Attachment 8J

Cost Estimates

CENTRAL VALLEY
FLOOD MANAGEMENT
PLANNING PROGRAM

FloodSAFE
CALIFORNIA

2012 Central Valley Flood Protection Plan

Attachment 8J: Cost Estimates

June 2012

STATE OF CALIFORNIA
THE NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

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Table of Contents

1.0 Introduction 1-1
1.1 Purpose of this Attachment 1-1
1.2 Background 1-1
1.3 CVFPP Planning Areas 1-2
1.4 2012 CVFPP Planning Goals 1-4
1.5 2012 CVFPP Planning Approaches 1-4
1.6 Cost Estimates for 2012 CVFPP 1-5
1.7 Report Organization 1-6

2.0 Summary and Findings 2-1
2.1 Cost Estimate Elements 2-1
2.2 Cost Estimate Summary 2-2

3.0 Acronyms and Abbreviations 3-1

List of Tables

Table 2-1. Summary of Cost Estimate Ranges for Preliminary Approaches Considered and Preferred State Systemwide Investment Approach ($-Million) 2-3

List of Figures

Figure 1-1. Central Valley Flood Protection Plan Planning Areas 1-3

Figure 1-2. Formulation Process for State Systemwide Investment Approach 1-5

List of Appendices

Appendix A – CVFPP Cost Estimate Methodology

Appendix B – Urban Levee Evaluations Project Remediation Alternatives and Cost Estimate Report

Appendix C – Non-Urban Levee Evaluations Project Remediation Alternatives and Cost Estimate Report

Appendix D – Protection of Small Communities

Appendix E – Flood Corridor Expansion

1.0 Introduction

This section states the purpose of this attachment, gives background information (including a description of planning areas, goals, and approaches), overviews the cost estimate work performed, and provides an overview of the report organization.

1.1 Purpose of this Attachment

This attachment documents (1) the cost estimating methodology and approach, and (2) findings that support the cost estimates of the State Systemwide Investment Approach presented in the 2012 Central Valley Flood Protection Plan (CVFPP).

This attachment provides the detailed pre-appraisal level engineering and associated construction costs that support three preliminary approaches and are utilized to develop a pre-appraisal level construction cost for the State Systemwide Investment Approach.

Costs summarized in Section 2 of the 2012 CVFPP can be reviewed in greater detail in this attachment.

1.2 Background

As authorized by Senate Bill 5, also known as the Central Valley Flood Protection Act of 2008, the California Department of Water Resources (DWR) has prepared a sustainable, integrated flood management plan called the CVFPP, for adoption by the Central Valley Flood Protection Board (Board). The 2012 CVFPP provides a systemwide approach to protecting lands currently protected from flooding by existing facilities of the State Plan of Flood Control (SPFC), and will be updated every 5 years.

As part of development of the CVFPP, a series of technical analyses were conducted to evaluate hydrologic, hydraulic, geotechnical, economic, ecosystem, and related conditions within the flood management system and to support formulation of system improvements. These analyses were conducted in the Sacramento River Basin, San Joaquin River Basin, and Sacramento-San Joaquin Delta (Delta).

1.3 CVFPP Planning Areas

For planning and analysis purposes, and consistent with legislative direction, two geographical planning areas were important for CVFPP development (Figure 1-1):

- **SPFC Planning Area –** This area is defined by the lands currently receiving flood protection from facilities of the SPFC (see *State Plan of Flood Control Descriptive Document* (DWR, 2010)). The State of California's (State) flood management responsibility is limited to this area.

- **Systemwide Planning Area** – This area includes the lands that are subject to flooding under the current facilities and operation of the Sacramento-San Joaquin River Flood Management System (California Water Code Section 9611). The SPFC Planning Area is completely contained within the Systemwide Planning Area which includes the Sacramento River Basin, San Joaquin River Basin, and Delta regions.

Planning and development for the CVFPP occurs differently in these planning areas. The 2012 CVFPP focused on SPFC facilities; therefore, evaluations and analyses were conducted at a greater level of detail within the SPFC Planning Area than in the Systemwide Planning Area.

Costs presented herein cover primarily the SPFC Planning Area but some elements of the conceptual level engineering approaches and pre-appraisal level costs are outside of the SPFC Planning Area and contained within the Systemwide Planning Area.

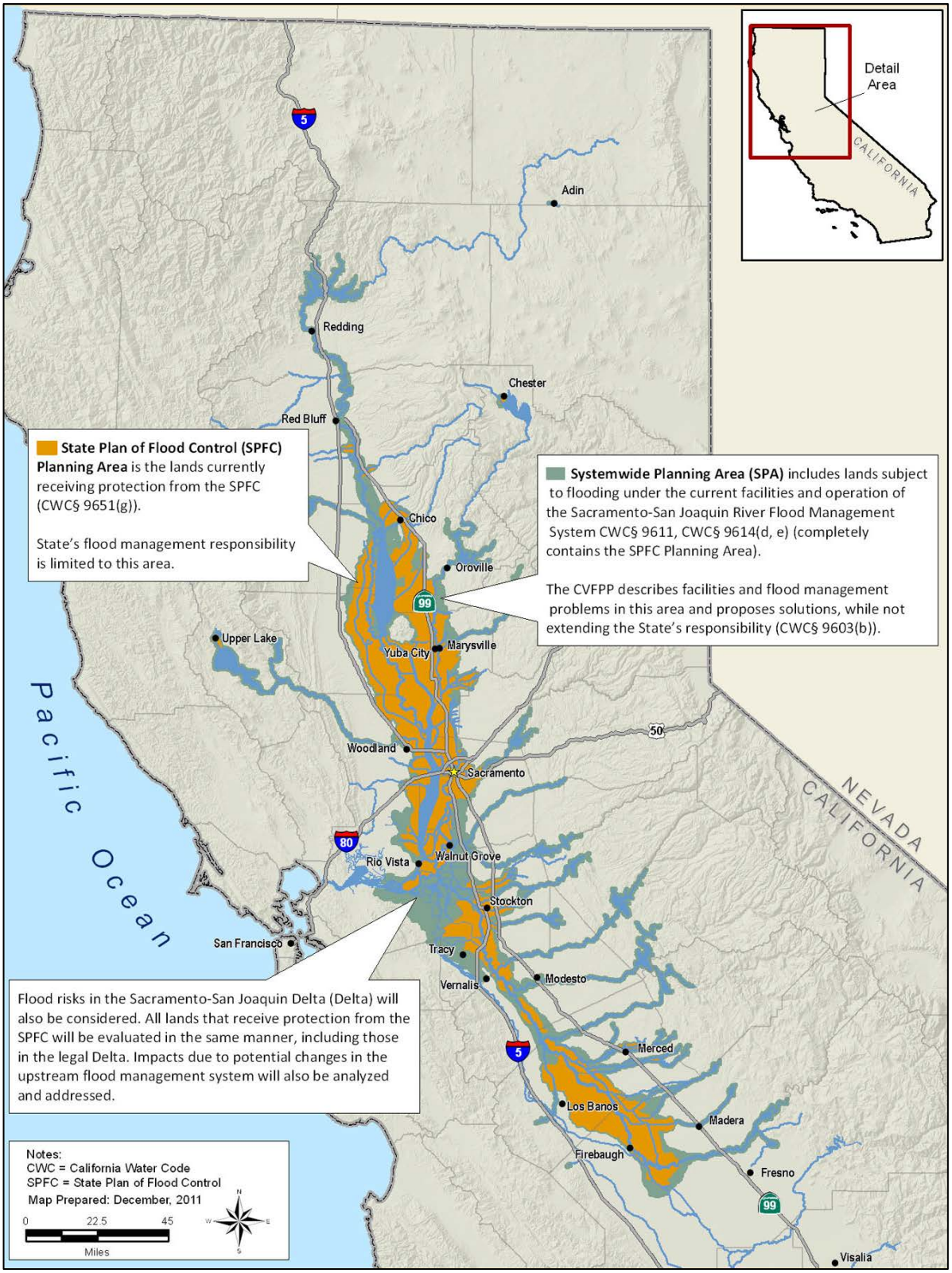

Figure 1-1. Central Valley Flood Protection Plan Planning Areas

1.4 2012 CVFPP Planning Goals

To help direct CVFPP development to meet legislative requirements and address identified flood-management-related problems and opportunities, a primary and four supporting goals were developed:

- **Primary Goal** – Improve Flood Risk Management
- **Supporting Goals:**
  - Improve Operations and Maintenance
  - Promote Ecosystem Functions
  - Improve Institutional Support
  - Promote Multi-Benefit Projects

This attachment supports the goals of the 2012 CVFPP by providing the planning and engineering detail to support cost estimates which are key to plan formulation and ultimately implementation of flood management improvements.

1.5 2012 CVFPP Planning Approaches

In addition to **No Project**, three fundamentally different preliminary approaches to flood management were initially compared to explore potential improvements in the Central Valley. These preliminary approaches are not alternatives; rather, they bracket a range of potential actions and help explore trade-offs in costs, benefits, and other factors important in decision making. The preliminary approaches are as follows:

- **Achieve SPFC Design Flow Capacity** – Address capacity inadequacies and other adverse conditions associated with existing SPFC facilities, without making major changes to the footprint or operation of those facilities.
- **Protect High Risk Communities** – Focus on protecting life safety for populations at highest risk, including urban areas and small communities.
- **Enhance Flood System Capacity** – Seek various opportunities to achieve multiple benefits through enhancing flood system storage and conveyance capacity.

Comparing these approaches helped identify the advantages and disadvantages of different combinations of management actions, and demonstrated opportunities to address the CVFPP goals to different degrees.

Based on this evaluation, a **State Systemwide Investment Approach** was developed that encompasses aspects of each of the approaches to balance achievement of the goals from a systemwide perspective, and includes integrated conservation elements. Figure 1-2 illustrates this plan formulation process.

This attachment contains the costs summarized in the CVFPP for all preliminary approaches and ultimately the State Systemwide Investment Approach.

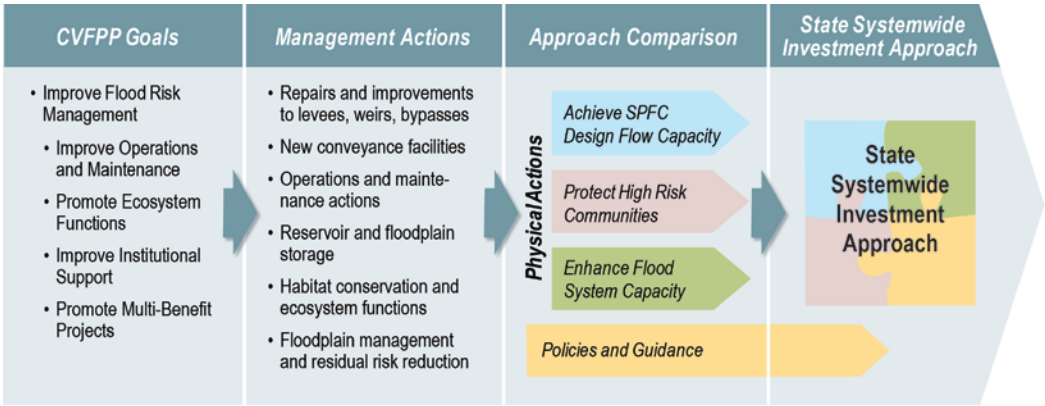

Figure 1-2. Formulation Process for State Systemwide Investment Approach

1.6 Cost Estimates for 2012 CVFPP

This report documents the assumptions and methodology for developing costs, and presents cost estimates for elements of the CVFPP preliminary approaches and the State Systemwide Investment Approach. An appropriate cost estimating methodology, using best available data, was required to evaluate and compare the preliminary approaches. The elements of the preliminary approaches and the methodology to develop them are then presented with their total estimated costs. The cost estimating work completed for the CVFPP was not based on bid-ready engineering documents, but rather conceptual designs and remedial actions extracted from parallel evaluation efforts, and carries an appropriate level of contingency for a conceptual-level planning effort or 25 percent plus/minus for all cost elements.

1.7 Report Organization

Organization of this document is as follows:

- Section 1 introduces and describes the purpose of this document.
- Section 2 summarizes of total estimated costs of the preliminary approaches and the State Systemwide Investment Approach.
- Section 3 lists acronyms and abbreviations used in this document.
- Appendix A documents the cost estimating methodology and provides cost details.
- Appendix B describes the remediation alternative analysis and cost estimates for addressing identified hazard factors for the urban SPFC levees and for achieving 200-year level protection.
- Appendix C describes the remediation alternative analysis and cost estimates for addressing the identified hazard factors for Non-Urban SPFC levees.
- Appendix D documents the conceptual design and cost estimates for providing 100-year level protection for small communities.
- Appendix E documents the conceptual design and cost estimates for the flood corridor expansion features, including levee setback.

2.0 Summary and Findings

The conceptually designed flood management elements used for the preliminary CVFPP cost estimates in this attachment are at a planning level of detail, and should be used for planning purposes only. These cost estimates will be further refined in future feasibility and design studies.

2.1 Cost Estimate Elements

The cost estimates are organized according to four primary flood management elements that address the different types of improvements made to the flood protection system in each approach:

- **System Improvement Element** – The bypass and weir system of the SPFC has provided systemwide benefits of flood protection. System improvements are intended to improve the flood operations for the system as a whole and provide areas to enhance the ecosystem. Considered bypass expansion and weir modifications would lower peak floodflows throughout the system from the reservoirs downstream, providing further improvements in flood protection for urban areas, small communities, and rural-agricultural areas.

- **Urban Improvement Element** – Urban areas located within the region protected by SPFC facilities are defined as developed areas with 10,000 residents or more. The SPFC provides flood protection to nearly 1 million people living in urban areas. The urban areas located within the SPFC are generally concentrated in a few regions (Feather River, Lower Sacramento River, and Lower San Joaquin River) in the Sacramento and San Joaquin River basins. Urban improvements are targeted to achieve 200-year level of protection.

- **Rural-Agricultural Improvement Element** – The rural-agricultural improvement addresses the flood protection needs of the largely agricultural areas and small communities throughout these areas (both located within the area protected by the SPFC).

- **Residual Risk Management Element** – Residual risk management addresses additional efforts needed to provide flood protection beyond capital flood protection projects included in the other flood management elements. While this includes features that support improved flood protection throughout the system, it focuses on providing supplemental flood protection in rural-agricultural areas. It

includes three features: Enhanced Flood Emergency Response, Enhanced Operations and Maintenance, and Floodplain Management.

It should be noted that ecosystem enhancements are integrated into the above flood management elements. Ecosystem enhancement features are included in the Enhance Flood System Capacity Approach and the State Systemwide Investment Approach. The Achieve SPFC Design Flow Capacity Approach and the Protect High Risk Communities Approach do not include ecosystem enhancements, but do include cost allowances for mitigation of ecosystem impacts.

2.2 Cost Estimate Summary

The estimated costs for the flood management elements included in the CVFPP preliminary approaches and the State Systemwide Investment Approach are based on 2011 price levels. These costs are not based on bid-ready engineering documents, but rather on conceptual designs and remedial actions extracted from parallel evaluation efforts, and carry an appropriate level of contingency for a conceptual-level planning costs effort or 25 percent plus/minus for all cost elements. The actual implementation cost of flood management actions will depend on many factors that cannot be determined and evaluated in detail at this time. The actual costs will ultimately depend on the features chosen during future feasibility studies, engineering, actual future labor and material costs, competitive market conditions, construction schedule, and other factors. To reflect this uncertainty, estimated costs for the proposed flood management elements are presented as a range of low to high cost. Details of the cost estimate methodology are contained in Appendix A. Additional supporting details for cost estimates appear in Appendices B through E.

Table 2-1 summarizes the costs ranges for each of the flood management elements. Detailed cost estimates are included in Appendix A.

Table 2-1. Summary of Cost Estimate Ranges for Preliminary Approaches Considered and Preferred State Systemwide Investment Approach ($-Million)

Flood Management Element	Preliminary Approaches Considered			State Systemwide Investment Approach
	Achieve SPFC Design Flow Capacity	Protect High Risk Communities	Enhance Flood System Capacity	
System Improvements	$91 – $114	$91 – $114	$7,605 – $10,889	$5,142 – $6,501
Urban Improvements	$3,827 – $4,783	$5,496 – $6,675	$5,496 – $6,675	$5,496 – $6,675
Rural/Agricultural Improvements	$13,843 – $17,305	$1,253 – $1,504	$18,088 – $23,075	$1,772 – $1,873
Residual Risk Management	$732 – $901	$1,357 – $1,637	$653 – $798	$1,511 – $1,863
TOTAL	**$18,493 – $23,103**	**$8,197 – $9,930**	**$31,842 – $41,437**	**$13,921 – $16,912**

Key:
SPFC = State Plan of Flood Control

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3.0 Acronyms and Abbreviations

Annual Report ..... Local agency annual report

AEP ..... annual exceedence probability

APN..... Assessor's Parcel Number

ASPE ..... American Society of Professional Estimators

Board ..... Central Valley Flood Protection Board

CDP ..... Census-Designated Place

Comprehensive Study ..... Sacramento and San Joaquin River Basins Comprehensive Study

CVFPP ..... Central Valley Flood Protection Plan

Delta..... Sacramento-San Joaquin Delta

DFG ..... California Department of Fish and Game

DWR ..... California Department of Water Resources

FEMA ..... Federal Emergency Management Agency

FIP ..... flood inundation potential

FROA ..... floodplain restoration opportunities analysis

GAR ..... Geotechnical Assessment Report

GIS..... geographic information system

I-5..... Interstate 5

LiDAR..... Light Detection and Ranging

NGO..... nongovernmental organization

NULE ..... Non-Urban Levee Evaluations

O&M..... operations and maintenance

PCET ..... Parametric Cost Estimating Tool

RACER ..... Remedial Alternatives and Cost Estimate Report

ROW ..... right-of-way

SB ..... Senate Bill

SPFC ..... State Plan of Flood Control

State..... State of California

ULDC ..... Urban Levee Design Criteria

ULE ..... Urban Levee Evaluations

USACE..... U.S. Army Corps of Engineers

USFWS ..... U.S. Fish and Wildlife Service

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Attachment 8J: Cost Estimates Appendix A – CVFPP Cost Estimates Methodology

June 2012

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Table of Contents

1.0 Introduction A-1-1

2.0 Background A-2-1
2.1 Planning Area A-2-1
2.2 Key Cost Estimate Assumptions and Limitations A-2-3
2.2.1 Cost Uncertainty A-2-3
2.2.2 Cost Ranges A-2-3
2.2.3 Risk Assessment, Feasibility, Engineering, and Permitting A-2-3
2.3 Data Sources A-2-4

3.0 Approach Descriptions and Cost Estimates A-3-1
3.1 Flood Management Elements A-3-1
3.2 Approach Descriptions and Costs A-3-7
3.2.1 Achieve SPFC Design Flow Capacity Approach A-3-7
3.2.2 Protect High-Risk Communities Approach A-3-10
3.2.3 Enhance Flood System Capacity Approach A-3-13
3.2.4 State Systemwide Investment Approach A-3-16

4.0 Flood Management Elements A-4-1
4.1 System Improvement Element A-4-1
4.1.1 Land Acquisition A-4-2
4.1.2 Agricultural Conservation Easements A-4-3
4.1.3 Ecosystem Restoration and Enhancement A-4-4
4.1.4 Levee Improvements for New and Expanded Bypasses A-4-5
4.1.5 Flood System Structures A-4-7
4.1.6 Fish Passage Structures A-4-8
4.1.7 Reservoir Operations – Forecast-Coordinated Operations/Forecast-Based Operations A-4-10
4.1.8 New Reservoir Flood Storage/Enlarge Flood Pool A-4-11
4.1.9 Easements A-4-12
4.1.10 System Erosion and Bypass Sediment Removal Projects A-4-13
4.2 Urban Improvement Element A-4-13
4.2.1 Option 1: 200-Year Level of Protection Projects A-4-14

4.2.2 Option 2: Urban Levee Improvements to Achieve SPFC Design Flow Capacity A-4-16
4.2.3 Non-SPFC Urban Levee Improvements A-4-18
4.3 Rural-Agricultural Improvement Element A-4-20
4.3.1 Small Community Improvements A-4-20
4.3.2 Rural-Agricultural Levee Improvements A-4-23
4.3.3 Setback Levees A-4-27
4.4 Residual Risk Management Element A-4-28
4.4.1 Enhanced Flood Emergency Response A-4-29
4.4.2 Enhanced Operation and Maintenance A-4-31
4.4.3 Floodplain Management A-4-34

5.0 Acronyms and Abbreviations A-5-1

6.0 Detailed Cost Tables A-6-1

List of Tables

Table A-3-1. System Improvement Elements Incorporated in the CVFPP Approaches A-3-3

Table A-3-2. Urban Improvement Elements Incorporated in the CVFPP Approaches A-3-4

Table A-3-3. Rural-Agricultural Improvement Elements Incorporated in the CVFPP Approaches A-3-5

Table A-3-4. Residual Risk Management Elements Incorporated in the CVFPP Approaches A-3-6

Table A-3-5. Cost Summary for Three CVFPP Preliminary Approaches and State Systemwide Investment Approach ($ millions, 2011 dollars) A-3-7

Table A-3-6. Improvement Costs for the Achieve SPFC Design Flow Capacity Approach A-3-9

Table A-3-7. Improvement Costs for the Protect High-Risk Communities Approach A-3-12

Table A-3-8. Improvement Costs for the Enhance Flood System Capacity Approach A-3-15

Table A-3-9. Improvement Costs for the State Systemwide Investment Approach A-3-20

Table A-4-1. Land Acquisition Acreage for Bypass Expansions..... A-4-3

Table A-4-2. Land Acquisition Costs for Bypass Expansions..... A-4-3

Table A-4-3. Agricultural Conservation Easements..... A-4-4

Table A-4-4. Environmental Conservation Acreages..... A-4-5

Table A-4-5. New Levees Needed for System Improvements..... A-4-6

Table A-4-6. Levee Repairs Needed for System Improvements A-4-7

Table A-4-7. Flood System Structures Included in System Improvements A-4-8

Table A-4-8. Fish Passage Improvements Included in System Improvements A-4-9

Table A-4-9. New Reservoir Flood Storage.....A-4-11

Table A-4-10. Easements.....A-4-12

Table A-4-11. System Erosion and Bypass Sediment Removal.....A-4-13

Table A-4-12. Flood Risk Reduction Projects Included in Urban Improvements A-4-15

Table A-4-13. SPFC Urban Levee Improvements from the Urban Levee Evaluation Program A-4-18

Table A-4-14. Non-SPFC Urban Levee Improvements A-4-19

Table A-4-15. Identified Small Communities within State Plan of Flood Control A-4-21

Table A-4-16. Comparison of Levee Improvements for Small Communities A-4-22

Table A-4-17. Non-Urban Levee Erosion Repair Needs and Cost Estimate per Region A-4-24

Table A-4-18. Site-Specific Non-Urban Levee Improvements A-4-24

Table A-4-19. Non-Urban Levee Evaluation Program A-4-27

Table A-4-20. Setback Levees A-4-28

Table A-4-21. Local Flood Emergency Response Planning Costs A-4-31

Table A-4-22. Identification and Repair of After Event Erosion Implementation A-4-33

Table A-4-23. Sacramento Channel and Levee Management, and Bank Protection Implementation A-4-34

Table A-4-24. Costs for Raising and Waterproofing Structures and Building Berms A-4-36

Table A-4-25. Costs for Purchasing and Relocating Homes in Floodplains A-4-37

Table A-6-1. System Improvement Costs for the Achieve SPFC Design Flow Capacity Approach A-6-3

Table A-6-2. Urban Improvement Costs for the Achieve SPFC Design Flow Capacity Approach A-6-4

Table A-6-3. Rural-Agricultural Improvement Costs for the Achieve SPFC Design Flow Capacity Approach A-6-5

Table A-6-4. Residual Risk Management Costs for the Achieve SPFC Design Flow Capacity Approach A-6-6

Table A-6-5. System Improvement Costs for the Protect High Risk Communities Approach A-6-8

Table A-6-6. Urban Improvement Costs for the Protect High Risk Communities Approach.....A-6-10

Table A-6-7. Rural-Agricultural Improvement Costs for the Protect High Risk Communities Approach.....A-6-12

Table A-6-8. Residual Risk Management Costs for the Protect High Risk Communities Approach.....A-6-14

Table A-6-9. System Improvement Costs for the Enhance Flood System Capacity Approach.....A-6-16

Table A-6-10. Urban Improvement Costs for the Enhance Flood System Capacity Approach A-6-18

Table A-6-11. Rural-Agricultural Improvement Costs for the Enhance Flood System Capacity Approach.....A-6-20

Table A-6-12. Residual Risk Management Costs for the Enhance Flood System Capacity Approach.....A-6-22

Table A-6-13. System Improvement Costs for the State Systemwide Investment Approach.....A-6-24

Table A-6-14. Urban Improvement Costs for the State Systemwide Investment Approach.....A-6-26

Table A-6-15. Rural-Agricultural Improvement Costs for the State Systemwide Investment Approach.....A-6-28

Table A-6-16. Residual Risk Management Costs for the State Systemwide Investment Approach.....A-6-30

List of Figures

Figure A-2-1. Central Valley Flood Protection Plan Implementation Regions and Flood Protection Zones..... A-2-2

Figure A-3-1. State Systemwide Investment Approach – Sacramento River Basin Major Capital Improvements Under Consideration.....A-3-18

Figure A-3-2. State Systemwide Investment Approach – San Joaquin River Basin Major Capital Improvements Under Consideration.....A-3-19

Appendix A

1.0 Introduction

This appendix documents the Central Valley Flood Protection Plan (CVFPP) Cost Estimate Methodology and summarizes the various preliminary approaches and the State Systemwide Investment Approach (SSIA), including the programmatic-level costs for Residual Risk Management.

