5	5	0.0	0.0
	Sediment Traps	5	0	0.0	0.0
8	Localized Excavation	0	0	2.5	0.0
	Short Channel Excavation	0	1	2.5	0.0
	Long Channel Excavation	0	2	2.5	0.0
	Riprap	0	10	0.0	1.0
	Spur Dikes	2.5	5	0.0	2.0
9	Localized Excavation	0	0	2.5	0.0
	Short Channel Excavation	0	0	2.5	0.0
	Long Channel Excavation	0	0	2.5	0.0
	Island Destabilization	0	7.5	2.5	0.0
	Spur Dikes	2.5	5	2.5	0.0

Channel Maintenance Alternatives and Sediment-transport Studies for the Rio Grande Canalization Project:
Final Report

APPENDIX R

Digital Data Disc

October 20, 2015

Contract No. IBM09D0006
Order No. IBM14T0016