CVFPP goals include the primary goal of improving flood risk management and four supporting goals of improving operations and maintenance (O&M), improving institutional support, promoting ecosystem functions, and promoting multi-benefit projects. These goals are described in the 2012 CVFPP. To achieve these goals, the CVFPP has identified four different approaches for Central Valley flood management. These include:

1. Achieve State Plan of Flood Control (SPFC) Design Flow Capacity Approach.

2. Protect High-Risk Communities Approach.

3. Enhance Flood System Capacity Approach.

4. SSIA – the State's preferred approach.

The cost estimates presented in this Appendix are at a reconnaissance (appraisal) level of detail and will be updated as future evaluations are conducted. The costs used in this estimate were assembled from many different sources at various levels of detail. In some cases, materials quantities and unit costs were used to develop some of the cost estimates; in other cases, already existing cost estimates from ongoing efforts were used. While this may result in a broad range of the level of detail for the costs, it does represent the initial effort to estimate the costs of these approaches. It is expected that the cost estimates will be brought to a more uniform level of detail as part of the feasibility studies.

The purpose of this appendix is to support the 2012 CVFPP by providing relevant information, assumptions, and cost estimates for the system and local/regional improvements to existing facilities, constructing new

facilities, and/or other flood management actions. This includes all the components evaluated in the CVFPP for each of the four approaches listed above. This appendix also provides estimates for ongoing annual costs for residual risk management actions, such as O&M.

The remainder of this appendix is organized into the following sections:

- Section 2 provides general contextual information that is relevant to preparation of this appendix. This information includes:
  - Data sources used in this analysis
  - Descriptions of the regions used to aggregate and summarize cost information
  - Major assumptions used for cost estimates
- Section 3 summarizes the flood management elements included in each of the four CVFPP flood management approaches, including their costs for each flood management element by region. This section also provides a cost summary table comparing all four approaches.
- Section 4 describes the flood management elements and assumptions used in estimating their costs. The flood management elements represent different types of improvements made to the flood protection system (systemwide, urban, rural-agricultural). Each flood management element is then further divided into the specific flood management components, which are the most detailed level of information identified and used for purposes of this preliminary cost estimate.
- Section 5 lists acronyms and abbreviations used in this appendix.
- Section 6 includes detailed cost tables that are summarized in Section 3.

2.0 Background

This provides background information on planning areas, data sources, and key assumptions for the preliminary cost estimates.

2.1 Planning Area

The SPFC Planning Area is the geographic area that includes the lands currently receiving flood damage reduction benefits from the SPFC. The SPFC Planning Area can be further subdivided into Levee Flood Protection Zones (LFPZ), which are defined as those areas that are protected by a levee that is part of the facilities of the SPFC, as defined under Section 5096.805 of the Public Resources Code. There are currently 221 LFPZs identified in the SPFC Planning Area. For purposes of organizing and presenting information about the approaches and project costs, the SPFC Planning Area was subdivided into nine regions listed below, based on the location of the facilities of the SPFC, as shown in Figure A-2-1. The following regions are described in more detail in the Draft Location and Description of Levee Flood Protection Zones within the Central Valley Technical Memoranda (June 23, 2011):

- Upper Sacramento/Butte Basin Region
- Mid-Sacramento Region
- Feather River Region
- Lower Sacramento Region
- Delta North Region
- Delta South Region
- Lower San Joaquin Region
- Mid-San Joaquin Region
- Upper San Joaquin Region

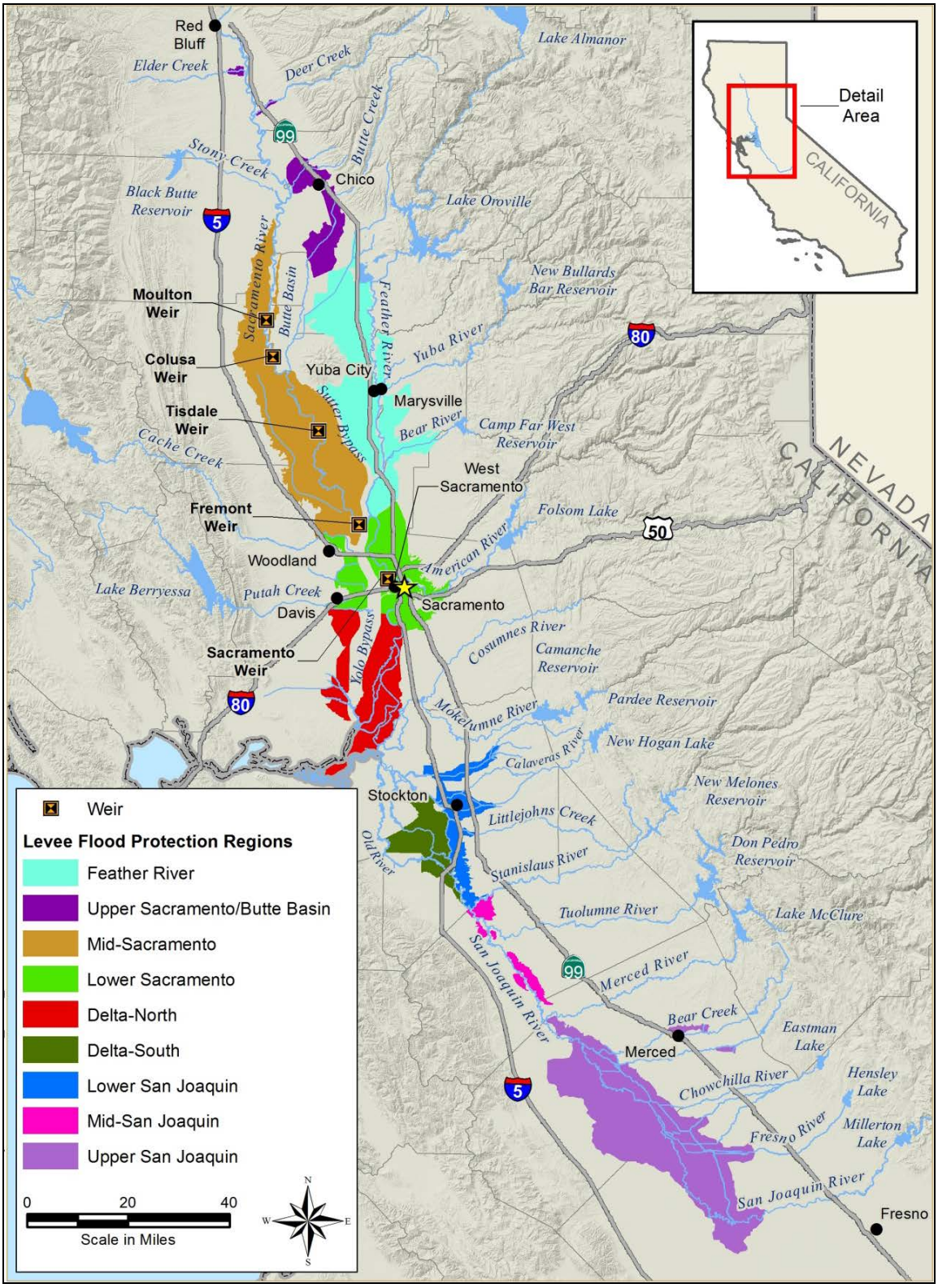

Figure A-2-1. Central Valley Flood Protection Plan Implementation Regions and Flood Protection Zones

2.2 Key Cost Estimate Assumptions and Limitations

The estimated project costs are based on 2011 costs.

2.2.1 Cost Uncertainty

The actual cost of future improvements will depend upon a host of factors that cannot be determined and evaluated in detail at this time, so the cost estimates provided here should be considered preliminary. Cost estimates will change as the project is refined during future studies, permitting, design, and construction. The actual costs will ultimately depend on the components chosen, the engineering, the actual future labor and material costs, competitive market conditions, the construction schedule, and other factors. As a result, the final project costs will vary from estimates provided in this appendix.

2.2.2 Cost Ranges

In most cases, a range of costs is provided to account for some of the uncertainty included in the preliminary assumptions. The range of costs includes:

- **Low Estimated Total Cost** – The low estimated total cost is determined using the smaller quantity (when a range is provided) and the lower unit cost (when a range is provided).

- **High Estimated Total Cost** – The high estimated total cost is determined using the larger quantity (when a range is provided) and higher unit costs (when a range is provided).

A range of costs is provided for each of the flood management components based on the available supporting information (for each element) and program assumptions. These costs are presented on the tables in this cost estimate.

2.2.3 Risk Assessment, Feasibility, Engineering, and Permitting

In general, an additional 20 to 25 percent contingency is included to both the Low and High Estimated Total Cost to account for potential uncertainty in cost estimates due to future refinement to plan concept and elements, such as:

- Future updates to the CVFPP

- Planned basinwide feasibility studies for the Sacramento River Basin and San Joaquin River Basin
- Updates on risk assessments of the flood management system, including updated geotechnical information, new hydrology, and updated system hydraulic modeling tools.
- Detailed engineering design of the flood management elements and facilities that evaluates site specific conditions
- Permitting process and requirements for the proposed flood management projects
- Cost for mitigating any potential hydraulic impacts
- Other ecosystem mitigation costs not identified in this cost estimate
- Other unidentified cost items

2.3 Data Sources

The following data sources were used to prepare this appendix:

- Levee hazard information and structural remediation cost estimates developed by Urban and non-urban levee evaluations (ULE and NULE)
- Program-level cost information for residual risk management elements developed by California Department of Water Resources (DWR), Division of Flood Management (DFM)
- Information from local flood management and maintaining agencies
- CVFPP Conservation Framework (2012 CVFPP Attachment 2) and supporting technical documentations (2012 CVFPP Attachment 9)
- Unit costs from recently implemented projects (such as Three River Levee Improvement Authority (TRLIA) and Sacramento Area Flood Control Agency (SAFCA))
- Reconnaissance and pre-feasibility level conceptual designs and costs information on flood management improvements, such as:
    - Sacramento Bypass Expansion Conceptual Design and Cost Estimates (SAFCA, March 2009)

- Formulation and Analysis of Alternatives for Supplemental Flood Control Program on Yuba River (Yuba County Water Agency (YCWA), 1999)
- Paradise Cut Bypass Investigation – Draft Technical Memorandum, (Central Valley Flood Management Program, June 2010)
- Daguerre Point Dam Fish Passage Improvement Project – Alternative Concepts Evaluation (U.S. Army Corps of Engineers, September, 2003)

- Reconnaissance information on storage projects:
  - Shasta Lake Water Resources Investigation (U.S. Department of the Interior, Bureau of Reclamation (Reclamation), 2011)
  - North of Delta Offstream Storage (DWR, 2010)
  - Upper San Joaquin River Basin Storage Investigation (Reclamation, 2008)

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3.0 Approach Descriptions and Cost Estimates

This section summarizes the four approaches evaluated in the CVFPP and their preliminary costs. Three fundamentally different approaches to flood management were initially compared to explore potential flood risk reduction improvements in the Central Valley. These include:

1. Achieve SPFC Design Flow Capacity Approach

2. Protect High Risk Communities Approach

3. Enhance Flood System Capacity Approach

Based on an evaluation of these three approaches, the California Department of Water Resources (DWR) developed the SSIA that encompasses aspects of each of the three preliminary approaches to balance achievement of the goals from a systemwide perspective, and includes integrated conservation elements.

3.1 Flood Management Elements

This cost estimate is organized into four primary flood management elements that address the different types of improvements made to the flood protection system in each approach. The four flood management elements are:

1. System improvement element

2. Urban improvement element

3. Rural-agricultural improvement element

4. Residual risk management element

The flood management elements are described in more detail in Section 4. Each flood management element is then further divided into the specific flood management components, which are the most detailed level of information identified and used for purposes of this preliminary cost estimate. Tables A-3-1 to A-3-4 identify which flood management components are included in each approach. It should be noted that many of the ecosystem restoration enhancements are integrated into the above flood

management elements and are components of the Enhance Flood System Capacity Approach and the SSIA. The Achieve SPFC Design Capacity Approach and the Protect High-Risk Communities Approach do not include similar ecosystem enhancements, but do include cost allowances for mitigation of ecosystem impacts.

Table A-3-1. System Improvement Elements Incorporated in the CVFPP Approaches

Flood Management Component	Achieve SPFC Design Flow Capacity	Protect High-Risk Communities	Enhance Flood System Capacity	State Systemwide Investment Approach
Land Acquisition	NO	NO	YES	YES
Agricultural Conservation Easements	NO	NO	YES	YES
Ecosystem Restoration and Enhancement	NO	NO	YES	YES
New Levee Construction	NO	NO	YES	YES
Improve Existing Levees	NO	NO	YES	YES
Flood System and Fish Passage Structures	NO	NO	YES	YES
Forecast – Coordinated Operations/ Forecast-Based Operations	YES	YES	YES	YES
New Reservoir Storage	NO	NO	YES	NO
Easements	NO	NO	YES	NO
System Erosion and Bypass Sediment Removal Project	NO	NO	YES	YES

Key:
CVFPP = Central Valley Flood Protection Plan
SPFC = State Plan of Flood Control

Table A-3-2. Urban Improvement Elements Incorporated in the CVFPP Approaches

Flood Management Component	Achieve SPFC Design Flow Capacity	Protect High-Risk Communities	Enhance Flood System Capacity	State Systemwide Investment Approach
Urban Flood Protection Projects	NO	YES	YES	YES
Achieve SPFC Design Capacity in Urban Areas	YES	NO	NO	NO
Non-SPFC Urban Levee Improvements	YES	YES	YES	YES

Key:
CVFPP = Central Valley Flood Protection Plan
SPFC = State Plan of Flood Control

Table A-3-3. Rural-Agricultural Improvement Elements Incorporated in the CVFPP Approaches

Flood Management Component	Achieve SPFC Design Flow Capacity	Protect High Risk Communities	Enhance Flood System Capacity	State Systemwide Investment Approach
Small Community Improvements	NO	YES	YES	YES
Non-Urban Levee Improvements to Achieve SPFC Design Capacity	YES	NO	YES	NO
Rural Setback Levees	NO	NO	YES	NO
Site-Specific Rural Agricultural Levee Improvements	NO	NO	NO	YES
Known and Identified Erosion Repairs	NO	NO	NO	YES

Key:
CVFPP = Central Valley Flood Protection Plan
SPFC = State Plan of Flood Control

Table A-3-4. Residual Risk Management Elements Incorporated in the CVFPP Approaches

Flood Management Component	Achieve SPFC Design Flow Capacity	Protect High Risk Communities	Enhance Flood System Capacity	State Systemwide Investment Approach
Additional Flood Information Collection and Sharing	YES	YES	YES	YES
All Weather Roads on Levee Crowns	YES[1]	NO	YES[1]	YES
Local Flood Emergency Planning	YES	YES	YES	YES
Additional Forecasting and Notification	NO	YES	NO	YES
Identification and Repair After Event Erosions	YES	YES	YES	YES
Develop and Implement Enhanced O&M Programs and Regional Organizations	YES	YES	YES	YES
Sacramento Channel and Levee Management and Bank Protection	YES	YES	YES	YES
Raising and Waterproofing Structures and Building Berms	NO	NO	NO	YES
Purchasing and Relocating Homes in Floodplains	NO	NO	NO	YES
Land Use and Floodplain Management	YES	YES	YES	YES

Notes:
[1] Costs for All Weather Roads on Levee Crowns are included in two preliminary approaches under Non-Urban Levee Improvements to Achieve SPFC Design Capacity (Table A-3-3).
Key:
CVFPP = Central Valley Flood Protection Plan
O&M = operations and maintenance
SPFC = State Plan of Flood Control

3.2 Approach Descriptions and Costs

The CVFPP approaches are more fully described in the Draft 2012 Central Valley Flood Protection Plan. A brief description of the four approaches is provided in this section to provide context for comparing the flood management components included in each approach. Table A-3-5 provides the cost summary for the four CVFPP approaches. Additional information on improvement costs to each of the nine regions is provided for each approach in the following sections.

Table A-3-5. Cost Summary for Three CVFPP Preliminary Approaches and State Systemwide Investment Approach ($ millions, 2011 dollars)

Approach	Achieve SPFC Design Flow Capacity	Protect High Risk Communities	Enhance Flood System Capacity	State Systemwide Investment Approach
System Improvements	$91 to $114	$91 to $114	$7,605 to $10,889	$5,142 to $6,501
Urban Improvements	$3,827.0 to $4,783	$5,496 to $6,675	$5,496 to $6,675	$5,496 to $6,675
Rural-Agricultural Improvements	$13,843 to $17,305	$1,253 to $1,504	$18,088 to $23,075	$1,772 to $1,873
Residual Risk Management	$732 to $901	$1,356 to $1,638	$653 to $798	$1,511 to $1,863
TOTAL	$18,493 to $23,103	$8,196 to $9,931	$31,842 to $41,437	$13,921 to $16,912

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million
Cost estimates include 20 to 25 percent contingencies for risk assessment, feasibility, engineering, and permitting.
Key:
CVFPP = Central Valley Flood Protection Plan
SPFC = State Plan of Flood Control

3.2.1 Achieve SPFC Design Flow Capacity Approach

The Achieve SPFC Design Capacity Approach focuses on reconstructing existing SPFC facilities throughout the system, such that the SPFC can reliably accommodate established project design flows.

This approach was formulated to address legislation that required DWR to consider structural improvements and repairs necessary to reconstruct SPFC facilities to their original design standards (California Water Code 9614 (g)). It also addresses requests from stakeholders to consider repairing the existing flood management system in place, or without major modification to facility locations.

This approach does not consider improving SPFC facilities to carry flows greater than project design flows, nor enhancements (to levee height, width, or footprint, for example) that exceed current SPFC design standards. The projects and their associated costs included in this approach are distributed among the nine regions, as presented on the Table A-3-6.

System Improvements – System improvements are generally not included in the Achieve SPFC Design Capacity Approach.

Table A-3-1 identifies the System improvements included in this approach. Tables A-4-1 to A-4-11 describe the range of costs for the flood management components included in the system improvements.

Urban Improvements – Urban improvements are not a direct element of the Achieve SPFC Design Capacity Approach. There are some improvements to urban levees included in this approach to achieve SPFC design flow capacities around urban areas.

Table A-3-2 identifies the urban improvements included in this approach. Tables A-4-12 to A-4-14 describe the range of costs for the flood management components included in the urban improvements.

Rural Agricultural Improvements – In the Achieve SPFC Design Capacity Approach, rural agricultural improvements focus on the wide range of repairs identified in the NULE Program that provides extensive repairs to the rural levees throughout the system; it is not targeting a specified level of protection, but rather achieving the original design capacity of the SPFC.

Table A-3-3 identifies the rural-agricultural improvements included in this approach. Tables A-4-15 to A-4-20 describe the range of costs for the flood management components included in the rural-agricultural improvements.

Residual Risk Management – Residual risk management is a minor part of the Achieve SPFC Design Capacity Approach because the need is expected to be less than the other approaches due to significant investment in physical flood system improvements, especially in rural areas.

Table A-3-4 identifies the residual risk management elements included in this approach. Tables A-4-21 to A-4-25 describe the range of costs for the flood management components included in residual risk management.

Table A-3-6. Improvement Costs for the Achieve SPFC Design Flow Capacity Approach

Region	System Improvements			Urban Improvements			Rural Improvements			Residual Risk Management			Total Costs		
	Low		High	Low		High	Low		High	Low		High	Low		High
1 Upper Sacramento Region	$12.0	to	$15.0	$0.0	to	$0.0	$510.0	to	$638.0	$44.0	to	$54.0	$566.0	to	$707.0
2 Mid-Sacramento Region	$0.0	to	$0.0	$0.0	to	$0.0	$3,223.0	to	$4,028.0	$103.0	to	$132.0	$3,326.0	to	$4,160.0
3 Feather River Region	$12.0	to	$15.0	$1,196.0	to	$1,495.0	$2,039.0	to	$2,548.0	$88.0	to	$112.0	$3,335.0	to	$4,170.0
4 Lower Sacramento Region	$7.0	to	$8.0	$1,529.0	to	$1,912.0	$1,434.0	to	$1,793.0	$95.0	to	$120.0	$3,065.0	to	$3,833.0
5 Delta North Region	$12.0	to	$15.0	$288.0	to	$360.0	$3,889.0	to	$4,862.0	$155.0	to	$174.0	$4,344.0	to	$5,411.0
6 Delta South Region	$0.0	to	$0.0	$144.0	to	$180.0	$629.0	to	$787.0	$44.0	to	$54.0	$817.0	to	$1,021.0
7 Lower San Joaquin Region	$7.0	to	$8.0	$238.0	to	$296.0	$340.0	to	$425.0	$50.0	to	$61.0	$635.0	to	$790.0
8 Mid-San Joaquin Region	$12.0	to	$15.0	$432.0	to	$540.0	$474.0	to	$592.0	$38.0	to	$46.0	$956.0	to	$1,193.0
9 Upper San Joaquin Region	$29.0	to	$38.0	$0.0	to	$0.0	$1,305.0	to	$1,632.0	$115.0	to	$148.0	$1,449.0	to	$1,818.0
Total	**$91.0**	**to**	**$114.0**	**$3,827.0**	**to**	**$4,783.0**	**$13,843.0**	**to**	**$17,305.0**	**$732.0**	**to**	**$901.0**	**$18,493.0**	**to**	**$23,103.0**

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million
The Achieve SPFC Design Flow Capacity Approach is one of three preliminary approaches initially considered for the CVFPP.
Additional detail for specific components is provided in Tables A-6-1 through A-6-4.
Key:
SPFC = State Plan of Flood Control

3.2.2 Protect High-Risk Communities Approach

The Protect High-Risk Communities Approach focuses on improvements to the flood management system that directly reduce risks to life and life safety. These threats are predominantly in densely populated areas, including urban areas and small communities subject to deep or rapid flooding. This approach would primarily improve levees without major changes to their existing footprints. Rural-agricultural levees would remain in their existing configurations. The projects and their associated costs for this approach are distributed among the nine regions as presented in Table A-3-7.

System Improvements – System improvements are generally not included in the Protect High-Risk Communities Approach.

Table A-3-1 identifies the system improvements included in this approach. Tables A-4-1 to A-4-11 describe the range of costs for the flood management components included in the system improvements.

Urban Improvements – The urban improvements are a significant element of the Protect High-Risk Communities Approach. DWR Flood Project Office compiled a list of projects and preliminary cost estimates for achieving a 200-year level of flood protection in the Central Valley. This list was compiled using information from DWR projects and information from local flood maintenance agencies.

Table A-3-2 identifies the urban improvements included in this approach. Tables A-4-12 to A-4-14 describe the range of costs for the flood management components included in the urban improvements.

Rural Agricultural Improvements – Only the small community improvements component is included in the Protect High-Risk Communities Approach.

Table A-3-3 identifies the rural-agricultural improvements included in this approach. Tables A-4-15 to A-4-20 describe the range of costs for the flood management components included in the rural-agricultural improvements.

Residual Risk Management – Since the focus of this approach is on small communities and urban areas, a moderate amount of the residual risk management elements is needed. Because this approach does not address rural flood risks, the residual risk management element is smaller than the SSIA.

Table A-3-4 identifies the residual risk management elements included in this approach. Tables A-4-21 to A-4-25 describe the range of costs for the flood management components included in residual risk management.

Table A-3-7. Improvement Costs for the Protect High-Risk Communities Approach

Region	System Improvements			Urban Improvements			Rural Improvements			Residual Risk Management			Total Costs		
	Low		High	Low		High	Low		High	Low		High	Low		High
1 Upper Sacramento Region	$12.0	to	$15.0	$120.0	to	$144.0	$93.0	to	$112.0	$95.0	to	$113.0	$320.0	to	$384.0
2 Mid-Sacramento Region	$0.0	to	$0.0	$0.0	to	$0.0	$238.0	to	$285.0	$220.0	to	$277.0	$458.0	to	$562.0
3 Feather River Region	$12.0	to	$15.0	$891	to	$1,048.0	$399.0	to	$479.0	$165.0	to	$204.0	$1,467.0	to	$1,746.0
4 Lower Sacramento Region	$7.0	to	$8.0	$3,549.0	to	$4,283.0	$0.0	to	$0.0	$139.0	to	$169.0	$3,695.0	to	$4,460.0
5 Delta North Region	$12.0	to	$15.0	$144.0	to	$192.0	$367.0	to	$440.0	$258.0	to	$300.0	$781.0	to	$947.0
6 Delta South Region	$0.0	to	$0.0	$0.0	to	$0.0	$0.0	to	$0.0	$91.0	to	$106.0	$91.0	to	$106.0
7 Lower San Joaquin Region	$7.0	to	$8.0	$626.0	to	$809.0	$0.0	to	$0.0	$93.0	to	$107.0	$726.0	to	$924.0
8 Mid-San Joaquin Region	$12.0	to	$15.0	$0.0	to	$0.0	$4.0	to	$5.0	$84.0	to	$97.0	$100.0	to	$117.0
9 Upper San Joaquin Region	$29.0	to	$38.0	$166.0	to	$199.0	$152.0	to	$183.0	$211.0	to	$265.0	$558.0	to	$685.0
Total	**$91.0**	**to**	**$114.0**	**$5,496.0**	**to**	**$6,675.0**	**$1,253.0**	**to**	**$1,504.0**	**$1,356.0**	**to**	**$1,638.0**	**$8,196.0**	**to**	**$9,931.0**

Notes:
All cost estimates are based on 2011 costs rounded to nearest $ million
The Protect High-Risk Communities Approach is one of three preliminary approaches initially considered for the CVFPP.
Additional detail for specific components is provided in Tables A-6-5 through A-6-8.

3.2.3 Enhance Flood System Capacity Approach

The Enhance Flood System Capacity Approach focuses on enhancing flood system storage and conveyance capacity to achieve multiple benefits. This approach combines components of the above two approaches and provides more room within flood conveyance channels to lower flood stages throughout most of the system. This approach would represent a major realignment of the existing footprint and function of the flood management system. Flood system capacity enhancements would be designed on a systemwide scale to integrate multiple benefits, including environmental restoration and water supply reliability.

In addition to improving the overall capacity of the system to convey large flood events, additional improvements would be made to protect urban areas and communities where a high threat to public safety exists. The projects and their associated costs for this approach are distributed among the nine regions, as presented in Table A-3-8.

System Improvements – System improvements are a significant element of the Enhance Flood System Capacity Approach. Most of the system improvements components are needed to expand the bypass system, make the needed levee improvements, or build new levees and needed facilities to move flood waters into and out of the bypass system. Fish passage improvements are also included in this approach. The Enhance Flood System Capacity Approach also includes increases in flood storage in foothill reservoirs, and transitory storage on the floodplains.

Table A-3-1 identifies the system improvements included in this approach. Tables A-4-1 to A-4-11 describe the range of costs for the flood management components included in the system improvements.

Urban Improvements - Urban improvements are a significant element of the Enhance Flood System Capacity Approach. DWR Flood Project Office compiled a list of projects and preliminary cost estimates for achieving a 200-year level of flood protection in the Central Valley. This list was compiled using information from DWR projects and information from local flood management agencies. The Urban Improvements are the same as the Protect High-Risk Communities Approach and SSIA.

Table A-3-2 identifies the urban improvements included in this approach. Tables A-4-12 to A-4-14 describe the range of costs for the flood management components included in the urban improvements.

Rural-Agricultural Improvements – In the Enhance Flood System Capacity Approach, Rural Agricultural Improvements focus on the wide

range of repairs identified in the NULE Program that provides extensive repairs to the rural levees throughout the system. It does not target a specified level of protection, but rather achieving the original design capacity of the SPFC.

In addition, this approach includes setback levees at selected locations throughout the system and the associated environmental restoration of those areas returned to the floodplain. This component is not included in any of the other approaches.

Table A-3-3 identifies the rural-agricultural improvements included in this approach. Tables A-4-15 to A-4-20 describe the range of costs for the flood management components included in the rural-agricultural improvements.

Residual Risk Management – Residual risk management is a minor part of the Enhance Flood System Capacity Approach because the need is expected to be less than the other approaches due to the significant investment in physical flood system improvements.

Table A-3-4 identifies the residual risk management elements included in this approach. Tables A-4-21 to A-4-25 describe the range of costs for the flood management components included in residual risk management.

Table A-3-8. Improvement Costs for the Enhance Flood System Capacity Approach

Region	System Improvements			Urban Improvements			Rural Improvements			Residual Risk Management			Total Costs		
	Low		High	Low		High	Low		High	Low		High	Low		High
1 Upper Sacramento Region	$315.0	to	$447.0	$120.0	to	$144.0	$510.0	to	$638.0	$40.0	to	$49.0	$985.0	to	$1,278.0
2 Mid-Sacramento Region	$578.0	to	$784.0	$0.0	to	$0.0	$5,508.0	to	$7,179.0	$117.0	to	$152.0	$6,203.0	to	$8,115.0
3 Feather River Region	$2,120.0	to	$2,729.0	$891	to	$1,048.0	$2,834.0	to	$3,644.0	$81.0	to	$102.0	$5,926.0	to	$7,523.0
4 Lower Sacramento Region	$1,627.0	to	$1,962.0	$3,549.0	to	$4,283.0	$1,434.0	to	$1,793.0	$59.0	to	$72.0	$6,669.0	to	$8,110.0
5 Delta North Region	$754.0	to	$924.0	$144.0	to	$192.0	$4,139.0	to	$5,112.0	$145.0	to	$161.0	$5,182.0	to	$6,389.0
6 Delta South Region	$427.0	to	$549.0	$0.0	to	$0.0	$629.0	to	$787.0	$37.0	to	$45.0	$1,093.0	to	$1,3810.0
7 Lower San Joaquin Region	$7.0	to	$8.0	$626.0	to	$809.0	$340.0	to	$425.0	$48.0	to	$59.0	$1,021.0	to	$1,3010.0
8 Mid-San Joaquin Region	$778.0	to	$1,129.0	$0.0	to	$0.0	$1,370.0	to	$1,847.0	$35.0	to	$42.0	$2,183.0	to	$3,018.0
9 Upper San Joaquin Region	$999.0	to	$2,357.0	$166.0	to	$199.0	$1,324.0	to	$1,650.0	$91.0	to	$116.0	$2,580.0	to	$4,322.0
Total	**$7,605.0**	**to**	**$10,889.0**	**$5,496.0**	**to**	**$6,675.0**	**$18,088.0**	**to**	**$23,075.0**	**$653.0**	**to**	**$798.0**	**$31,842.0**	to	$41,437.0

Notes:
All cost estimates are based on 2011 costs rounded to nearest $ million
The Enhance Flood System Capacity Approach is one of three preliminary approaches initially considered for the CVFPP.
Additional detail for specific components is provided in Tables A-6-9 through A-6-12.

3.2.4 State Systemwide Investment Approach

The SSIA provides guidance for future State participation in projects and programs for integrated flood management in the Central Valley. The approach combines the most promising and cost-effective public safety, flood storage and conveyance, environmental conservation and restoration, and other elements of the preliminary approaches with policies, guidance, and improvements to routine State flood management functions. In general, this approach incorporates most elements of the Protect High-Risk Communities Approach. It adds the bypass expansions and new bypasses from the Enhance Flood System Capacity Approach. Based on observed rural-agricultural benefits from the Achieve SPFC Approach, select rural-agricultural levee improvements are included without incorporating the extent or expense of the approach.

The projects and their associated costs for this approach are distributed among the nine regions as presented in Table A-3-9. The locations of some of the major system improvements for the SSIA are shown for the Sacramento River Basin and the San Joaquin River Basin on Figures A-3-1 and A-3-2 respectively.

System Improvements – System improvements are a significant element of the SSIA. Most of the system improvements components are needed to expand the bypass system, make the needed levee improvements, or build new levees and needed facilities to move flood waters into and out of the bypass system. Fish passage improvements are also included in this approach.

Table A-3-1 identifies the system improvements included in this approach. Tables A-4-1 to A-4-11 describe the range of costs for the flood management components included in the system improvements.

Urban Improvements - Urban improvements are a significant element of the SSIA. DWR FPO compiled a list of projects and preliminary cost estimates for achieving 200-year level of flood protection in the Central Valley. This list was compiled using information from DWR projects and information from local flood maintenance agencies.

Table A-3-2 identifies the urban improvements included in this approach. Tables A-4-12 to A-4-14 describe the range of costs for the flood management components included in the urban improvements.

Rural-Agricultural Improvements – In the SSIA, rural-agricultural improvements focus on those identified and known deficiencies at specific areas based on recent levee inspections rather than providing a very broad level of repairs and improvements for the entire rural levee system. This is

intended to provide a more cost-effective approach to rural levee improvements that, when combined with some of the floodplain management components, provides a mechanism that is available to address the flood threat for the approximately 20,000 houses identified in the rural areas protected by the SPFC.

Table A-3-3 identifies the rural-agricultural improvements included in this approach. Tables A-4-15 to A-4-20 describe the range of costs for the flood management components included in the rural-agricultural improvements.

Residual Risk Management – Residual risk management is a significant part of the SSIA, by providing cost-effective alternative (through floodplain management component) to provide protection (reduced risk) in rural floodplains through the enhanced flood emergency response and floodplain management components (which is more comprehensive than in the other approaches). The floodplain management component provides a mechanism that is available to address the flood threat for the approximately 20,000 houses identified in the rural areas protected by the SPFC.

Table A-3-4 identifies the residual risk management elements included in this approach. Tables A-4-21 to A-4-25 describe the range of costs for the flood management components included in residual risk management.

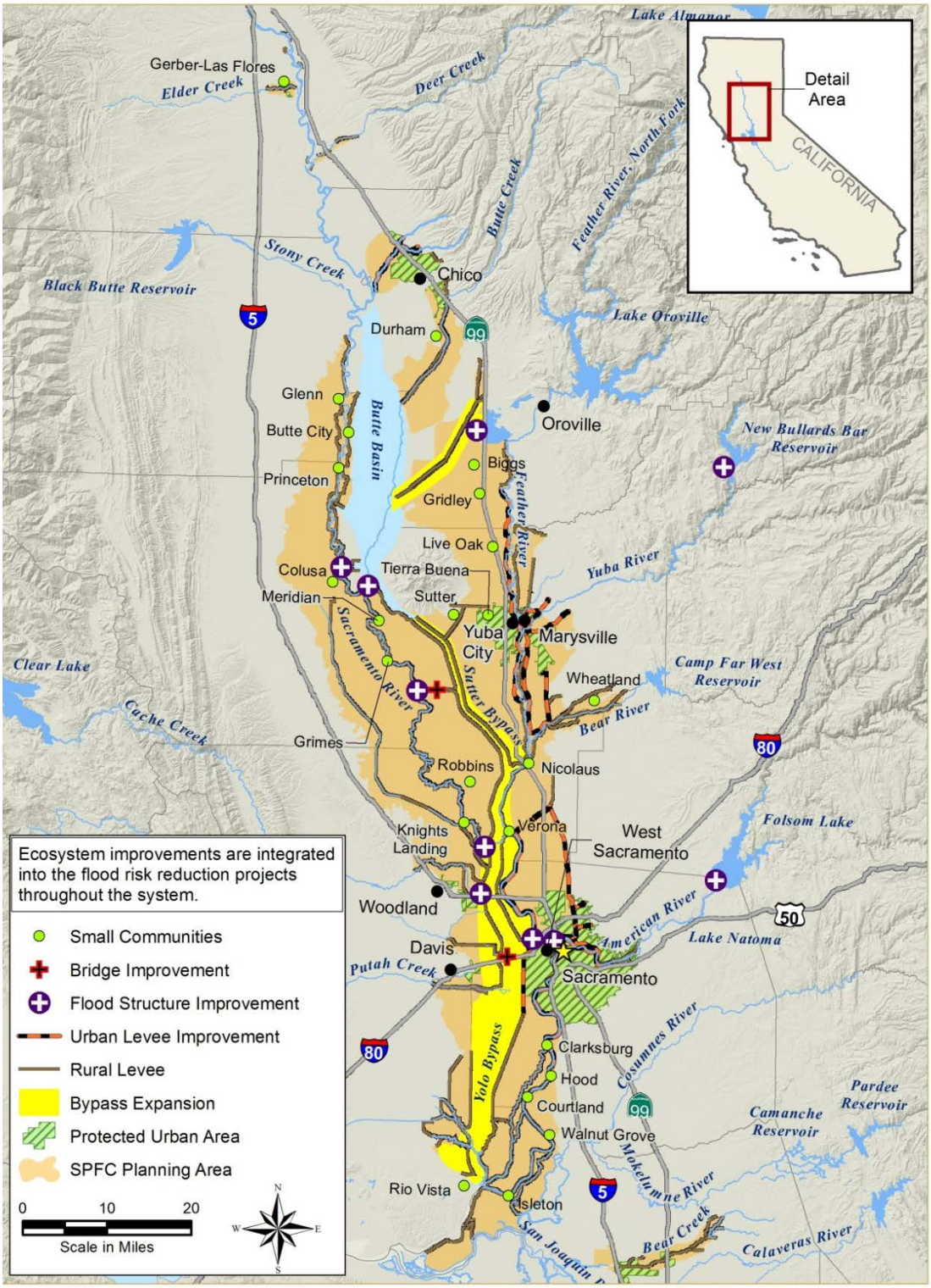

Figure A-3-1. State Systemwide Investment Approach – Sacramento River Basin Major Capital Improvements Under Consideration

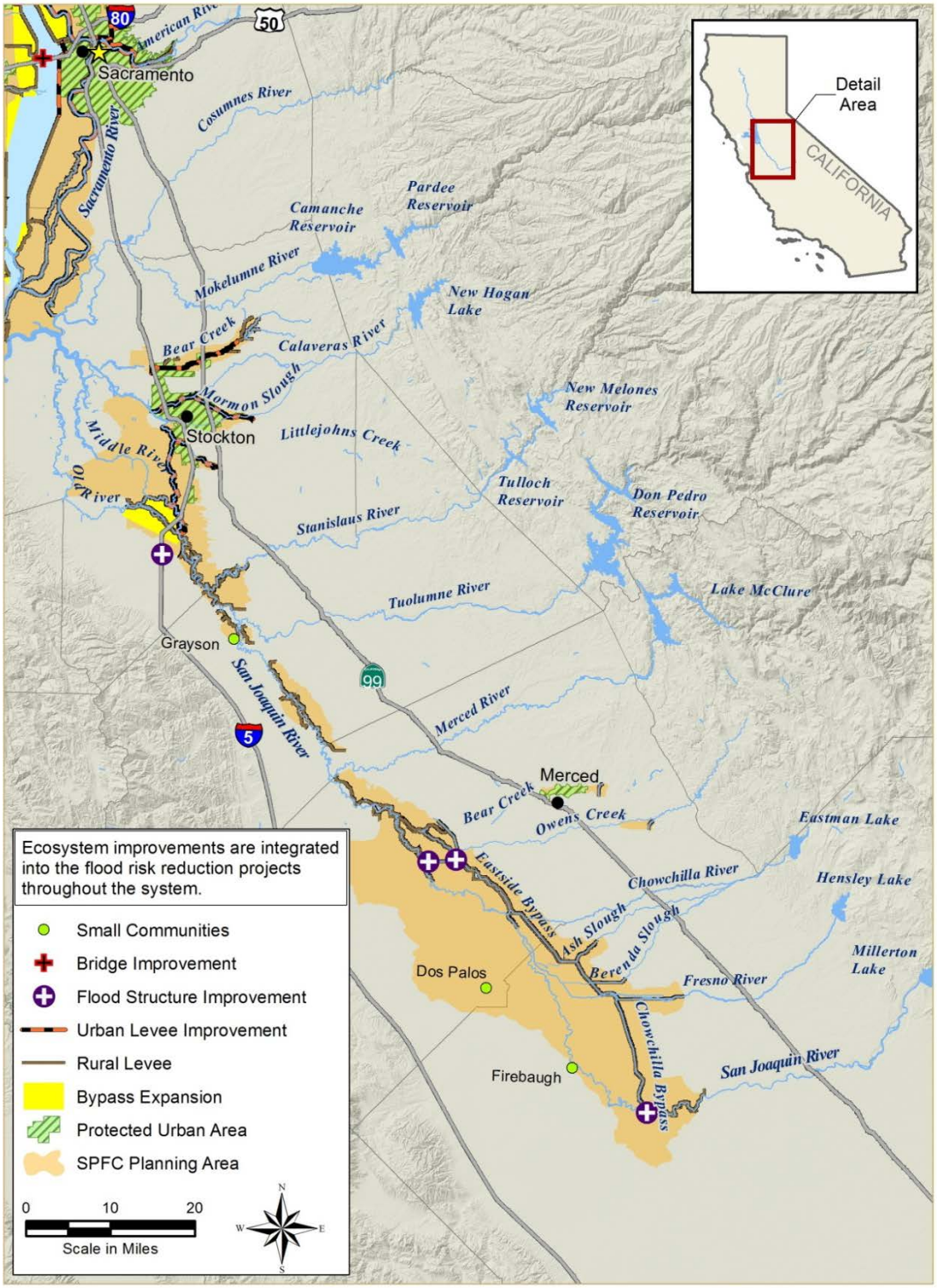

Figure A-3-2. State Systemwide Investment Approach – San Joaquin River Basin Major Capital Improvements Under Consideration

Table A-3-9. Improvement Costs for the State Systemwide Investment Approach

Region	System Improvements			Urban Improvements			Rural Improvements			Residual Risk Management			Total Costs		
	Low		High	Low		High	Low		High	Low		High	Low		High
1 Upper Sacramento Region	$109.0	to	$180.0	$120.0	to	$144.0	$154.0	to	$168.0	$95.0	to	$114.0	$478.0	to	$606.0
2 Mid-Sacramento Region	$234.0	to	$340.0	$0.0	to	$0.0	$360.0	to	$379.0	$261.0	to	$333.0	$855.0	to	$1,052.0
3 Feather River Region	$1,695.0	to	$2,139.0	$891	to	$1,048.0	$282.0	to	$289.0	$170.0	to	$212.0	$3,038.0	to	$3,688.0
4 Lower Sacramento Region	$1,627.0	to	$1,962.0	$3,549.0	to	$4,283.0	$77.0	to	$88.0	$138.0	to	$169.0	$5,391.0	to	$6,502.0
5 Delta North Region	$754.0	to	$924.0	$144.0	to	$192.0	$604.0	to	$634.0	$266.0	to	$311.0	$1,768.0	to	$2,061.0
6 Delta South Region	$427.0	to	$549.0	$0.0	to	$0.0	$47.0	to	$52.0	$110.0	to	$135.0	$584.0	to	$736.0
7 Lower San Joaquin Region	$7.0	to	$8.0	$626.0	to	$809.0	$17.0	to	$19.0	$82.0	to	$97.0	$732.0	to	$933.0
8 Mid - San Joaquin Region	$60.0	to	$102.0	$0.0	to	$0.0	$48.0	to	$55.0	$81.0	to	$96.0	$189.0	to	$253.0
9 Upper San Joaquin Region	$229.0	to	$297.0	$166.0	to	$199.0	$183.0	to	$189.0	$308.0	to	$396.0	$886.0	to	$1,081.0
Total	**$5,142.0**	**to**	**$6,501.0**	**$5,496.0**	**to**	**$6,675.0**	**$1,772.0**	**to**	**$1,873.0**	**$1,511.0**	**to**	**$1,863.0**	**$13,921.0**	**to**	**$16,912.0**

Notes:
All cost estimates are based on 2011 costs rounded to nearest $ million
The State Systemwide Investment Approach is the State's preferred approach for the CVFPP.
Additional detail for specific components is provided in Tables A-6-13 through A-6-16.

4.0 Flood Management Elements

This section documents the cost assumptions details for the following four primary flood management elements:

1. System Improvement Element
2. Urban Improvement Element
3. Rural-Agricultural Improvement Element
4. Residual Risk Management Element

The flood management elements used in this preliminary cost estimate are at an appraisal level of detail, and should be used for planning purposes only. These cost estimates will be further refined in future feasibility studies.

4.1 System Improvement Element

The bypass and levee system of the SPFC have provided systemwide benefits of flood protection. The System improvements are intended to improve the flood operations for the system as a whole and provide areas to enhance the ecosystem. These systemwide improvements would lower peak flood flows throughout the system from the reservoirs downstream, providing further improvements in flood protection for urban, small communities, and rural-agricultural areas.

This flood management element includes purchasing land and easements for the bypasses and levees, and making environmental improvements to the lands included in the expanded bypasses. Additional and improved flood management structures are needed to pass the flood flows into and out of the bypass system. This includes weirs, gates, pumping plants, fish screens, and bypass structures to improve fish passage. Reservoir improvements for flood protection include improved and coordinated operations and expanded flood storage. In addition to using the foothill reservoirs to manage the flood peaks, additional storage is being considered on the valley floor. Historic use of the bypass system has resulted in sedimentation near some of the gates and weirs in the bypasses that reduces their performance. Therefore, rehabilitation of existing facilities is also required.

The locations of the major system improvements for the Sacramento River Basin and San Joaquin River Basin are shown in Figures A-3-1 and A-3-2, respectively. The flood management components identified to support System improvements include:

- Land acquisition
- Agricultural conservation easement
- Ecosystem restoration and enhancement
- Levee improvements for new and expanded bypasses
  - New levee construction
  - Improving existing levees
- Flood system structures
- Fish passage structures
- Forecast-Coordination Operations (F-CO) and Forecast-Based Operations (F-BO)
- New reservoir flood storage/enlarge flood pool
- Easements
- System erosion and bypass sediment removal projects

Each of these system improvement flood management elements is described in detail below and includes assumptions used for the planning-level cost estimates.

4.1.1 Land Acquisition

The land acquisition component includes the purchase of lands (fee and title) needed for expansion and extension of the bypasses identified in the CVFPP Framework. The specific projects and the associated land acquisition acreages are listed in Table A-4-1. The cost to acquire lands varies throughout the Sacramento and San Joaquin River Basins due in part to their location relative to urban areas, and the existing agricultural development (i.e., lands with permanent crops have a higher cost than annual crops). The range of cost estimates for land acquisition is listed in Table A-4-2. Land acquisition costs are based on a market value analysis to determine an aggregate value for each region. Region-specific costs

vary by land use type (example unit costs are provided in Attachment 8J, Appendices B and C), structure relocations, and other factors.

Table A-4-1. Land Acquisition Acreage for Bypass Expansions

Name	Region	Area (acres)
Feather River Bypass	Feather River Region	5,000
Sutter Bypass Expansion	Feather River Region	4,000
Yolo Bypass Expansion	Lower Sacramento and Delta North Regions	25,500
Sacramento Bypass Expansion	Lower Sacramento Region	1,300
Lower San Joaquin Bypass Expansion	Delta South Region	1,000
Total		**36,800**

Table A-4-2. Land Acquisition Costs for Bypass Expansions

Region	Land Purchase Price ($/acre)
1 Upper Sacramento	$10,000 to $12,000
2 Mid-Sacramento	$10,000 to $12,000
3 Feather River	$15,000 to $17,000
4 Lower Sacramento	$18,000 to $20,000
5 Delta North	$12,000 to $14,000
6 Delta South	$12,000 to $14,000
7 Lower San Joaquin	$15,000 to $17,000
8 Mid-San Joaquin	$11,000 to $13,000
9 Upper San Joaquin	$11,000 to $13,000

Notes:
Land acquisition costs include purchase of land (fee title), which varies by region.
Costs for land acquisition are included in one preliminary approach considered (Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach.

4.1.2 Agricultural Conservation Easements

Agricultural conservation easements include lands on the landward side of levees that will be preserved in current land use (primarily agriculture). This will also reduce future development in the floodplains. While specific agricultural conservation easements (acreages) have not been identified at this time, the assumptions for the distribution of agricultural conservation easements are listed in Table A-4-3. The cost for agricultural conservation easements is estimated to be 35 percent of the cost to purchase lands (listed in Table A-4-2). Agricultural conservation easement costs estimated at 35 percent of the actual land-use costs are based on the range of agricultural

easement costs from other projects in the Central Valley identified by DWR Flood Projects Office and Flood Maintenance Office.

Table A-4-3. Agricultural Conservation Easements

Region	Area (acres)
1 Upper Sacramento	5,000 to 10,000
2 Mid-Sacramento	10,000 to 15,000
3 Feather River	15,000 to 25,000
4 Lower Sacramento	5,000 to 10,000
5 Delta North	5,000 to 10,000
6 Delta South	10,000 to 15,000
7 Lower San Joaquin	0 to 0
8 Mid-San Joaquin	10,000 to 15,000
9 Upper San Joaquin	10,000 to 15,000
Total	**70,000 to 115,000**

Notes:
Agricultural conservation easements would preserve agricultural land uses. These differ from easements (Section 4.1.9) because there is no provision for storage of flood flows within an agricultural conservation easement.
The cost for an agricultural easement is assumed to be 35 percent of the cost of acquiring the land (see Table A-4-2).
Costs for agricultural conservation easements are included in one preliminary approach considered (Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach.

4.1.3 Ecosystem Restoration and Enhancement

The ecosystem restoration and enhancement elements are integrated within two of the approaches and are primarily associated with the system improvements. These include development of habitat within the flood corridor described in this section, and fish passage improvements that are presented in the Flood System Structures section.

The ecosystem restoration and enhancement elements include the costs for making environmental enhancements to the lands acquired for bypass expansions to improve habitat and provide for a more contiguous habitat throughout the flood protection system. The land acreage estimates are based on individual bypass areas identified in the CVFPP. Acreages estimates based on GIS analysis are listed in Table A-4-4. These reflect a fairly uniform distribution of the acreage throughout the area where bypass expansions are planned. This may be modified, based on future studies, to reflect environmental conservation priorities.

For planning purposes, it was estimated that 25 percent of the lands acquired for bypass expansion would be developed for environmental conservation. The remaining 75 percent of the lands (not used for levee construction) would be leased back to farmers for environmentally friendly agricultural practices such as planting of corn, rice, and other grains. For the Sutter Bypass Expansion it was assumed that 50 percent of the lands acquired for the bypass expansion would be developed for environmental conservation.

The costs for environmental conservation are estimated to range from $35,000 to $45,000 per acre. These cost estimates are based on recent environmental conservation in the Sacramento River Basin identified by DWR Division of Flood Management, which includes activities such as permitting and planting native vegetation.

The Enhanced Flood System Capacity Approach and the State Systemwide Investment Approach include $50 million for ecosystem improvement projects associated with the Upper San Joaquin River Restoration.

Table A-4-4. Environmental Conservation Acreages

Name	Region	Area (acres)
Feather River Bypass	Feather River	1,300
Sutter Bypass Expansion	Feather River	2,000
Yolo Bypass Expansion	Lower Sacramento and Delta North	6,500
Sacramento Bypass Expansion	Lower Sacramento	400
Lower San Joaquin Bypass Expansion	Delta South	300
Total		**10,500**

Notes:
It is assumed that 25 percent of lands acquired (see Table A-4-1) would be developed for environmental conservation and 75 percent leased back to farmers for environmentally friendly agricultural practices such as planting of corn, rice, and other grains, except for the Sutter Bypass Expansion, where environmental conservation is designated for 50 percent of lands acquired.
Environmental conservation cost includes development of or improvement to habitat, and is estimated at $35,000 to $45,000 per acre.
Costs for environmental conservation are included in one preliminary approach considered (Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach.

4.1.4 Levee Improvements for New and Expanded Bypasses

Improvements to the flood protection system levees for bypass expansion are intended to cost effectively expand the capacity of the SPFC by removing known flow constraints and increase the capacity of the bypasses to carry more water at a lesser stage. This approach includes building new

levees where needed to extend or expand the bypass capacity and, where appropriate, make improvements to existing levees to bring them up to current levee performance criteria. In the case of expanded bypasses, the approach only moves the levee on one side of the bypass to provide the increased capacity, and improves the levee on the other side to meet the current performance standards. For purposes of this analysis, generally levees on the uphill side of the bypass would be improved while the levees on the downhill side of the bypass would be relocated. The specifics of the system levee improvements are described below.

New Levee Construction

New levee construction includes levees needed to construct new or expanded bypasses identified in the CVFPP. The levee lengths were estimated based on GIS analysis at the specific levee locations listed in Table A-4-5. These lengths are rounded up to the nearest half mile. Costs for the new levee construction are estimated to range from $22 million (low) to $26 million (high) per levee mile. These estimates are based on recent urban levees constructed for SAFCA and Three Rivers Levee Improvement Authority (TRLIA) projects.

Table A-4-5. New Levees Needed for System Improvements

Name	Region	Length	Estimated Range of Costs ($ millions)
Cherokee Canal – left bank	Feather River	15.5 miles	$341 to $403
Sutter Bypass – left bank	Feather River	15 miles	$330 to $390
Sacramento Bypass – left bank	Lower Sacramento	2.0 miles	$44 to $52
Yolo Bypass near Fremont Weir left bank	Lower Sacramento	2.5 miles	$55 to $65
Yolo Bypass upstream of Putah Creek – right bank	Lower Sacramento	16.5 miles	$363 to $429
Yolo Bypass downstream of Putah Creek and near Rio Vista – right bank	Delta North	18.5 miles	$407 to $481
Lower San Joaquin Bypass Expansion Paradise Cut/San Joaquin River – left bank	Delta South	7.5 miles	$165 to $195
Total		**77.5 miles**	**$1,705 to $2,015**

Notes:
Unit costs of $22 million to $26 million are based on recent levee projects in the Central Valley.
Costs for new levees for bypass extension are included in one preliminary approach considered (Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach.

Improving Existing Levees

This component includes improving existing levees that provide a system benefit as identified in the CVFPP. The levee lengths were estimated based on GIS analysis. Levee lengths are based on the specific levee locations listed on Table A-4-6. The cost estimates range from $14 million (low) to $18 million (high) per levee mile. The cost estimates are based on per-mile estimates from the DWR Levee Evaluations Program included in Attachment 8J, Appendices B and C. The selected levee improvements for expanding and extending the bypass system required a total of 77.5 miles of new levees and improvements to 23.5 miles of existing levees.

Table A-4-6. Levee Repairs Needed for System Improvements

Name	Region	Length	Estimated Range of Costs ($ millions)
Cherokee Canal – right bank	Feather River	15.0 miles	$210 to $270
Sacramento Bypass – right bank	Lower Sacramento	2.0 miles	$28 to $36
Lower San Joaquin Bypass Expansion Paradise Cut/San Joaquin River – right bank	Delta South	6.5 miles	$91 to $117
Total		**23.5 miles**	**$329 to $423**

Note:
Costs for levee repairs for bypass extension are included in one preliminary approach considered (Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach.

4.1.5 Flood System Structures

In addition to the improvements and expansion of the levee system identified above, improvements are needed to existing hydraulic structures to improve the ability to move flood waters into and out of the bypass system, and provide additional ecosystem benefits such as supporting improved fish passage (described below). The major flood system structures are identified in Table A-4-7. Where available, facility-specific cost estimates were used for the new system improvements. When no information was available for identified new facilities, the facility-specific cost estimates were used to guide cost estimates for similar structures. Costs for additional improvements needed to increase or restore capacity for existing facilities were identified and estimated by the DWR Flood Maintenance Office.

Table A-4-7. Flood System Structures Included in System Improvements

Major Flood System Structures	Region	Estimated Range of Costs ($ millions)
Intake Structure for Feather River Bypass	Feather River	$30 to $35
Butte Basin Small Weir Structures	Upper Sacramento	$15 to $20
Upgrade and Modification of Colusa and Tisdale Weirs and Modification to County Bridge	Mid-Sacramento	$25 to $35
Fremont Weir Widening	Mid-Sacramento	$25 to $40
Sacramento Weir Widening and Automation	Lower Sacramento	$200 to $240
Gate Structures and/or Weir for new Lower San Joaquin Bypass (Paradise Cut)	Delta South	$20 to $25
Upgrade Structures in the Upper San Joaquin Bypasses (includes Chowchilla, Mariposa, and East Side Bypasses)	Upper San Joaquin	$45 to $55
Low Level Reservoir Outlets on New Bullards Bar	Feather River	$35 to $50
Identified Flood Structure Improvements	Various	$133 to $192
TOTAL		**$528 to $692**

Notes:
Where available, facility-specific cost estimates were used for the new system improvements. When no information was available for identified new facilities, the facility-specific cost estimates were used to guide cost estimates for similar structures.
Costs for flood system structures are included in one preliminary approach considered (Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach.

4.1.6 Fish Passage Structures

Additional ecosystem benefits such as supporting improved fish passage can be included in the expansion and improvements to the bypass system as identified above. Fish passage improvement opportunities primarily include projects located within the SPFC, but also include additional projects located outside the SPFC that are critical to fish passage through the SPFC. Fish passage priorities developed based on information from the CVFPP Attachment 9C: Fish Passage Assessment.

No detailed costs estimates are available for the fish passage improvements being considered at this time, so the costs were approximated using information from other comparable projects. A 2003 draft report of alternative fish passage improvement projects on the Yuba River at Daguerre Point Dam that evaluated eight concepts for improving fish passage with costs ranging from $2.5 million to $97 million was used to bookend potential fish passage improvement costs. This report

demonstrates the potential range of costs for an individual fish passage improvement project, which depends on location, number, and size of the required improvements. The projects identified at this time (and their estimated project costs) are listed in Table A-4-8.

Table A-4-8. Fish Passage Improvements Included in System Improvements

Major Fish Passage Improvement Structures	Region	Estimated Range of Costs ($ millions)
Sutter Bypass and Streams East of Butte Basin	Feather River	$80 to $85
Fremont Weir Improved Fish Passage	Lower Sacramento	$15 to $20
Yolo Bypass Fish Passage Improvements/Willow Slough Weir	Lower Sacramento	$30 to $40
Deer Creek Project	Upper Sacramento	$5 to $10
TOTAL		**$110 to $155**

Notes:
Project-specific designs or cost estimates were not available for the projects being considered; costs are programmatic in nature and were approximated based on similar fish passage projects elsewhere in California.
Costs for fish passage structures are included in one preliminary approach considered (Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach.

Additional activities to improve fish passage include the following.

- **Fish Passage Collaboration** – This component includes $25 million for collaboration activities with the U.S. Department of the Interior, Bureau of Reclamation and other agencies to advance fish passage opportunities. Activities includerisk assessment, feasibility, engineering, and permitting of the fish passage projects. The collaboration activities may include the following reservoirs:

  - Shasta
  - Keswick
  - Cottonwood
  - Red Bluff Diversion
  - New Bullards Bar
  - Daguerre Point
  - Englebright
  - Thermalito Diversion

- Oroville dams
- New Melones
- Tulloch
- Camanche
- Pardee
- Don Pedro
- New Hogan
- Exchequer
- Webster
- La Grange
- McSwain
- Friant
- Goodwin

- **Fish Passage Feasibility Studies** – This component includes fish passage assessments and feasibility studies to improve fish passage opportunities for SPFC facilities. Costs for these activities are included in the risk assessment, feasibility, engineering, and permitting, of the residual risk management cost element.

4.1.7 Reservoir Operations – Forecast-Coordinated Operations/Forecast-Based Operations

Forecast-Coordinated Operations and Forecast-Based Operations provide systemwide flood benefits by supporting the coordinated reoperation of multiple reservoirs on both the Sacramento River Basin (up to seven reservoirs) and the San Joaquin River Basin (up to eight reservoirs). The costs are estimated to range from $4.5 million to $6.0 million per reservoir to develop F-CO/F-BO capabilities. The total cost for this component is estimated to range from $69 to $90 million. These costs are estimated based on current F-CO project costs for Yuba-Feather River Basin Forecast-Coordinated Operations. The range of costs for this element was reviewed by the DWR Hydrology and Flood Operations Office.

Costs for reservoir operations are included in all three preliminary approaches considered (Achieve SPFC Design Flow Capacity, Protect High-Risk Communities, Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach.

4.1.8 New Reservoir Flood Storage/Enlarge Flood Pool

This flood management component includes additional storage developed in existing foothill reservoirs, either through physical improvements to the facilities or for the costs to replace water supply lost through increasing the flood storage conservation pool.

It should be noted that the enlargement of Folsom Dam to provide additional flood storage has already been authorized as part of the improvements to increase the level of flood protection to the City of Sacramento, so it is included in the urban improvements. Raising Shasta Dam to increase the flood conservation pool was also considered, but is not included because it was not determined to be cost effective for flood management. The costs presented in Table A-4-9 are estimated based on prior reports. Some of the data sources used to estimate the range of costs for new flood storage or multipurpose facilities or replacement for water supplies to mitigate for storage reallocation or reoperation include:

- Shasta Lake Water Resources Investigation (Reclamation, 2011)
- North of Delta Offstream Storage (DWR, 2010)
- Upper San Joaquin River Basin Storage Investigation (Reclamation, 2008)
- Formulation and Analysis of Alternatives for Supplemental Flood Control Program on the Yuba River (YCWA, 1999)

Table A-4-9. New Reservoir Flood Storage

New Reservoir Storage	Region	Estimated Range of Costs ($ millions)
Lake Oroville and New Bullards Bar	Feather River	$200 to 300
Don Pedro and McClure Reservoirs	Mid-San Joaquin	$400 to $600
Friant Dam or New Upstream Reservoir	Upper San Joaquin	$500 to $1,500
Total		**$1,100 to $2,400**

Notes:
Costs for new reservoir flood storage are programmatic in nature, and are determined as unit costs to purchase new storage and mitigate impacts in flood storage or multipurpose facilities.
Costs for new reservoir flood storage are included in one preliminary approach considered (Enhance Flood System Capacity) and are not included in the State Systemwide Investment Approach.

4.1.9 Easements

Easements include the temporary and periodic storage of peak flood flows from adjacent rivers or waterways through the modification of certain floodplain areas acquired through easement or fee title. While specific transitory storage locations were not identified, the regional assumptions of the need for and corresponding costs for transitory storage are listed in Table A-4-10. These estimates are based on the assumption of needing approximately 200,000 acre-feet of storage in the Sacramento River Basin, and 100,000 acre-feet of storage in the San Joaquin River Basin, based on preliminary hydraulic modeling studies. Additional facilities such as flow control structures are needed in addition to the acreage requirements listed in Table A-4-10. The costs include estimates for the easements and facilities. The land acreage costs were estimated to be 60 percent of the region's land purchase costs listed in Table A-4-2 for the low and high ends of the range. Table A-4-10 includes the costs for the additional facilities needed to move water into and out of the easements. The costs for these facilities were estimated using the approach used to estimate the new flood structures listed above.

Table A-4-10. Easements

Region	Area (acres)	Estimated Range of Costs ($ millions)
1 Upper Sacramento	10,000 to 15,000	$165 to $213
2 Mid-Sacramento	20,000 to 25,000	$275 to $355
3 Feather River	5,000 to 10,000	$140 to $172
4 Lower Sacramento	None	$0
5 Delta North	None	$0
6 Delta South	None	$0
7 Lower San Joaquin	None	$0
8 Mid-San Joaquin	10,000 to 15,000	$174 to $222
9 Upper San Joaquin	5,000 to 10,000	$116 to $148
Total	**50,000 to 75,000**	**$870 to $1,110**

Notes:
Easements allow for temporary and periodic storage of flood flows from adjacent waterways. Specific locations have not yet been identified.
The cost for an easement is assumed to be 60 percent of the cost of acquiring the land (see Table A-4-2).
Costs for easements are only included in one preliminary approach considered (Enhance Flood System Capacity) and are not included in the State Systemwide Investment Approach.

4.1.10 System Erosion and Bypass Sediment Removal Projects

System erosion and bypass sediment removal projects address the need to remove sediment that has accumulated over time in the bypasses and behind weirs. These projects are necessary to maintain proper functioning of the bypass system. While sediment removal can be considered a routine operations and maintenance (O&M) cost, these projects identified here represent specific large-scale projects that have been identified at this point in time as a result of deferred maintenance. It is anticipated that maintenance will be performed on a routine and ongoing basis to avoid such projects in the future. Table A-4-11 lists the sediment removal projects included as part of the system improvement flood management components.

Table A-4-11. System Erosion and Bypass Sediment Removal

Region	Estimated Range of Costs ($ millions)
1 Upper Sacramento	None
2 Mid-Sacramento Cache Creek Settling Basin Sediment Management Project	$30 to $35
3 Feather River	None
4 Lower Sacramento Sacramento System Sediment Remediation Downstream from Weirs	$30 to $40
5 Delta North	None
6 Delta South	None
7 Lower San Joaquin	None
8 Mid-San Joaquin	None
9 Upper San Joaquin	None
Total	**$60 to $75**

Notes:
System erosion and bypass sediment removal costs represent a one-time expenditure for sediment removal from bypasses and weirs to address deferred maintenance.
Costs for system erosion and bypass sediment removal are included in one preliminary approach considered (Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach.

4.2 Urban Improvement Element

Urban areas located within the areas protected by the facilities of the SPFC and non-SPFC appurtenant facilities are defined as a developed area in which there are 10,000 residents or more. The SPFC provides flood

protection to close to 1 million people living in urban areas. The urban areas located within the SPFC are generally concentrated in a few regions (Feather River, Lower Sacramento, and Lower San Joaquin) in the Sacramento and San Joaquin river basins as shown on Figures A-3-1 and A-3-2.

Two options are considered for urban improvement costs: a 200-year level of protection based on project-specific costs collected from ongoing feasibility studies or other information provided by local flood and other agencies and an alternative option of achieving the SPFC design flow capacity through levee improvements based on deficiencies identified by the ULE program. An improvement for urban improvements to non-SPFC levee is also described below.

4.2.1 Option 1: 200-Year Level of Protection Projects

In this option, the urban areas are looking to achieve an urban level of protection that is defined as the ability to withstand flooding that has a 1-in-200 chance of occurring in any given year using criteria consistent with, or developed by, the DWR.

DWR Flood Project Office compiled a list of projects and preliminary cost estimates for achieving 200-year level of flood protection in the Central Valley. This list was compiled using information provided by local agencies to DWR. Table A-4-12 lists projects that were identified for inclusion as urban improvements.

Because many of these projects have a higher level of engineering and include allowances for engineering contingencies in their estimates, the risk assessment, feasibility, engineering, and permitting costs are set at 20 percent of the estimated project cost instead of 25 percent as is for the other improvements. This markup is included on the project list shown in Table A-4-12.

A project cost was provided by DWR Flood Projects Office for each urban area. For purposes of this cost estimate, these were estimated to be low cost. In most cases, the low project cost estimate was increased by 20 percent to provide the high end of the cost estimate. For projects that have advance design studies, or are in progress or completed, the low and high costs are the same (i.e. 0 percent increase between low and high estimate). These projects also have a higher level of engineering already completed compared to other urban improvement projects, so there are no additional risk assessment, feasibility, engineering, and permitting costs included in the estimates.

Option 1 costs are used in the Protect High-Risk Communities Approach, Enhance Flood System Communities Approach, and the SSIA.

Table A-4-12. Flood Risk Reduction Projects Included in Urban Improvements

Name	Region	Estimated Range of Costs ($ millions)
Chico Urban Levee Improvements	Upper Sacramento	$100.0 to $120.0
Sutter County Feasibility Study	Feather River	$8.5 to $10.2
Feather River West Levee SBFCA	Feather River	$245.0 to $294.0
LD1-EIP-Lower Feather River Setback Levee at Star Bend [1]	Feather River	$20.8
Marysville Ring Levee Reconstruction [2]	Feather River	$161.9 to $194.3
Yuba River Basin GRR	Feather River	$15.4 to $18.5
TRLIA – EIP – Feather River Levee Improvement Project [3]	Feather River	$222.0 to $266.4
TRLIA – EIP – Upper Yuba River Levee Improvement Project[1,3]	Feather River	$68.0
RD 2103 EIP - Bear River North Levee Rehabilitation [1]	Feather River	$18.2
American River Common Components Project/GRR	Lower Sacramento	$12.8 to $15.4
American River Common Components-WRDA96/99 Projects/Remaining Sites	Lower Sacramento	$282.0 to $338.4
Folsom Dam Modifications - Joint Federal Project (Gated Auxiliary Spillway)	Lower Sacramento	$800.0 to $1,000.0
Folsom Dam Raise – Reservoir Enlargement	Lower Sacramento	$125.0 to $130.0
Folsom Dam Raise, Bridge Element and Implementation	Lower Sacramento	$130.0 to $140.0
South Sacramento County Streams	Lower Sacramento	$104.0 to $124.8
SAFCA-EIP-NCC Natomas Levee Improvement Project	Lower Sacramento	$70.0 to $84.0
SAFCA-NLIP, Natomas Levee Improvement Project	Lower Sacramento	$310.0 to $372.0
Natomas Basin Design and Construction	Lower Sacramento	$385.0 to $462.0
Magpie Creek Project	Lower Sacramento	$9.8 to $11.8
American River South and Sacramento River Future Improvements	Lower Sacramento	$500.0 to $600.0
Slip Repair	Lower Sacramento	$53.0 to $63.6
WSAFCA –West Sacramento Levee Improvement Program[4]	Lower Sacramento	$105.0 to $126.0
West Sacramento Project GRR	Lower Sacramento	$10.0 to $12.0

Table A-4-12. Flood Risk Reduction Projects included in Urban Improvements (contd.)

Name	Region	Estimated Range of Costs ($ millions)
Woodland/ Lower Cache Creek Feasibility Study and Implementation	Lower Sacramento	$190.0 to $210.0
Davis-Willow Slough	Lower Sacramento	$30.0 to $36.0
Lower San Joaquin Feasibility Study	Lower San Joaquin	$15.4 to $18.5
RD 17-EIP-100-Year Levee Seepage Area Project	Lower San Joaquin	$76.0 to $91.2
Mormon Slough Bypass/ Stockton Diverter Canal	Lower San Joaquin	$40.0 to $48.0
Smith Canal Closure Structure (EIP Project)	Lower San Joaquin	$30.0 to $36.0
Merced County Streams Group (Bear Creek Unit)	Upper San Joaquin	$137.7 to $165.2
TOTAL		**$4,277.0 to $5,097.0**

Key:
EIP = Early Implementation Program
GRR = General Reevaluation Report
LD = lacking sufficient data
NCC = Natomas Cross Canal
NLIP = Natomas Levee Improvement Project
RD = Reclamation District
SAFCA = Sacramento Area Flood Control Agency
SBFCA = Sutter Buttes Flood Control Agency
TRLIA = Three Rivers Levee Improvement Authority
WSAFCA = West Sacramento Area Flood Control Agency

Notes:
Projects would provide a 200-year level of protection for urban areas.
Folsom Dam Raise is an authorized project to provide flood protection for the City of Sacramento.
Costs were collected from ongoing feasibility studies or other information provided by local flood and other agencies.
Costs for the urban flood protection projects in this table are included in two preliminary approaches considered (Protect High-Risk Communities, Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach.
[1] Construction of flood improvement project is completed. Not cost range is identified and contingencies for risk assessment, feasibility, and permitting are not applied.
[2] After additional analysis and input from David Lamon (City of Marysville) provided on the public draft CVFPP (December 30, 2011), the current implementation cost is estimated to be $70 to $92.5 million.
[3] Based on input from Larry Dacus (MBK Engineers) provided on the public draft CVFPP (December 30, 2011), two additional TRLIA projects should be considered to be part of this component. These are the TRLIA Proposition 13 RD 784 Levee System Improvements (Feather River, cost $61 to $105 million) and the TRLIA Goldfields High Ground Evaluation (Yuba River, cost $10 to $50 million). Although these projects are not explicitly named in the table, the costs to include them are encompassed within the range of total costs of this component ($4,277 to 5,097 million).
[4] After additional analysis and public comment from Derek Larsen (MBK Engineers) provided on the public draft CVFPP (December 30, 2011), the current cost of implementing the WSAFCA program recommendations is expected to be $440 to $526 million. Ongoing studies may further refine these costs. This information was not available at the time this table was prepared, but the higher cost of this program are encompassed within the range of total costs of this component ($4,277 to 5,097 million).

4.2.2 Option 2: Urban Levee Improvements to Achieve SPFC Design Flow Capacity

The ULE Program evaluated the condition of approximately 290 miles of SPFC urban levees and the cost of the necessary remediations. The ULE

Program cost estimates used in this analysis are based on achieving the SPFC design capacity, but may not necessarily provide the 200-year level of protection established as one of the goals of the CVFPP. In this option, repairs to urban project levees were identified by the Urban Levee Evaluations Program. Table A-4-13 summarizes the extent of the levee repairs needed for the urban areas included in the ULE Program. While this option improves the urban levees to achieve the SPFC design flow capacity, the actual level of flood protection varies with location and may not provide a 200-year level of flood protection. Additional analysis is needed to determine the level of protection provided from implementation of this option.

The levee repair lengths shown in Table A-4-13 represent the repair lengths (determined independently) for structural remediations, erosion remediations, freeboard and geometry remediations, and pier wall or joint remediations. As such, the repair lengths may differ from the total levee length shown in Table A-4-13. Costs from the ULE Program (Attachment 8J, Appendix B) were used as a guide to develop a suitable cost range for each project. These ranges are shown in Table A-4-13.

Option 2 costs are used in the Achieve SPFC Design Capacity Approach.

Table A-4-13. SPFC Urban Levee Improvements from the Urban Levee Evaluation Program

Urban Area	Region	Total Levee Length (Feet)	Levee Repair Length (Feet)	Estimated Range of Repair Costs ($ millions)
Marysville	Feather River	39,220	43,830	$146 to $176
RD 784	Feather River	22,940	35,750	$62 to $75
Sutter	Feather River	241,970	262,140	$790 to $948
American River	Lower Sacramento	9,910	9,910	$17 to $21
Natomas NWS	Lower Sacramento	40,040	40,040	$123 to $148
Natomas EMDC East	Lower Sacramento	38,000	30,740	$123 to $148
Natomas EMDC West	Lower Sacramento	76,880	79,120	$128 to $154
Sacramento River	Lower Sacramento	18,400	28,900	$174 to 209
West Sacramento	Lower Sacramento	84,600	77,620	$395 to $474
Davis	Lower Sacramento	96,500	139,550	$150 to $180
Woodland	Lower Sacramento	82,800	125,510	$168 to $202
RD 17	Lower San Joaquin	50,400	48,500	$135 to $ 162
RD 404	Lower San Joaquin	10,300	20,600	$26 to $32
SJAFCA Calaveras River	Lower San Joaquin	7,690	7,680	$22 to $27
SJAFCA Bear Creek	Lower San Joaquin	86,910	23,910	$17 to $21
Total		**906,560**	**973,280**	**$2,476 to $2,977**

Notes:
Levee repair projects would restore the SPFC design capacity but may not necessarily provide a 200-year level of protection.
Project costs were developed as part of the Urban Levee Evaluation Program.
Costs for SPFC urban levee improvements from the Urban Levee Evaluation Program are included in one preliminary approach considered (Achieve SPFC Design Flow Capacity) and are not included in the State Systemwide Investment Approach.
Key:
EMDC = East Main Drainage Canal
RD = Reclamation District
SJAFCA = San Joaquin Area Flood Control Agency

4.2.3 Non-SPFC Urban Levee Improvements

This component includes improving existing non-SPFC urban levees. There are approximately 120 miles of non-SPFC urban levees that support the SPFC urban levees to provide some level of flood protection. The levee lengths were estimated based on GIS analysis. The conditions of these levees will not be evaluated by ULE until 2013. For purposes of this cost estimate it was assumed that some level of repair to these levees would

be necessary to avoid having weak links in the urban flood protection. These levees are typically located on the tributary streams and not in the deep floodplain, so they may be smaller than other urban levees. In addition, some of these levees in the Stockton area have already had some improvements completed through the efforts of the San Joaquin Flood Area Flood Control Agency. As a result, the improvements for the non-SFPC urban levees are lower than the SPFC urban levees (Attachment 8J, Appendix B) and are estimated to range from $6 million (low) to $8 million (high) per levee mile. Table A-4-14 presents the distribution of the non-SPFC levee miles and estimated costs used in this estimate.

The costs for improving non-SPFC urban levees are used in the Achieve SPFC Design Capacity Approach, Protect High-Risk Communities Approach, Enhance Flood System Communities Approach, and the SSIA.

Table A-4-14. Non-SPFC Urban Levee Improvements

Region	Estimated Levee Length (miles)	Estimated Range of Costs ($ millions)
1 Upper Sacramento	0	$0
2 Mid-Sacramento	0	$0
3 Feather River	0	$0
4 Lower Sacramento	40	$240 to $320
5 Delta North	20	$120 to $160
6 Delta South	0	$0
7 Lower San Joaquin	60	$360 to $480
8 Mid-San Joaquin	0	$0
9 Upper San Joaquin	0	$0
Total	**120**	**$720 to $960**

Notes:
Projects include repairs to levees that are not part of the SPFC. Although the condition of these levees is not currently known, it was assumed that some repair would be needed at a unit cost of $6 to $8 million per levee mile. This unit cost is lower than SPFC levee repair costs because these levees are generally on smaller tributary streams and as a result are smaller than other levees, and certain improvement projects have already been completed.
Costs for non-SPFC urban levee improvements are included in all three preliminary approaches considered (Achieve SPFC Design Flow Capacity, Protect High-Risk Communities, Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach.

Key:
SPFC = State Plan of Flood Control

4.3 Rural-Agricultural Improvement Element

The Rural-Agricultural Improvements flood management element addresses the flood protection needs of the largely agricultural rural areas and the small communities that are disbursed throughout these areas (both located within the area protected by the SPFC).

In contrast to the urban areas, the rural-agricultural areas include a total population of approximately 100,000, which are disbursed throughout the areas protected by the SPFC. In the Sacramento and San Joaquin river basins, much of the lands in the rural-agricultural areas are agricultural, and landowners cannot afford the level of flood protection proposed for the urban areas.

For planning purposes, a cost improvement threshold of $30,000 per person (approximately $100,000 per household) threshold was established to determine the type and extent of improvements that may be practical and cost effective for the rural-agricultural areas. Two methods are considered to address the flood threat in rural-agricultural areas. If costs for structural methods exceed the threshold, then non-structural methods would be used, as follows:

- Structural methods include repairs to existing rural-agricultural levees and/or the construction of new levees. These include the small community improvements and the rural-agricultural levee improvements.

- Nonstructural methods include flood-proofing houses or purchasing and relocating houses (estimated to be applied in the rural-agricultural areas). These nonstructural methods are described later in the floodplain management element of residual risk management.

4.3.1 Small Community Improvements

There are small communities at high flood risk in the rural-agricultural areas. Some of the small communities that are subject to flooding are located in low-lying areas or adjacent to the rivers and may already have some level of flood protection offered by existing levees. Table A-4-15 presents the distribution of the small communities by region.

Table A-4-15. Identified Small Communities within State Plan of Flood Control

Region	Small Communities
1 Upper Sacramento	Durham, Gerber-Las Flores
2 Mid-Sacramento	Knights Landing, Glenn, Meridian, Colusa, Grimes, Butte City, Robbins, Princeton
3 Feather River	Verona, Biggs, Gridley, Live Oak, Sutter, Tierra Buena, Wheatland, Nicolaus
4 Lower Sacramento	
5 Delta North	Rio Vista, Clarksburg, Courtland, Hood, Walnut Grove, Isleton
6 Delta South	
7 Lower San Joaquin	
8 Mid-San Joaquin	Grayson
9 Upper San Joaquin	Dos Palos, South Dos Palos, Firebaugh

Small community improvements would provide a 100-year level of protection for small communities within the SPFC that are not protected by other systemwide and/or urban improvements. When the cost of protection exceeds $100,000 per house, non-structural measures would be taken (see Residual Risk Management). The total population in protected small communities is estimated at 47,000 people, and would require about 120 miles of new or improved levees. All levee improvements to protect small communities for this approach are included in this cost element, although some of the small communities may receive protection from other urban improvements. The assumed construction costs include a combination of levee improvements and construction of new levees for each individual community.

The assumptions for estimating the small community improvement costs are listed below. Because the small community improvements are addressed differently in each approach, they are all described here and summarized in Table A-4-16. Attachment 8J, Appendix D, provides additional information about the small community cost estimates.

Table A-4-16. Comparison of Levee Improvements for Small Communities

	Achieve SPFC Design Flow Capacity Approach	Protect High Risk Communities Approach	Enhance Flood System Capacity Approach	State Systemwide Investment Approach
Number of Communities Receiving Improved Flood Protection from System, Urban or Rural-Agricultural Improvements	27	5	16	5
Number of Communities Explicitly Protected by Small Community Improvement	None	22	11	15
Number of Communities Receiving Benefits from Improved Floodplain Management	None	None	None	7
Approximate New Levee Miles	None	N/A	60[1]	40[3]
Approximate Fixed Levee Miles	60[2]	N/A	60[2]	40[3]
Combined Fixed/New Levee Miles	None	120	N/A	80
Estimated Population benefited from Small Community Improvement	None	47,000	47,000	39,000
Estimated Cost	None	$1,003 million	$344 million	$555 million

Notes:
[1] Estimated one-half of the total levee miles for the small communities would be new.
[2] Existing levees around small communities would be improved as part of the recommendations from the Non-Urban Levee Evaluation Program. Estimated one-half of the total miles would receive repairs.
[3] The 80-mile estimate is the total length of new levees (40-miles) and improved levees (40-miles) needed to protect the selected 15 communities.
Small community improvements would provide a 100-year level of protection for small communities within the SPFC that are not protected by other systemwide and/or urban improvements.
Attachment 8J, Appendix D, provides additional detail for small community cost estimates.
Costs for small community improvements are included in two preliminary approaches considered (Protect High-Risk Communities, Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach.
Key:
N/A = Not Applicable
SPFC = State Plan of Flood Control

4.3.2 Rural-Agricultural Levee Improvements

The facilities of the SPFC currently provide flood protection to rural-agricultural areas through the approximately 1,200 miles of rural-agricultural levees. These levees provide varying degrees of flood protection to different areas, and differ in their condition and state of repair. The need for improvements to the rural levee system has been recently identified though two separate options:

- **Option 1** – Site-specific rural-agricultural improvements
- **Option 2** – NULE Program

Option 1: Site Specific Rural-Agricultural Improvements

Rural-agricultural improvements have been identified from recent levee inspections and other levee deficiencies as described below.

- **2011 Levee Inspection Reports for the Sacramento and San Joaquin Basins** – The results of the 2011 inspections identified more than 40 miles of levee repairs on the nonurban levees of the SPFC in both the Sacramento and San Joaquin river basins. These include repairs on the water side and land side of the levees. The levee repair lengths and estimated repair costs are summarized by region in Table A-4-17. Cost estimates were provided by DWR Flood Maintenance Office.
- **Levee Improvements** – Levee improvements includes levee freeboard improvements identified in the NULE Program (Attachment 8J, Appendix C – Non-Urban Levee Evaluations Project Remediation Alternatives and Cost Estimate Report). Improvements are estimated for all rural levees (1,200 miles) less system bypass levees (approximately 350 miles) by region. Table A-4-18 includes the estimated distribution of levee miles and approximate costs.

Table A-4-17. Non-Urban Levee Erosion Repair Needs and Cost Estimate per Region

Region	Erosion Length (feet)	Repair Length (feet)	Estimated Costs ($ millions)
1 Upper Sacramento	628	942	$2.3
2 Mid-Sacramento	31,607	47,410	$118.5
3 Feather River	7,416	11,125	$27.8
4 Lower Sacramento	6,306	9,460	$23.7
5 Delta North	83,308	124,962	$312.4
6 Delta South	4,830	7,245	$18.1
7 Lower San Joaquin	1,255	1,882	$4.7
8 Mid-San Joaquin	2,535	3,802	$9.5
9 Upper San Joaquin	1,570	2,355	$5.9
Total	**139,455**	**289,183**	**$522.9**

Notes:
Repair needs were identified in 2011 levee inspections.
Costs for site-specific non-urban levee improvements are not included in any of the preliminary approaches but are included in the State Systemwide Investment Approach.

Table A-4-18. Site-Specific Non-Urban Levee Improvements

Region	Rural Levee Length (miles)	Estimated Range of Costs ($ millions)
1 Upper Sacramento	71	$46 to $57
2 Mid-Sacramento	211	$62 to $77
3 Feather River	72	$24 to $30
4 Lower Sacramento	23	$37 to $46
5 Delta North	202	$93 to $117
6 Delta South	54	$18 to $22
7 Lower San Joaquin	38	$8 to $10
8 Mid - San Joaquin	51	$25 to $31
9 Upper San Joaquin	128	$19 to $24
Total	**850**	**$332 to $414**

Notes:
Repair needs include freeboard improvements identified in the NULE program (see Attachment 8J, Appendix C).
Costs for site-specific non-urban levee improvements are not included in any of the preliminary approaches but are included in the State Systemwide Investment Approach.

Option 2: Non-Urban Levee Evaluation Program

The purpose of the NULE Program was to determine the approximate cost to repair non-urban project and non-project levees in the Sacramento and San Joaquin river basins. The results of these efforts are summarized in Attachment 8J, Appendix C – Non-Urban Levee Evaluations Project Remediation Alternatives and Cost Estimate Report, and include remediation alternatives to address deficiencies and determine likely conceptual planning-level remediation costs. The deficiencies identified in the Geotechnical Assessment Report (GAR) included under seepage, through seepage, stability, erosion, and freeboard/geometry deficiency that could exist along levee segments for the design basis water level. The deficiencies were identified based on limited, existing surface and subsurface levee data and past performance history.

The costs of the nonurban levee repairs are summarized by region in Table A-4-19. The NULE Program costs include a 30 percent contingency for miscellaneous repairs, including remediating utility and canal hazards and reconstructing paved roads on levees. Therefore, approaches that include this component are assumed to also include all-weather roads on levee crowns (a component under the residual risk management element). The detailed cost tables in Section 6 do not include separate costs for all-weather roads because those costs are included in this component.

These estimates include repairs to SPFC project levees only. The NULE cost estimates for non-project levees were removed from the cost estimate because the non-project levees were not included in the CVFPP. The State may choose to participate in funding improvements for non-SPFC levees under other State programs. Each levee segment is characterized based on its hazard level, as defined below.

- **Hazard Level A** – When water reaches the assessment water-surface elevation (WSE), there is a low likelihood of either levee failure or the need to flood-fight to prevent levee failure.

- **Hazard Level B** – When water reaches the assessment WSE, there is a moderate likelihood of either levee failure or the need to flood-fight to prevent levee failure.

- **Hazard Level C** – When water reaches the assessment WSE, there is a high likelihood of either levee failure or the need to flood-fight to prevent levee failure.

- **Lacking Sufficient Data (Category LD)** – The segment is currently lacking sufficient data about past performance or hazard indicators to

be able to assign a hazard level, or there is poor correlation between past performance and hazard indicators.

In the CVFPP, these hazard designations are identified as listed below:

- Low Concern (Hazard Level A)
- Medium Concern (Hazard Level B)
- High Concern (Hazard Level C)

All deficiencies categorized as B, C, or LD were estimated to require remediation. Segments with an overall Category A classification that had a freeboard/geometry deficiency were remediated for the freeboard/geometry deficiency.

Table A-4-19. Non-Urban Levee Evaluation Program

Region	Corresponding Geotechnical Assessment Report Area	Estimated Cost ($ millions)
1 Upper Sacramento	NULE North GAR 1	$408
2 Mid-Sacramento	NULE North GAR 2	$2,577
3 Feather River	NULE North GAR 3	$1,630
4 Lower Sacramento	NULE North GAR 4	$1,147
5 Delta North	NULE North GAR 5	$3,111
6 Delta South	NULE South GAR 1 (70%)	$503
7 Lower San Joaquin	NULE South GAR 1 (30%)	$272
8 Mid-San Joaquin	NULE South GAR 2	$378
9 Upper San Joaquin	NULE South GAR 3	$1,043
Total		**$11,069**

Notes:
Costs are identified in Attachment 8J, Appendix C, and address SPFC project levee deficiencies such as under-seepage, through-seepage, stability, erosion, and freeboard. NULE Program costs also include levee crown road all weather resurfacings for all rural levees.
Costs for the NULE Program are included in two preliminary approaches considered (Achieve SPFC Design Flow Capacity, Enhance Flood System Capacity) and are not included in the State Systemwide Investment Approach.

Key:
GAR = Geotechnical Assessment Report
NULE = Non-Urban Levee Evaluation

4.3.3 Setback Levees

This component includes the construction of setback levees at nine locations in the Sacramento and San Joaquin river basins. These projects include the replacement of approximately 93 miles of levees with 65 miles of new levees and the in-place repair of 60 miles of levees. These projects will require the purchase of between 26,000 and 35,000 acres for the setback areas and associated lands that are part of the same land parcels. As part of these projects, the levees that are being replaced will have to be removed. Ecosystem restoration of the lands, returned to the floodplain will take place through the natural riverine processes (no additional restoration activities are included in this cost estimate). These projects have limited hydraulic impact/benefit, but do provide for localized improved levees and add lands to the floodplain. The project cost estimates listed in Table A-4-20 were developed based on Attachment 8J –Appendix E – Flood Corridor Expansion.

Table A-4-20. Setback Levees

Location	Region	Range of Estimated Cost ($ millions)
FTR_01	Feather River	$380 to $520
MSAC_01	Mid-Sacramento	$ 200 to $290
MSAC_02	Mid-Sacramento	$390 to $550
MSA_03	Mid-Sacramento	$350 to $490
LSJ_01	Lower San Joaquin	$360 to $510
LSJ_02	Lower San Joaquin	$340 to $480
MSJ_01	Mid-San Joaquin	$400 to $540
USJ_01	Upper San Joaquin	$270 to $380
USJ_02	Upper San Joaquin	$560 to $760
Total		**$3,250 to $4,520**

Notes:
Setback levees would add lands to the floodways by widening portions of the Sacramento and San Joaquin rivers.
Costs include purchase of land, removal of existing levees, and construction of new levees. Attachment 8J, Appendix E, provides additional detail for setback levee cost estimates.
Costs for setback levees are included in only one preliminary approach considered (Enhance Flood System Capacity) and are not included in the State Systemwide Investment Approach.

4.4 Residual Risk Management Element

Residual risk management addresses the additional efforts needed to provide flood protection beyond capital flood protection projects included in the other flood management elements. While the residual risk management element included components that support improved flood protection throughout the system, it focuses on providing supplemental flood protection in the rural-agricultural areas. It includes three components:

1. Enhanced flood emergency response
2. Enhanced O&M
3. Floodplain management

Each of these is described below

4.4.1 Enhanced Flood Emergency Response

Even with the major physical improvements to the flood management system, the risk of flooding can never be entirely eliminated. The Central Valley floodplains will always be at risk of flooding, whether from unanticipated facility failures or extreme storm events. This component supports additional planning and response efforts in preparation of flood events beyond current levels, and supports real-time communications. The enhanced flood emergency response components include:

- All-weather roads on levee crowns
- Additional flood information collection and sharing
- Local flood emergency response planning
- Additional forecasting and notification

All-weather Roads on Levee Crowns

This component includes construction of all-weather roads on the levee crowns for rural-agricultural levees, which will improve access to inspect levees and flood-fighting activities during high-water events. This component includes approximately 1,200 miles of SPFC rural-agricultural levees. This one-time estimated cost is $50,000 per mile, based on estimates from the DWR Flood Maintenance Office.

The Achieve SPFC Design Flow Capacity Approach and the Enhanced Flood System Capacity include the all-weather roads as part of the NULE levee improvements (a component under the Rural-Agricultural Improvement Element), and the costs are included in that component. The Protect High Risk Communities does not include this improvement. The State Systemwide Investment Approach includes this improvement as its own component under the Residual Risk Management Element because NULE improvements are not part of that approach.

Additional Flood Information Collection and Sharing

This component includes the additional (beyond current levels of implementation) identification and notification of the flood hazards to residents, broadcasting real-time flood information to rural-agricultural areas, mapping evacuation routes and providing them to the public, and increasing the number of flood monitoring stations in rural areas. The cost varies for different CVFPP approaches for this component because the implementation assumptions are different. For planning purposes, the cost is estimated to be a one-time expenditure of $30 million per region for the Protect High Risk Communities Approach. This cost is high because this approach focuses on the flood systems protecting urban areas and small

communities, and leaves more than a thousand miles of rural-agricultural levees unimproved, requiring a more robust notification system. The cost per region is $8 million per region for the Achieve SPFC Design Flow Capacity and Enhance Flood System Capacity approaches because these approaches include improvements to the entire levee system, requiring less residual risk investment. The cost per region is $15 million for the State Systemwide Investment Approach because the extent of rural-agricultural improvements is between the other approaches. The level of effort is estimated from the DWR Hydrology and Flood Operations Office.

Local Flood Emergency Response Planning

This component includes assisting local agencies preparing flood emergency response plans, training local agencies in flood patrolling and flood-fighting, conducting flood exercises with local agencies, and developing communication tools and processes for improved flood emergency response.

Implementation of this component is focused at the LFPZs within the SPFC. For planning purposes, the one-time cost for assisting local agencies is estimated to range from $500,000 to $600,000 per LFPZ. The level of effort is estimated from the DWR Hydrology and Flood Operations Office. Table A-4-21 lists the number of LFPZs each region, and an estimated range of costs.

The Delta North Region costs include $80 million for a one-time purchase of Delta flood-fight materials and $5 million for increased Delta communications.

Table A-4-21. Local Flood Emergency Response Planning Costs

Region	Levee Flood Protection Zones	Estimated Range of Costs ($ millions)
1 Upper Sacramento	10	$5 to $6
2 Mid-Sacramento	16	$8 to $10
3 Feather River	25	$13 to $15
4 Lower Sacramento	38	$19 to $23
5 Delta North	19	$95 to $97
6 Delta South	17	$9 to $11
7 Lower San Joaquin	37	$19 to $23
8 Mid-San Joaquin	19	$10 to $12
9 Upper San Joaquin	40	$20 to $24
Total	**221**	**$198 to $221**

Notes:
Costs are estimated as a one-time expenditure of $500,000 to $600,000 per Levee Flood Protection Zone.
The Delta North region includes an additional $80 million for a one-time purchase of Delta flood-fight materials and $5 million for increased Delta communications.
Costs for local flood emergency planning are included in all three preliminary approaches considered (Achieve SPFC Design Flow Capacity, Protect High-Risk Communities, Enhance Flood System Capacity) and are also/not included in the State Systemwide Investment Approach.

Additional Forecasting and Notification

This component includes additional efforts (beyond current levels) focused at improving the timing and accuracy of flood forecasts, developing additional forecasting points to effectively serve rural communities, and developing additional methods to distribute forecasts to rural areas. For planning purposes, the one-time costs are estimated to total about $10 million per region. The level of effort is estimated from the DWR Hydrology and Flood Operations Office. It should be noted that improving the flood protection system may reduce the flood risk, but no activity completely removes the residual risk, so forecasting and notification is needed in all approaches.

4.4.2 Enhanced Operation and Maintenance

This component provides for future O&M of the flood protection system with regular activities to keep the SPFC facilities in good working order. Even with the significant capital improvements to the flood management system, the risk of flooding can never be entirely eliminated. The enhanced O&M components include:

- Identification and repair of after event erosions

- Develop and implement enhanced O&M
- Sacramento channel and levee management, and bank protection

Identification and Repair After-Event Erosions

This component includes one-time costs for inspecting the flood system after any major flood event to identify new threats to the flood system, and repair them before they become major repair projects. For planning purposes, the level of effort was estimated for the State Systemwide Investment Approach at approximately $10 million per year over 25 years for a total cost of $231 to $300 million. The costs are distributed across the regions proportionally to the number of rural levee miles. The implementation of this component is expected to vary on a year-to-year basis. Additionally, this level of effort was scaled up or down for each approach, based on the magnitude of rural levee repairs planned to be completed for each of the three approaches. Approaches with larger rural levee improvements (Achieve SPFC Design Flow Capacity and Enhance Flood System Capacity approaches) would have a lesser need compared to approaches with no or little rural levee improvements (Protect High Risk Communities Approach). The more significant the levee repairs to address existing erosion sites, the smaller the expected erosion repairs need after future high-water events. Table A-4-22 lists the level of implementation of this flood management component in each of the four CVFPP approaches. These costs are distributed among all the regions based on the number of rural project levees.

Table A-4-22. Identification and Repair of After Event Erosion Implementation

Approach	Implementation	Estimated Range of Costs ($ millions)
Achieve SPFC Design Flow Capacity Approach	Past problems would have been addressed as part of the repairs to rural levees as defined in the NULE Program, so it is expected that future levee erosion problems would be reduced through these repairs	$119 to $150
Protect High Risk Communities Approach	Past problems would not be addressed, so there is a greater need to address past levee deficiencies	$456 to $600
Enhance Flood System Capacity Approach	Past problems would have been addressed as part of the repairs to rural levees as defined in the NULE Program, so it is expected that future levee erosion problems would be reduced through these repairs	$119 to $150
State Systemwide Investment Approach	Some rural levee repairs will address some of the historic levee repair needs thereby preventing them from becoming large issues in the future, which will require greater efforts to repair.	$231 to $300

Notes:
Costs are estimated as $10 million per year for the State Systemwide Investment Approach, lower for approaches with larger rural levee improvements, and higher for the approach with fewer rural levee improvements. Costs are distributed across regions proportionally based on number of rural levee miles. Costs for identification and repair of erosion are included in all three preliminary approaches considered (Achieve SPFC Design Flow Capacity, Protect High-Risk Communities, Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach.
Key:
NULE = Non-Urban Levee Evaluation
SPFC = State Plan of Flood Control

Develop Enhanced O&M Programs and Regional Maintenance Organizations

This component includes the development and implementation of enhanced O&M programs and establishment of regional maintenance organizations. For planning purposes, the cost for this component is estimated to total $4 to $5 million per year for 25 years (total of $100 to $125 million). The funds will be regionally distributed, based upon distribution of LFPZs. Implementation of this component will be the same in each of the four CVFPP approaches.

Sacramento Channel and Levee Management, and Bank Protection

This component includes the Sacramento River Bank Protection Program and the Channel and Levee Management Program. The State would assume

responsibilities for O&M of the bypasses as well as the water side of the project levees in Sacramento River System.

The cost for this component is estimated to total $4 million to $5 million per year for 25 years (total of up to $125 million) with the distribution of the funds generally reflecting the number of rural miles per region. This estimate is based on the recent annual expenditures for this program. Table A-4-23 lists the estimated distribution of funds for implementation of this flood management component. It will be implemented in each of the four CVFPP approaches.

Table A-4-23. Sacramento Channel and Levee Management, and Bank Protection Implementation

Region	Rural Levee Length (miles)	Estimated Range of Costs ($ millions)
1 Upper Sacramento	71	$12 to $15
2 Mid-Sacramento	301	$53 to $65
3 Feather River	162	$28 to $35
4 Lower Sacramento	43	$7 to $10
5 Delta North	0	$0
6 Delta South	0	$0
7 Lower San Joaquin	0	$0
8 Mid-San Joaquin	0	$0
9 Upper San Joaquin	0	$0
Total	**0**	**$100 to $125**

Notes:
Costs are estimated to total $4 to $5 million per year for 25 years (total of $100 to $125 million).
Costs for Sacramento Channel and Levee Management, and Bank Protection Implementation are included in all three preliminary approaches considered (Achieve SPFC Design Flow Capacity, Protect High-Risk Communities, Enhance Flood System Capacity) and are also included in the State Systemwide Investment Approach. Distribution of the cost between the various regions is preliminary and is subject to refinement.

4.4.3 Floodplain Management

This component focuses on activities in the floodplain to reduce the existing flood threat and support changes in land uses to reduce future flood threat in rural areas. It includes improvements to individual houses to protect them from flood waters (by raising them or flood-proofing them) or purchasing them to remove them from the threat of future floods. Floodplain management is important and necessary because it presents a cost-effective approach to protect houses or remove them from the threat of flooding. These activities can be done in a more cost-effective manner than trying to protect every single house from flooding.

The floodplain management component is intended to provide a nonstructural option to providing improved flood protection for a portion of the approximately 20,000 houses scattered across the rural areas protected by the SPFC. It is a cost-effective approach to providing flood protection to individual houses, compared to making significant and expensive improvements to flood protection system that cannot be supported by the limited benefits provided. Individual participation (by household) in this flood management component would be voluntary, and the actual level of participation is not known at this time. This component, along with the small community improvements, is intended to provide improved flood protection for all houses located in the rural-agricultural areas of the SPFC.

This component includes:

- Raising and waterproofing structures and building berms
- Purchasing and relocating homes in the floodplains
- Land use and floodplain management

Raising and Waterproofing Structures and Building Berms

This is one of the nonstructural components that may be used in place of the structural improvements described in Section 4.3.1 or purchasing and relocating houses (described below) to protect rural households. This component includes flood-proofing and raising structures in the floodplain. For planning purposes, this estimate assumes that this component would be applied to up to 3,000 houses at a cost of up to $100,000 per house, so it would have a total cost of up to $300 million. The number of houses that may participate in this program was estimated based on the distribution of houses in the rural areas. Table A-4-24 lists the estimated costs per region. This component is only included in the State Systemwide Investment Approach.

Table A-4-24. Costs for Raising and Waterproofing Structures and Building Berms

Region	Potential Number of Households	Estimated Range of Costs ($ millions)
1 Upper Sacramento	150	$11 to $15
2 Mid-Sacramento	660	$50 to $66
3 Feather River	270	$20 to $27
4 Lower Sacramento	120	$9 to $12
5 Delta North	390	$29 to $39
6 Delta South	270	$20 to $27
7 Lower San Joaquin	60	$5 to $6
8 Mid-San Joaquin	120	$9 to $12
9 Upper San Joaquin	960	$72 to $96
Total	**3,000**	**$225 to $300**

Notes:
Includes removing or raising structures within floodplains within rural areas.
Budget costs were based on 3,000 homes, distributed throughout the regions, at $75,000 to $100,000 per home.
Costs for raising and waterproofing structures and building berms are not included in any of the preliminary approach considered, but are included in the State Systemwide Investment Approach.

Purchasing and Relocating Homes in Floodplains

This is one of the nonstructural components that may be used in place of the structural improvements described in Section 4.3.1 or the raising and waterproofing structures and building berms (described above) to protect rural households. For planning purposes, this component includes purchasing up to 3,000 houses in high-risk areas of rural floodplain at up to $100,000 per house (totals $300 million) to reduce the future flood damages in rural areas. The number of houses that may participate in this program is estimated based on the distribution of houses in the rural areas. Table A-4-25 lists the estimated costs per region. This component is only included in the State Systemwide Investment Approach.

Table A-4-25. Costs for Purchasing and Relocating Homes in Floodplains

Region	Potential Number of Households	Estimated Range of Costs ($ Millions)
1 Upper Sacramento	150	$11 to $15
2 Mid-Sacramento	660	$50 to $66
3 Feather River	270	$20 to $27
4 Lower Sacramento	120	$9 to $12
5 Delta North	390	$29 to $39
6 Delta South	270	$20 to $27
7 Lower San Joaquin	60	$5 to $6
8 Mid-San Joaquin	120	$9 to $12
9 Upper San Joaquin	960	$72 to $96
Total	**3,000**	**$225 to $300**

Notes:
Budget costs were based on 3,000 homes, distributed throughout the regions, at up to $100,000 per home.
Costs for purchasing and relocating homes in floodplains are not included in any of the preliminary approach considered, but are included in the State Systemwide Investment Approach.

Land Use and Floodplain Management

This component includes the integration of land use and floodplain management to support the preparation of local/regional planning efforts such as multi-hazard plans, floodplain management plans, and local general plan updates. For planning purpose, this was estimated up to $200 million (about $25 million per region). This component will be applied the same in each approach, except for the Enhance Flood System Capacity Approach. The costs for Enhance Flood System Capacity Approach are half of the other approaches because this approach includes improvement to the entire non-urban SPFC levees as well as system element improvements, thereby reducing the need for residual risk management.

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5.0 Acronyms and Abbreviations

Board .....Central Valley Flood Protection Board
CVFPP .....Central Valley Flood Protection Plan
DWR .....California Department of Water Resources
F-BO .....Forecast-Based Operation
F-CO .....Forecast-Coordination Operation
GAR .....Geotechnical Assessment Report
GIS.....geographic information system
LD .....lacking sufficient data
LFPZ .....Levee Flood Protection Zone
NULE .....North Non-Urban Levee Evaluation
O&M.....operations and maintenance
RACER .....Remediation Alternatives and Cost Estimate Report
SAFCA .....Sacramento Area Flood Control Agency
SPFC .....State Plan of Flood Control
TRLIA.....Three Rivers Levee Improvement Authority
ULE .....Urban Levee Evaluation
WSE.....water surface elevation

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6.0 Detailed Cost Tables

This section includes the detailed cost tables for the three preliminary approaches and SSIA. Summary of these detailed tables are provided included in Section 3.

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Table A-6-1. System Improvement Costs for the Achieve SPFC Design Flow Capacity Approach

REGION	Land Acquisition[1]		Agricultural Conservation Easement[2]		Ecosystem Restoration and Enhancement[3]		LEVEES: New Levee Construction[4]		LEVEES: Improve Existing Levees[5]		Flood System and Fish Passage Structures[6]	Reservoir Operations: Forecast-Coordinated Operations / Forecast-Based Operations[7]	Reservoir Operations: New Reservoir Storage[8]	Easements[9]	System Erosion and Bypass Sediment Removal Project[10]	Estimated Total Cost	Risk Assessment, Feasibility, Engineering, and Permitting (25%)	Range of Estimated Total Cost over Program Duration
	Acreage	Cost	Acreage	Cost	Acreage	Cost	Length	Cost	Length	Cost	Cost	Cost	Cost	Cost	Cost			
	(acres)	Low High	Low High	Low High	(acres)	Low High	(miles)	Low High	(miles)	Low High	Low High	Low High	Low High	Low High	Low High	Low High	Low High	Low High
1 Upper Sacramento Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$9 to $12	$0 to $0	$0 to $0	$0.0 to $0.0	**$9 to $12**	**$3 to $3**	**$12 to $15**
2 Mid-Sacramento Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0.0 to $0.0	**$0 to $0**	**$0 to $0**	**$0 to $0**
3 Feather River Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$9 to $12	$0 to $0	$0 to $0	$0.0 to $0.0	**$9 to $12**	**$3 to $3**	**$12 to $15**
4 Lower Sacramento Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$5 to $6	$0 to $0	$0 to $0	$0.0 to $0.0	**$5 to $6**	**$2 to $2**	**$7 to $8**
5 Delta North Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$9 to $12	$0 to $0	$0 to $0	$0.0 to $0.0	**$9 to $12**	**$3 to $3**	**$12 to $15**
6 Delta South Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0.0 to $0.0	**$0 to $0**	**$0 to $0**	**$0 to $0**
7 Lower San Joaquin Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$5 to $6	$0 to $0	$0 to $0	$0.0 to $0.0	**$5 to $6**	**$2 to $2**	**$7 to $8**
8 Mid-San Joaquin Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$9 to $12	$0 to $0	$0 to $0	$0.0 to $0.0	**$9 to $12**	**$3 to $3**	**$12 to $15**
9 Upper San Joaquin Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$23 to $30	$0 to $0	$0 to $0	$0.0 to $0.0	**$23 to $30**	**$6 to $8**	**$29 to $38**
Total	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$69 to $90	$0 to $0	$0 to $0	$0 to $0	**$69 to $90**	**$18 to $23**	**$91 to $114**

Notes:
4 All cost estimates are based on 2011 costs rounded to nearest $million.
The Achieve SPFC Design Flow Capacity Approach is one of three preliminary approaches initially considered for the CVFPP.
System Improvement Assumptions:
[1] Land Acquisition:
Not included in this approach
[2] Agricultural Conservation Easement:
Not included in this approach
[3] Ecosystem Restoration and Enhancement:
Not included in this approach
[4] New Levee Design and Construction:
Not included in this approach
[5] Improve Existing Levees:
Not included in this approach
[6] Flood System and Fish Passage Structures:
Not included in this approach
[7] F-CO / F-BO:
Includes up to 15 F-CO/F-BO in the Sacramento Basin (up to seven reservoirs) and the San Joaquin Basin (up to eight reservoirs) , with $4.5 to $6.0 million per reservoir
[8] New Reservoirs:
Not included in this approach
[9] Easements:
Not included in this approach
[10] System Erosion and Bypass Sediment Removal Project:
Not included in this approach

Table A-6-2. Urban Improvement Costs for the Achieve SPFC Design Flow Capacity Approach

Urban Levee Improvements (ULE) – Design Capacity Improvements for SPFC and Non-SPFC Levees									
REGION	Estimated Project Cost[11]			Risk Assessment, Feasibility, Engineering, and Permitting[12]			Range of Estimated Total Cost over Program Duration		
	Low		High	Low		High	Low		High
1 Upper Sacramento Region	$0.0	to	$0.0	$0.0	to	$0.0	$0.0	to	$0.0
2 Mid-Sacramento Region	$0.0	to	$0.0	$0.0	to	$0.0	$0.0	to	$0.0
3 Feather River Region	$997.0	to	$1,246.0	$199.0	to	$249.0	$1,196.0	to	$1,495.0
4 Lower Sacramento Region	$1,274.0	to	$1,593.0	$255.0	to	$319.0	$1,529.0	to	$1,912.0
5 Delta North Region	$240.0	to	$300.0	$48.0	to	$60.0	$288.0	to	$360.0
6 Delta South Region	$120.0	to	$150.0	$24.0	to	$30.0	$144.0	to	$180.0
7 Lower San Joaquin Region	$198.0	to	$247.0	$40.0	to	$49.0	$238.0	to	$296.0
8 Mid-San Joaquin Region	$360.0	to	$450.0	$72.0	to	$90.0	$432.0	to	$540.0
9 Upper San Joaquin Region	$0.0	to	$0.0	$0.0	to	$0.0	$0.0	to	$0.0
Urban Levee Improvements (ULE) Subtotal	**$3,189.0**	**to**	**$3,986.0**	**$638.0**	**to**	**$797.0**	**$3,827.0**	**to**	**$4,783.0**
Urban Improvements Total	**$3,189.0**	**to**	**$3,986.0**	**$638.0**	**to**	**$797.0**	**$3,827.0**	**to**	**$4,783.0**

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million.
The Achieve SPFC Design Flow Capacity Approach is one of three preliminary approaches initially considered for the CVFPP.
Assumptions:
[11] Estimated Project Costs:
Levee Improvements to for Urban - Design Capacity Improvements: SPFC Levee Improvements based on ULE Cost Estimates for individual urban areas identified on Table 4-13. Would restore SPFC design capacity but may not necessarily provide 200-year level of protection.
Non-SPFC Urban Levee Improvement costs estimated at $6 to $8 million per mile for approximately 120 miles of Non-SPFC Urban Levees because no levee evaluation data is available at this time. These improvement costs are less than other improvement cost estimates because these levees are generally on smaller tributary streams and as a result are smaller than other levees, and certain improvements projects have already been completed.
[12] Risk Assessment, Feasibility, Engineering, and Permitting ranges by project from 0% to 20% depending on level of project development

Table A-6-3. Rural-Agricultural Improvement Costs for the Achieve SPFC Design Flow Capacity Approach

REGION	Small Community Improvement[13]	Non-Urban - Design Capacity Improvements[14]	Rural Setback Levees[15]	Site-Specific Rural Agricultural Improvement[16]			Estimated Total Costs[17]		Risk Assessment, Feasibility, Engineering, and Permitting (25%)		Range of Estimated Total Cost over Program Duration
	Levee Improvement to Provide 100-Year Protection for Small Communities			Miles of Rural Levees	Levee Improvements	Known and Identified Erosion Repairs	Low	High	Low	High	($)
1 Upper Sacramento Region	$0.0	$408.0	$0.0	0	$0.0 to $0.0	$0.0	$408.0 to	$510.0	$102.0 to	$128.0	**$510.0 to $638.0**
2 Mid-Sacramento Region	$0.0	$2,578.0	$0.0	0	$0.0 to $0.0	$0.0	$2,578.0 to	$3,222.0	$645.0 to	$806.0	**$3,223.0 to $4,028.0**
3 Feather River Region	$0.0	$1,631.0	$0.0	0	$0.0 to $0.0	$0.0	$1,631.0 to	$2,038.0	$408.0 to	$510.0	**$2,039.0 to $2,548.0**
4 Lower Sacramento Region	$0.0	$1,147.0	$0.0	0	$0.0 to $0.0	$0.0	$1,147.0 to	$1,434.0	$287.0 to	$359.0	**$1,434.0 to $1,793.0**
5 Delta North Region	$0.0	$3,111.0	$0.0	0	$0.0 to $0.0	$0.0	$3,111.0 to	$3,889.0	$778.0 to	$973.0	**$3,889.0 to $4,862.0**
6 Delta South Region	$0.0	$503.0	$0.0	0	$0.0 to $0.0	$0.0	$503.0 to	$629.0	$126.0 to	$158.0	**$629.0 to $787.0**
7 Lower San Joaquin Region	$0.0	$272.0	$0.0	0	$0.0 to $0.0	$0.0	$272.0 to	$340.0	$68.0 to	$85.0	**$340.0 to $425.0**
8 Mid-San Joaquin Region	$0.0	$379.0	$0.0	0	$0.0 to $0.0	$0.0	$379.0 to	$473.0	$95.0 to	$119.0	**$474.0 to $592.0**
9 Upper San Joaquin Region	$0.0	$1,044.0	$0.0	0	$0.0 to $0.0	$0.0	$1,044.0 to	$1,305.0	$261.0 to	$327.0	**$1,305.0 to $1,632.0**
Total	**$0.0**	**$11,073.0**	**$0.0**	**0**	**$0.0 to $0.0**	**$0.0**	**$11,073.0 to**	**$13,840.0**	**$2,770.0 to**	**$3,465.0**	**$13,843.0 to $17,305.0**

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million.
The Achieve SPFC Design Flow Capacity Approach is one of three preliminary approaches initially considered for the CVFPP.
Assumptions:
[13] Small Community Improvements:
Not included in this approach - Existing levees around small communities would be improved as part of the recommendations from NULE Program
[14] Non-Urban - Design Capacity Improvements:
Estimates from NULE program for improvements to non-urban project levees (see Attachment 8J, Appendix C) to address levee deficiencies such as under-seepage, through-seepage, stability, erosion, and freeboard
The NULE improvements include Levee Crown Road All Weather resurfacings for all rural levees.
[15] Rural Setback Levees: Not included in this approach
[16] Site-Specific Rural Agricultural Improvements:
Not included in this approach
[17] High estimate includes 25% increase for Non-Urban Design Capacity Improvements to account for upper cost estimate range.

Table A-6-4. Residual Risk Management Costs for the Achieve SPFC Design Flow Capacity Approach

REGION	Enhanced Flood Emergency Response					Enhanced Operation and Maintenance					Floodplain Management					Estimated Total Costs	Risk Assessment, Feasibility, Engineering, and Permitting (25%)	Range of Estimated Total Cost over Program Duration
	Additional Flood Information Collection and Sharing[18]	All Weather Roads on Levee Crowns[19]	Local Flood Emergency Response Planning[20]		Additional Forecasting and Notification[21]	Identification and Repair of After Event Erosions[22]		Develop and Implement Enhanced O&M Programs and Regional Organizations[23]		Sacramento Channel and Levee Management and Bank Protection[24]	Raising and Waterproofing Structures and Building Berms[25]		Purchasing and Relocating Homes in Floodplains[26]		Land Use and Floodplain Management Integration[27]			
			Number of Levee Flood Protection Zones	Cost		Miles of Rural Levees	Cost of Repairs	Number of LFPZs	Cost of Repairs		Potential Number of Homes	Costs	Potential Number of Homes	Costs	Costs			
1 Upper Sacramento Region	$8.0	$0.0	10	$5 to $6	$0.0	71	$7 to $9	10	$4 to $6	$12 to $15	0	$0 to $0	0	$0 to $0	$7.5 to $10	**$44 to $54**	**$0 to $0**	**$44 to $54**
2 Mid-Sacramento Region	$8.0	$0.0	16	$8 to $10	$0.0	301	$29 to $38	16	$7 to $9	$18 to $23	0	$0 to $0	0	$0 to $0	$33.0 to $44	**$103 to $132**	**$0 to $0**	**$103 to $132**
3 Feather River Region	$8.0	$0.0	25	$13 to $15	$0.0	162	$16 to $21	25	$11 to $14	$ 2 7 to $36	0	$0 to $0	0	$0 to $0	$13.5 to $18	**$88 to $112**	**$0 to $0**	**$88 to $112**
4 Lower Sacramento Region	$8.0	$0.0	38	$19 to $23	$0.0	43	$5 to $6	38	$16 to $22	$41 to $54	0	$0 to $0	0	$0 to $0	$6.0 to $8	**$95 to $120**	**$0 to $0**	**$95. to $120**
5 Delta North Region*	$8.0	$0.0	19	$95 to $97	$0.0	252	$24 to $32	19	$8 to $11	$0 to $0	0	$0 to $0	0	$0 to $0	$19.5 to $26	**$155 to $174**	**$0 to $0**	**$155 to $174**
6 Delta South Region	$8.0	$0.0	17	$9 to $11	$0.0	54	$6 to $7	17	$7 to $10	$0 to $0	0	$0 to $0	0	$0 to $0	$13.5 to $18	**$44 to $54**	**$0 to $0**	**$44 to $54**
7 Lower San Joaquin Region	$8.0	$0.0	37	$19 to $23	$0.0	38	$4 to $5	37	$16 to $21	$0 to $0	0	$0 to $0	0	$0 to $0	$3 to $4	**$50 to $61**	**$0 to $0**	**$50 to $61**
8 Mid-San Joaquin Region	$8.0	$0.0	19	$10 to $12	$0.0	51	$6 to $7	19	$8 to $11	$0 to $0	0	$0 to $0	0	$0 to $0	$6 to $8	**$38 to $46**	**$0 to $0**	**$38 to $46**
9 Upper San Joaquin Region	$8.0	$0.0	40	$20 to $24	$0.0	228	$22 to $29	40	$17 to $23	$0 to $0	0	$0 to $0	0	$0 to $0	$48 to $64	**$115 to $148**	**$0 to $0**	**$115 to $148**
Total	**$72.0**	**$0.0**	**221**	**$198 to $221**	**$0.0**	**1,200**	**$119 to $150**	**221**	**$94 to $125**	**$98 to $125**	0	**$0 to $0**	0	**$0 to $0**	**$150 to $200**	**$732 to $901**	**$0 to $0**	**$732 to $901**

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million.
The Achieve SPFC Design Flow Capacity Approach is one of three preliminary approaches initially considered for the CVFPP.
Residual Risk Management Assumptions:

[18] Additional Flood Information Collection and Sharing:
Includes $8 million per region to improve:
- Identification and notification of the flood hazards to residents
- Effectively broadcasting real-time flood information to rural areas
- Map evacuation routes and provide them to public
- Additional flood monitoring stations in rural areas

[19] All Weather Roads on Levee Crowns:
Improvements would be made as part of NULE Program and costs are included in the non-urban design capacity component of the rural0agricultural improvement element..

Table A-6-4. Residual Risk Management Costs for the Achieve SPFC Design Flow Capacity Approach (contd.)

Notes: (contd.)

[20] Local Flood Emergency Response Planning:
Includes a one-time expenditure of $500,000 to $600,000 per Levee Flood Protection Zone to improve:
Assist local agencies to prepare flood emergency response plan
Train flood patrolling and flood fight
Conduct flood exercises with local entities
Develop communication tool and process for flood emergency response
*Includes $80 million for purchase of Delta Flood fight materials and $5 million for increased Delta Communications

[21] Additional Forecasting and Notification:
Not included in this approach
Forecasting and Notification will continue to operate at its current level.

[22] Identification and Repair of After Event Erosions:
Inspect the flood system after any major flood event to identify erosion sites. Repair erosion sites in a timely manner before they are expected to become a major remaining project.
Costs are estimated to be approximately $5 million per year for 25 years and are distributed across regions proportionally based on number of rural levee miles.

[23] Develop and Implement Enhanced O&Ms:
Includes annual expenditures of $4,000,000 to $5,000,000 per year for 25 years, regionally distributed according to the number of Local Flood Protection Zones to:
Develop and implement an enhanced O&M program and establish regional maintenance organizations.

[24] Sacramento Channel and Levee Management and Bank Protection:
Channel and levee management program includes system capacity evaluation and remediation and Sacramento River Bank Protection. Assumes $4 to $5 million per year over next 25 years. Distribution of the cost between the various regions is preliminary and is subject to refinement. The State will assume responsibilities for O&M of the bypasses as well as the water side of the project levees in Sacramento River System

[25] Raising and Waterproofing Structures and Building Berms:
Not included in this approach

[26] Purchasing and Relocating Homes in Floodplains:
Not included in this approach because of extensive levee improvements made in ULE and NULE programs

[27] Land Use and Floodplain Management Integration :
Land use and floodplain management integration including preparing multi-hazard plans, multi-hazard plans, floodplain management plan, local general plan updates, etc.
Costs estimated to be up to $200 million, and were regionally distributed based on the number of houses in rural areas

Table A-6-5. System Improvement Costs for the Protect High Risk Communities Approach

REGION	Land Acquisition[1]		Agricultural Conservation Easement()		Ecosystem Restoration and Enhancement[3]		LEVEES: New Levee Construction[4]		LEVEES: Improve Existing Levees[5]		Flood System and Fish Passage Structures[6]	Reservoir Operations: Forecast-Coordinated Operations / Forecast-Based Operations[7]	Reservoir Operations: New Reservoir Storage[8]	Easements[9]	System Erosion and Bypass Sediment Removal Project[10]	Estimated Total Cost	Risk Assessment, Feasibility, Engineering, and Permitting (25%)	Range of Estimated Total Cost over Program Duration
	Acreage	Cost	Acreage	Cost	Acreage	Cost	Length	Cost	Length	Cost	Cost	Cost	Cost	Cost	Cost			
	(acres)	Low High	Low High	Low High	(acres)	Low High	(miles)	Low High	(miles)	Low High	Low High	Low High	Low High	Low High	Low High	Low High	Low High	Low High
1 Upper Sacramento Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$9 to $12	$0 to $0	$0 to $0	$0 to $0	$9 to $12	$3 to $3	$12 to $15
2 Mid-Sacramento Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0 to $0
3 Feather River Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$9 to $12	$0 to $0	$0 to $0	$0 to $0	$9 to $12	$3 to $3	$12 to $15
4 Lower Sacramento Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$5 to $6	$0 to $0	$0 to $0	$0 to $0	$5 to $6	$2 to $2	$7 to $8
5 Delta North Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$9 to $12	$0 to $0	$0 to $0	$0 to $0	$9 to $12	$3 to $3	$12 to $15
6 Delta South Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0 to $0	$0 to $0
7 Lower San Joaquin Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$5 to $6	$0 to $0	$0 to $0	$0 to $0	$5 to $6	$2 to $2	$7 to $8
8 Mid-San Joaquin Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$9 to $12	$0 to $0	$0 to $0	$0 to $0	$9 to $12	$3 to $3	$12 to $15
9 Upper San Joaquin Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$23 to $30	$0 to $0	$0 to $0	$0 to $0	$23 to $30	$6 to $8	$29 to $38
Total	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0.0	$0 to $0	0.0	$0 to $0	$0 to $0	$69 to $90	$0 to $0	$0 to $0	$0 to $0	$69 to $90	$18 to $23	$91 to $114

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million.
The Protect High Risk Communities Approach is one of three preliminary approaches initially considered for the CVFPP.
System Improvement Assumptions:
[1] Land Acquisition:
Not included in this approach

Table A-6-5. System Improvement Costs for the Protect High Risk Communities Approach (contd.)

Notes: (contd.)

[2] Agricultural Conservation Easement:
Not included in this approach

[3] Ecosystem Restoration and Enhancement:
Not included in this approach

[4] New Levee Design and Construction:
Not included in this approach

[5] Improve Existing Levees:
Not included in this approach

[6] Flood System and Fish Passage Structures:
Not included in this approach

[7] F-CO / F-BO:
Includes up to 15 F-CO/F-BO in the Sacramento Basin (up to seven reservoirs) and the San Joaquin Basin (up to eight reservoirs) , with $4.5 to $6.0 million per reservoir.

[8] New Reservoirs:
Not included in this approach

[9] Easements:
Not included in this approach

[10] System Erosion and Bypass Sediment Removal Project:
Not included in this approach

Table A-6-6. Urban Improvement Costs for the Protect High Risk Communities Approach

REGION	Estimated Project Cost[11]			Risk Assessment, Feasibility, Engineering, and Permitting [12]			Range of Estimated Total Cost over Program Duration		
	Low		High	Low		High	Low		High
Upper Sacramento Region	**$100.0**	**to**	**$120.0**	**$20.0**	**to**	**$24.0**	**$120.0**	**to**	**$144.0**
Chico Urban Levee Improvements	$100.0	to	$120.0	$20.0	to	$24.0	$120.0	to	$144.0
Mid-Sacramento Region	**$0.0**	**to**	**$0.0**	**$0.0**	**to**	**$0.0**	**$0.0**	**to**	**$0.0**
	$0.0	to	$0.0	$0.0	to	$0.0	$0.0	to	$0.0
Feather River Region	**$760.0**	**to**	**$891.0**	**$131.0**	**to**	**$157.0**	**$891.0**	**to**	**$1,048.0**
Sutter County Feasibility Study	$8.5	to	$10.2	$1.7	to	$2.0	$10.2	to	$12.2
Feather River West Levee SBFCA	$245.0	to	$294.0	$49.0	to	$58.8	$294.0	to	$352.8
LD1-EIP-Lower Feather River Setback Levee at Star Bend	$20.8	to	$20.8	$0.0	to	$0.0	$20.8	to	$20.8
Marysville Ring Levee Reconstruction	$161.9	to	$194.3	$32.4	to	$38.9	$194.3	to	$233.1
Yuba River Basin GRR	$15.4	to	$18.5	$3.1	to	$3.7	$18.5	to	$22.2
TRLIA-EIP Feather River Levee Improvement Project	$222.0	to	$266.4	$44.4	to	$53.3	$266.4	to	$319.7
TRLIA-EIP-Upper Yuba River Levee Improvement Project	$68.0	to	$68.0	$0.0	to	$0.0	$68.0	to	$68.0
RD 2103-EIP-Bear River North Levee Rehabilitation Project	$18.2	to	$18.2	$0.0	to	$0.0	$18.2	to	$18.2
Lower Sacramento Region	**$3,117.0**	**to**	**$3,726.0**	**$145.0**	**to**	**$173.0**	**$3,261.0**	**to**	**$3,899.0**
American River Common Features Project/GRR	$12.8	to	$15.4	$2.6	to	$3.1	$15.4	to	$18.4
American River Common Features-WRDA96/99 Projects/Remaining Sites	$282.0	to	$338.4	$0.0	to	$0.0	$282.0	to	$338.4
Folsom Dam Modifications-Joint Federal Project (Gated Auxiliary Spillway)	$800.0	to	$1,000.0	$0.0	to	$0.0	$800.0	to	$1,000.0
Folsom Dam Raise, Bridge Element Study and Implementation	$130.0	to	$140.0	$0.0	to	$0.0	$130.0	to	$140.0
Folsom Dam Raise - Reservoir Enlargement	$125.0	to	$130.0	$0.0	to	$0.0	$125.0	to	$130.0
South Sacramento County Streams	$104.0	to	$124.8	$0.0	to	$0.0	$104.0	to	$124.8
SAFCA-EIP-NCC Natomas Levee Improvement Project	$70.0	to	$84.0	$0.0	to	$0.0	$70.0	to	$84.0
SAFCA-NLIP,CO Natomas Levee Improvement Project	$310.0	to	$372.0	$0.0	to	$0.0	$310.0	to	$372.0
Natomas Basin Design and Construction (Future)	$385.0	to	$462.0	$0.0	to	$0.0	$385.0	to	$462.0
Magpie Creek Project (Future)	$9.8	to	$11.8	$2.0	to	$2.4	$11.8	to	$14.1
American River South and Sacramento River Future Improvements	$500.0	to	$600.0	$100.0	to	$120.0	$600.0	to	$720.0
Slip Repair	$53.0	to	$63.6	$10.6	to	$12.7	$63.6	to	$76.4
WSAFCA-EIP-CO West Sacramento	$105.0	to	$126.0	$21.0	to	$25.2	$126.0	to	$151.2
West Sacramento Project GGR	$10.0	to	$12.0	$2.0	to	$2.4	$12.0	to	$14.4
Woodland/ Lower Cache Creek Feasibility Study and Implementation	$190.0	to	$210.0	$0.0	to	$0.0	$190.0	to	$210.0
Davis-Willow Slough	$30.0	to	$36.0	$6.0	to	$7.2	$36.0	to	$43.2
Delta North Region	**$0.0**	**to**	**$0.0**	**$0.0**	**to**	**$0.0**	**$0.0**	**to**	**$0.0**
	$0.0	to	$0.0	$0.0	to	$0.0	$0.0	to	$0.0
Delta South Region	**$0.0**	**to**	**$0.0**	**$0.0**	**to**	**$0.0**	**$0.0**	**to**	**$0.0**
	$0.0	to	$0.0	$0.0	to	$0.0	$0.0	to	$0.0

Table A-6-6. Urban Improvement Costs for the Protect High Risk Communities Approach (contd.)

REGION	Estimated Project Cost[11]			Risk Assessment, Feasibility, Engineering, and Permitting[13]			Range of Estimated Total Cost over Program Duration		
	Low		High	Low		High	Low		High
Lower San Joaquin Region	$162.0	to	$194.0	$33.0	to	$39.0	$194.0	to	$233.0
Lower San Joaquin Feasibility Study	$15.4	to	$18.5	$3.1	to	$3.7	$18.5	to	$22.2
RD 17-EIP-100-Year Levee Seepage Area Project	$76.0	to	$91.2	$15.2	to	$18.2	$91.2	to	$109.4
Mormon Slough Bypass/ Stockton Diverter Canal	$40.0	to	$48.0	$8.0	to	$9.6	$48.0	to	$57.6
Smith Canal Closure Structure (EIP Project)	$30.0	to	$36.0	$6.0	to	$7.2	$36.0	to	$43.2
Mid- San Joaquin Region	**$0.0**	**to**	**$0.0**	**$0.0**	**to**	**$0.0**	**$0.0**	**to**	**$0.0**
	$0.0	to	$0.0	$0.0	to	$0.0	$0.0	to	$0.0
Upper San Joaquin Region	$138.0	to	$166.0	$28.0	to	$34.0	$166.0	to	$199.0
Merced County Streams Group (Bear Creek Unit)	$137.7	to	$165.2	$27.5	to	$33.0	$165.2	to	$198.3
Identified Urban Improvements Subtotal	$4,277.0	to	$5,097.0	$357.0	to	$427.0	$4,632.0	to	$5,523.0
Non-SPFC Urban Levee Improvements[12]									
REGION	**Estimated Project Cost[11]**			**Risk Assessment, Feasibility, Engineering, and Permitting[13]**			**Range of Estimated Total Cost over Program Duration**		
	Low		**High**	**Low**		**High**	**Low**		**High**
1 Upper Sacramento Region	$0.0		$0.0	$0.0		$0.0	$0.0		$0.0
2 Mid-Sacramento Region	$0.0		$0.0	$0.0		$0.0	$0.0		$0.0
3 Feather River Region	$0.0		$0.0	$0.0		$0.0	$0.0		$0.0
4 Lower Sacramento Region	$240.0		$320.0	$48.0		$64.0	$288.0		$384.0
5 Delta North Region	$120.0		$160.0	$24.0		$32.0	$144.0		$192.0
6 Delta South Region	$0.0		$0.0	$0.0		$0.0	$0.0		$0.0
7 Lower San Joaquin Region	$360.0		$480.0	$72.0		$96.0	$432.0		$576.0
8 Mid-San Joaquin Region	$0.0		$0.0	$0.0		$0.0	$0.0		$0.0
9 Upper San Joaquin Region	$0.0		$0.0	$0.0		$0.0	$0.0		$0.0
Non-SPFC Urban Levee Improvements Subtotal	**$720.0**		**$960.0**	**$144.0**		**$192.0**	**$864.0**		**$1,152.0**
Urban Improvements Total	**$4,997.0**	**to**	**$5,817.0**	**$501.0**	**to**	**$571.0**	**$5,496.0**	**to**	**$6,675.0**

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million.
The Protect High Risk Communities Approach is one of three preliminary approaches initially considered for the CVFPP.
Assumptions:
[11]

Urban Flood Protection Projects would provide a 200-year level of protection for urban areas. Project-specific costs were collected from ongoing feasibility studies or other information provided by local flood and other agencies Folsom Dam Raise is an authorized project to provide flood protection for the City of Sacramento[12] Non-SPFC Urban Levee Improvement costs estimated at $6 to $8 million per mile for approximately 120 miles of Non-SPFC Urban Levees because no levee evaluation data is available at this time. These improvement costs are less than other improvement cost estimates because these levees are generally on smaller tributary streams and as a result are smaller than other levees, and certain improvements projects have already been completed.
[13] Risk Assessment, Feasibility, Engineering, and Permitting ranges by project from 0% to 20% depending on level of project development

Table A-6-7. Rural-Agricultural Improvement Costs for the Protect High Risk Communities Approach

REGION	Small Community Improvement[14]	Non-Urban - Design Capacity Improvements[15]	Rural Setback Levees[16]	Site-Specific Rural Agricultural Improvement[17]					Estimated Total Costs			Risk Assessment, Feasibility, Engineering, and Permitting (25%)			Range of Estimated Total Cost over Program Duration		
	Levee Improvement to Provide 100-Year Protection for Small Communities			Miles of Rural Levees	Levee Improvements			Known and Identified Erosion Repairs	Low		High	Low		High	($)		
1 Upper Sacramento Region	$77.0	$0.0	$0.0	0	$0.0	to	$0.0	$0.0	$77.0	to	$89.0	$19.0	to	$23.0	**$93**	**to**	**$112**
2 Mid-Sacramento Region	$190.0	$0.0	$0.0	0	$0.0	to	$0.0	$0.0	$190.0	to	$228.0	$48.0	to	$57.0	**$238**	**to**	**$285**
3 Feather River Region	$319.0	$0.0	$0.0	0	$0.0	to	$0.0	$0.0	$319.0	to	$383.0	$80.0	to	$96.0	**$399**	**to**	**$479**
4 Lower Sacramento Region	$0.0	$0.0	$0.0	0	$0.0	to	$0.0	$0.0	$0.0	to	$0.0	$0.0	to	$0.0	**$0**	**to**	**$0.0**
5 Delta North Region	$293.0	$0.0	$0.0	0	$0.0	to	$0.0	$0.0	$293.0	to	$352.0	$74.0	to	$88.0	**$367**	**to**	**$440**
6 Delta South Region	$0.0	$0.0	$0.0	0	$0.0	to	$0.0	$0.0	$0.0	to	$0.0	$0.0	to	$0.0	**$0**	**to**	**$0**
7 Lower San Joaquin Region	$0.0	$0.0	$0.0	0	$0.0	to	$0.0	$0.0	$0.0	to	$0.0	$0.0	to	$0.0	**$0**	**to**	**$0**
8 Mid- San Joaquin Region	$3.0	$0.0	$0.0	0	$0.0	to	$0.0	$0.0	$3.0	to	$4.0	$1.0	to	$1.0	**$4**	**to**	**$5**
9 Upper San Joaquin Region	$121.0	$0.0	$0.0	0	$0.0	to	$0.0	$0.0	$121.0	to	$146.0	$31.0	to	$37.0	**$152**	**to**	**$183**
Total	**$1,003.0**	**$0.0**	**$0.0**	**0**	**$0.0**	**to**	**$0.0**	**$0.0**	**$1,003.0**	**to**	**$1,202.0**	**$250.0**	**to**	**$301.0**	**$1,253**	**to**	**$1,504**

Table A-6-7. Rural-Agricultural Improvement Costs for the Protect High Risk Communities Approach

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million.
The Protect High Risk Communities Approach is one of three preliminary approaches initially considered for the CVFPP.
Assumptions:
[14] Small Community Improvements:
Attachment 8J, Appendix D, provides detailed information about small community improvements.
Provides 100-year level of protection for small communities within the SPFC that are not protected by other systemwide and/or urban improvements. Cost of implementation is less than $30,000 per person protected (about $100,000 per house).
Non-structural measures will be taken when the cost of protection exceeds $100,000 per house (see Residual Risk Management)
Total population in protected small communities is estimated at 47,000 people, and requires about 120 miles of new or improved levees. All levee improvements to protect small communities for this approach are included in this cost element.
Assumed construction costs include a combination of levee improvements and construction of new levees for each individual community.
Small communities protected by Region are listed below:

1 Upper Sacramento: Durham, Gerber-Las Flores
2 Mid-Sacramento: Knights Landing, Meridian, Colusa, Glenn, Grimes, Butte City, Robbins, Princeton
3 Feather River: Verona, Biggs, Wheatland, Gridley, Live Oak, Nicolaus, Sutter, Tierra Buena
4 None
5 Delta North: Rio Vista, Clarksburg, Courtland, Hood, Walnut Grove, Iselton
6 None
7 None
8 Mid-San Joaquin: Grayson
9 Upper San Joaquin: Firebaugh, Dos Palos, South Dos Palos

[15] Non-Urban - Design Capacity Improvements:
Not included in this approach
[16] Rural Setback Levees
Not included in this approach
[17] Site Specific Rural Agricultural Improvements:
Not included in this approach

Table A-6-8. Residual Risk Management Costs for the Protect High Risk Communities Approach

REGION	Enhanced Flood Emergency Response						Enhanced Operation and Maintenance							Floodplain Management						Estimated Total Costs		Risk Assessment, Feasibility, Engineering, and Permitting (25%)		Range of Estimated Total Cost over Program Duration	
	Additional Flood Information Collection and Sharing[18]	All Weather Roads on Levee Crowns[19]	Local Flood Emergency Response Planning[20]			Additional Forecasting and Notification[21]	Identification and Repair of After Event Erosions[22]			Develop and Implement Enhanced O&M Programs and Regional Organizations[23]			Sacramento Channel and Levee Management and Bank Protection[24]	Raising and Waterproofing Structures and Building Berms[25]		Purchasing and Relocating Homes in Floodplains[26]			Land Use and Floodplain Management Integration[27]						
			Number of Levee Flood Protection Zones	Cost			Miles of Rural Levees	Cost of Repairs		Number of LFPZs	Cost of Repairs			Potential Number of Homes	Costs	Potential Number of Homes	Costs		Costs						
				Low	High			Low	High		Low	High	Low High		Low High		Low	High	Low High	Low	High		($)		($)
1 Upper Sacramento Region	$30	$0	10	$5	to $6	$10	71	$27	to $36	10	$4	to $6	$12 to $15	0	$0 to $0	0	$0 to $0		$7 to $10	**$95**	to **$113**	**$0**	to **$0**	**$95**	to **$113**
2 Mid-Sacramento Region	$30	$0	16	$8	to $10	$10	301	$114	to $151	16	$7	to $9	$18 to $23	0	$0 to $0	0	$0 to $0		$33 to $44	**$220**	to **$277**	**$0**	to **$0**	**$220**	to **$277**
3 Feather River Region	$30	$0	25	$13	to $15	$10	162	$61	to $81	25	$11	to $14	$ 2 7 to $36	0	$0 to $0	0	$0 to $0		$13 to $18	**$165**	to **$204**	**$0**	to **$0**	**$165**	to **$204**
4 Lower Sacramento Region	$30	$0	38	$19	to $23	$10	43	$17	to $22	38	$16	to $22	$41 to $54	0	$0 to $0	0	$0 to $0		$6 to $8	**$139**	to **$169**	**$0**	to **$0**	**$139**	to **$169**
5 Delta North Region*	$30	$0	19	$95	to $97	$10	252	$95	to $126	19	$8	to $11	$0 to $0	0	$0 to $0	0	$0 to $0		$20 to $26	**$258**	to **$300**	**$0**	to **$0**	**$258**	to **$300**
6 Delta South Region	$30	$0	17	$9	to $11	$10	54	$21	to $27	17	$7	to $10	$0 to $0	0	$0 to $0	0	$0 to $0		$14 to $18	**$91**	to **$106**	**$0**	to **$0**	**$91**	to **$106**
7 Lower San Joaquin Region	$30	$0	37	$19	to $23	$10	38	$15	to $19	37	$16	to $21	$0 to $0	0	$0 to $0	0	$0 to $0		$3 to $4	**$93**	to **$107**	**$0**	to **$0**	**$93**	to **$107**
8 Mid-San Joaquin Region	$30	$0	19	$10	to $12	$10	51	$20	to $26	19	$8	to $11	$0 to $0	0	$0 to $0	0	$0 to $0		$6 to $8	**$84**	to **$97**	**$0**	to **$0**	**$84**	to **$97**
9 Upper San Joaquin Region	$30	$0	40	$20	to $24	$10	228	$86	to $114	40	$17	to $23	$0 to $0	0	$0 to $0	0	$0 to $0		$48 to $64	**$211**	to **$265**	**$0**	to **$0**	**$211**	to **$265**
Total	**$270**	**$0**	**221**	**$198**	**to $221**	**$90**	**1,200**	**$456**	**to $600**	**221**	**$94**	**to $125**	**$98 to $125**	0	**$0 to $0**	0	**$0 to $0**		**$150 to $200**	**$1,356**	**to $1,638**	**$0**	**to $0**	**$1,356**	**to $1,638**

Table A-6-8. Residual Risk Management Costs for the Protect High Risk Communities Approach (contd.)

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million.
The Protect High Risk Communities Approach is one of three preliminary approaches initially considered for the CVFPP.
Residual Risk Management Assumptions:

[18] Additional Flood Information Collection and Sharing:
Includes $30 million per region to improve:
- Identification and notification of the flood hazards to residents
- Effectively broadcasting real-time flood information to rural areas
- Mapping evacuation routes and provide them to public
- Additional flood monitoring stations in rural areas

[19] All Weather Roads on Levee Crowns:
Not included in this approach

[20] Local Flood Emergency Response Planning:
Includes a one-time expenditure of $500,000 to $600,000 per Levee Flood Protection Zone to improve:
- Assist local agencies to prepare flood emergency response plan
- Train flood patrolling and flood fight
- Conduct flood exercises with local entities
- Develop communication tool and process for flood emergency response
- *Includes $80 million for purchase of Delta Flood fight materials and $5 million for increased Delta Communications

[21] Additional Forecasting and Notification:
Includes a one-time expenditure of $10,000,000 per Region to improve:
- Improve timing and accuracy of flood forecasts
- Develop additional forecasting points to effectively serve rural communities
- Develop an effective way of distribution forecasts to rural areas

[22] Identification and Repair of After Event Erosions:
Inspect the flood system after any major flood event to identify erosion sites. Repair erosion sites in a timely manner before they are expected to become a major remain project.
Costs are estimated to be approximately $20 million per year for 25 years and are distributed across regions proportionally based on number of rural levee miles.

[23] Develop and Implement Enhanced O&Ms Programs and Regional Organizations:
Includes annual expenditures of $4,000,000 to $5,000,000 per year for 25 years, regionally distributed according to the number of Local Flood Protection Zones to:
Develop and implement an enhanced O&M programs and establish regional maintenance organizations.

[24] Sacramento Channel and Levee Management and Bank Protection:
Channel and levee management program includes system capacity evaluation and remediations and Sacramento River Bank Protection. Assumes $4 to $5 million per year over next 25 years. Distribution of the cost between the various regions is preliminary and is subject to refinement. The State will assume responsibilities for O&M of the bypasses as well as the water side of the project levees in Sacramento River System

[23] Raising and Waterproofing Structures and Building Berms:
Not included in this approach

[24] Purchasing and Relocating Homes in Floodplains:
Not included in this approach

[25] Land Use and Floodplain Management Integration:
Land use and floodplain management integration including preparing multi-hazard plans, multi-hazard plans, floodplain management plan, local general plan updates, etc.
Costs estimated to be up to $200 million and were regionally distributed based on the number of houses in rural areas.

Table A-6-9. System Improvement Costs for the Enhance Flood System Capacity Approach

REGION	Land Acquisition[1]			Agricultural Conservation Easement[2]			Ecosystem Restoration and Enhancement[3]			LEVEES: New Levee Construction[4]			LEVEES: Improve Existing Levees[5]			Flood System and Fish Passage Structures[6]			Reservoir Operations: Forecast-Coordinated Operations / Forecast-Based Operations[7]			Reservoir Operations: New Reservoir Storage[8]			Easements[9]			System Erosion and Bypass Sediment Removal Project[10]			Estimated Total Cost			Risk Assessment, Feasibility, Engineering, and Permitting (25%)			Range of Estimated Total Cost over Program Duration		
	Acreage	Cost		Acreage (1,000)	Cost		Acreage	Cost		Length	Cost		Length	Cost		Cost			Cost			Cost			Cost			Cost											
	(acres)	Low	High	Low	Low	High	(acres)	Low	High	(miles)	Low	High	(miles)	Low	High	Low	Low	High	Low	Low	High	Low	Low	High	Low	Low	High	Low	Low	High	**Low**		**High**	**Low**		**High**	**Low**		**High**
1 Upper Sacramento Region	0	$0	to $0	5	to 10	$18	to $42	0	$0	to $0	0	$0	to $0	0	$0	to $0	$60	to $90	$9	to $12	$0	to $0	$0	to $0	$165	to $213	$0	to $0	$252	to $357	$63	to $90	$315	to $447
2 Mid-Sacramento Region	0	$0	to $0	10	to 15	$35	to $63	0	$0	to $0	0	$0	to $0	0	$0	to $0	$122	to $174	$0	to $0	$0	to $0	$0	to $0	$275	to $355	$30	to $35	$462	to $627	$116	to $157	$578	to $784
3 Feather River Region	9000	$87	to $98	15	to 25	$79	to $150	3,300	$165	to $198	31	$671	to $793	15	$210	to $270	$135	to $190	$9	to $12	$200	to $300	$140	to $172	$0	to $0	$1,696	to $2,183	$424	to $546	$2,120	to $2,729
4 Lower Sacramento Region	18,900	$256	to $284	5	to 10	$32	to $70	4,900	$258	to $307	21	$462	to $546	2	$28	to $36	$230	to $280	$5	to $6	$0	to $0	$0	to $0	$30	to $40	$1,301	to $1,569	$326	to $393	$1,627	to $1,962
5 Delta North Region	7,900	$72	to $83	5	to 10	$21	to $49	2,000	$94	to $114	19	$407	to $481	0	$0	to $0	$0	to $0	$9	to $12	$0	to $0	$0	to $0	$0	to $0	$603	to $739	$151	to $185	$754	to $924
6 Delta South Region	1,000	$9	to $11	10	to 15	$42	to $74	300	$14	to $17	8	$165	to $195	7	$91	to $117	$20	to $25	$0	to $0	$0	to $0	$0	to $0	$0	to $0	$341	to $439	$86	to $110	$427	to $549
7 Lower San Joaquin Region	0	$0	to $0	0	to 0	$0	to $0	0	$0	to $0	0	$0	to $0	0	$0	to $0	$0	to $0	$5	to $6	$0	to $0	$0	to $0	$0	to $0	$5	to $6	$2	to $2	$7	to $8
8 Mid-San Joaquin Region	0	$0	to $0	10	to 15	$39	to $69	0	$0	to $0	0	$0	to $0	0	$0	to $0	$0	to $0	$9	to $12	$400	to $600	$174	to $222	$0	to $0	$622	to $903	$156	to $226	$778	to $1,129
9 Upper San Joaquin Region	0	$0	to $0	10	to 15	$39	to $69	0	$50	to $50	0	$0	to $0	0	$0	to $0	$71	to $88	$23	to $30	$500	to $1,500	$116	to $148	$0	to $0	$799	to $1,885	$200	to $472	$999	to $2,357
Total	36,800	$424	to $476	70	to 115	$305	to $586	10,500	$581	to $686	79	$1,705	to $2,015	24	$329	to $423	$638	to $847	$69	to $90	$1,100	to $2,400	$870	to $1,110	$60	to $75	$6,081	to $8,708	$1,521	to $2,177	$7,605	to $10,889

Table A-6-9. System Improvement Costs for the Enhance Flood System Capacity Approach (contd.)

Notes:
All cost estimates are based on 2011 costs rounded to the nearest $million.
The Enhance Flood System Capacity Approach is one of three preliminary approaches initially considered for the CVFPP.
System Improvement Assumptions:

[1] Land Acquisition: includes purchase of land (fee title)

Land Purchase Cost Assumptions by Region

1	Upper Sacramento	$10,000 to $12,000/acre
2	Mid-Sacramento	$10,000 to $12,000/acre
3	Feather River	$15,000 to $17,000/acre
4	Lower Sacramento	$18,000 to $20,000/acre
5	Delta North	$12,000 to $14,000/acre
6	Delta South	$12,000 to $14,000/acre
7	Lower San Joaquin	$15,000 to $17,000/acre
8	Mid-San Joaquin	$11,000 to $13,000/acre
9	Upper San Joaquin	$11,000 to $13,000/acre

[2] Agricultural Conservation Easement: would preserve agricultural land uses with no provision for storage of flood flows within the easement

Agricultural Conservation Assumed 35% of Land Acquisition by Region

[3] Ecosystem Restoration and Enhancement:

Assumes 25% of land purchased for bypasses will be developed for conservation and other 75% will be leased back to farmers for environmentally friendly agricultural practices such as corn, rice, and other grains, except for the Sutter Bypass Expansion, where environmental conservation is designated for 50 percent of lands acquired.
Environmental conservation cost includes development of or improvement to habitat, and is estimated at $35,000 to $45,000 per acre
Also includes $50 million for Upper San Joaquin River Restoration Projects.

[4] New Levee Design and Construction:

$22 to $26 million/mile based on recent urban levee projects in the Central Valley.

[5] Improve Existing Levees:

$14 to $18 million/mile

[6] Flood System and Fish Passage Structures:

Where available, facility-specific cost estimates were used. Otherwise, programmatic costs were approximated based on similar projects elsewhere in California

[7] F-CO / F-BO:

Includes up to 15 F-CO/F-BO in the Sacramento Basin (up to seven reservoirs) and the San Joaquin Basin (up to eight reservoirs) , with $4.5 to $6 million per reservoir

[8] New Reservoirs:

Programmatic costs were approximated as unit costs to purchase new storage and mitigate impacts in flood storage or multipurpose facilities.

[9] Easements:

Easements are assumed to be 60 percent of the cost to acquire the land plus project-specific costs of additional facilities needed to move water in/out of easements. Specific locations have not yet been identified

[10] System Erosion and Bypass Sediment Removal Project:

Represents a one-time expenditure for sediment removal from bypasses and weirs to address deferred maintenance

Table A-6-10. Urban Improvement Costs for the Enhance Flood System Capacity Approach

REGION	Estimated Project Cost[11]			Risk Assessment, Feasibility, Engineering, and Permitting[13]			Range of Estimated Total Cost over Program Duration		
	Low		High	Low		High	Low		High
Upper Sacramento Region	**$100**	**to**	**$120**	**$20**	**to**	**$24**	**$120**	**to**	**$144**
Chico Urban Levee Improvements	$100	to	$120	$20	to	$24	$120	to	$144
Mid-Sacramento Region	**$0**	**to**	**$0**	**$0**	**to**	**$0**	**$0**	**to**	**$0**
	$0	to	$0	$0	to	$0	$0	to	$0
Feather River Region	**$760**	**to**	**$891**	**$131**	**to**	**$157**	**$891**	**to**	**$1,048**
Sutter County Feasibility Study	$8.5	to	$10.2	$1.7	to	$2	$10.2	to	$12.2
Feather River West Levee SBFCA	$245	to	$294	$49	to	$58.8	$294	to	$352.8
LD1-EIP-Lower Feather River Setback Levee at Star Bend	$20.8	to	$20.8	$0	to	$0	$20.8	to	$20.8
Marysville Ring Levee Reconstruction	$161.9	to	$194.3	$32.4	to	$38.9	$194.3	to	$233.1
Yuba River Basin GRR	$15.4	to	$18.5	$3.1	to	$3.7	$18.5	to	$22.2
TRLIA-EIP Feather River Levee Improvement Project	$222	to	$266.4	$44.4	to	$53.3	$266.4	to	$319.7
TRLIA-EIP-Upper Yuba River Levee Improvement Project	$68	to	$68	$0	to	$0	$68	to	$68
RD 2103-EIP-Bear River North Levee Rehabilitation Project	$18.2	to	$18.2	$0	to	$0	$18.2	to	$18.2
Lower Sacramento Region	**$3,117**	**to**	**$3,726**	**$145**	**to**	**$173**	**$3,261**	**to**	**$3,899**
American River Common Features Project/GRR	$12.8	to	$15.4	$2.6	to	$3.1	$15.4	to	$18.4
American River Common Features-WRDA96/99 Projects/Remaining Sites	$282	to	$338.4	$0	to	$0	$282	to	$338.4
Folsom Dam Modifications-Joint Federal Project (Gated Auxiliary Spillway)	$800	to	$1,000	$0	to	$0	$800	to	$1,000
Folsom Dam Raise, Bridge Element Study and Implementation	$130	to	$140	$0	to	$0	$130	to	$140
Folsom Dam Raise - Reservoir Enlargement	$125	to	$130	$0	to	$0	$125	to	$130
South Sacramento County Streams	$104	to	$124.8	$0	to	$0	$104	to	$124.8
SAFCA-EIP-NCC Natomas Levee Improvement Project	$70	to	$84	$0	to	$0	$70	to	$84
SAFCA-NLIP,CO Natomas Levee Improvement Project	$310	to	$372	$0	to	$0	$310	to	$372
Natomas Basin Design and Construction (Future)	$385	to	$462	$0	to	$0	$385	to	$462
Magpie Creek Project (Future)	$9.8	to	$11.8	$2	to	$2.4	$11.8	to	$14.1
American River South and Sacramento River Future Improvements	$500	to	$600	$100	to	$120	$600	to	$720
Slip Repair	$53	to	$63.6	$10.6	to	$12.7	$63.6	to	$76.4
WSAFCA-EIP-CO West Sacramento	$105	to	$126	$21	to	$25.2	$126	to	$151.2
West Sacramento Project GGR	$10	to	$12	$2	to	$2.4	$12	to	$14.4
Woodland/ Lower Cache Creek Feasibility Study and Implementation	$190	to	$210	$0	to	$0	$190	to	$210
Davis-Willow Slough	$30	to	$36	$6	to	$7.2	$36	to	$43.2
Delta North Region	**$0**	**to**	**$0**	**$0**	**to**	**$0**	**$0**	**to**	**$0**
	$0	to	$0	$0	to	$0	$0	to	$0
Delta South Region	**$0**	**to**	**$0**	**$0**	**to**	**$0**	**$0**	**to**	**$0**
	$0	to	$0	$0	to	$0	$0	to	$0

Table A-6-10. Urban Improvement Costs for the Enhance Flood System Capacity Approach (contd.)

REGION	Estimated Project Cost[11]			Risk Assessment, Feasibility, Engineering, and Permitting[13]			Range of Estimated Total Cost over Program Duration		
	Low		High	Low		High	Low		High
Lower San Joaquin Region	**$162**	**to**	**$194**	**$33**	**to**	**$39**	**$194**	**to**	**$233**
Lower San Joaquin Feasibility Study	$15.4	to	$18.5	$3.1	to	$3.7	$18.5	to	$22.2
RD 17-EIP-100-Year Levee Seepage Area Project	$76	to	$91.2	$15.2	to	$18.2	$91.2	to	$109.4
Mormon Slough Bypass/ Stockton Diverter Canal	$40	to	$48	$8	to	$9.6	$48	to	$57.6
Smith Canal Closure Structure (EIP Project)	$30	to	$36	$6	to	$7.2	$36	to	$43.2
Mid-San Joaquin Region	**$0**	**to**	**$0**	**$0**	**to**	**$0**	**$0**	**to**	**$0**
	$0	to	$0	$0	to	$0	$0	to	$0
Upper San Joaquin Region	**$138**	**to**	**$166**	**$28**	**to**	**$34**	**$166**	**to**	**$199**
Merced County Streams Group (Bear Creek Unit)	$137.7	to	$165.2	$27.5	to	$33	$165.2	to	$198.3
Identified Urban Improvements Subtotal	**$4,277**	**to**	**$5,097**	**$357**	**to**	**$427**	**$4,632**	**to**	**$5,523**
Non-SPFC Urban Levee Improvements[12]									
REGION	**Estimated Project Cost[11]**			**Risk Assessment, Feasibility, Engineering, and Permitting[13]**			**Range of Estimated Total Cost over Program Duration**		
	Low		**High**	**Low**		**High**	**Low**		**High**
1 Upper Sacramento Region	$0		$0	$0		$0	$0		$0
2 Mid-Sacramento Region	$0		$0	$0		$0	$0		$0
3 Feather River Region	$0		$0	$0		$0	$0		$0
4 Lower Sacramento Region	$240		$320	$48		$64	$288		$384
5 Delta North Region	$120		$160	$24		$32	$144		$192
6 Delta South Region	$0		$0	$0		$0	$0		$0
7 Lower San Joaquin Region	$360		$480	$72		$96	$432		$576
8 Mid-San Joaquin Region	$0		$0	$0		$0	$0		$0
9 Upper San Joaquin Region	$0		$0	$0		$0	$0		$0
Non-SPFC Urban Levee Improvements Subtotal	**$720**		**$960**	**$144**		**$192**	**$864**		**$1,152**
Urban Improvements Total	**$4,997**	**to**	**$5,817**	**$501**	**to**	**$571**	**$5,496**	**to**	**$6,675**

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million.
The Enhance Flood System Capacity Approach is one of three preliminary approaches initially considered for the CVFPP.
Assumptions:
[11] Estimated Project Costs:
Urban Flood Protection Projects would provide a 200-year level of protection for urban areas, Project-specific costs were collected from ongoing feasibility studies or other information provided by local flood and other agencies. Folsom Dam Raise is an authorized project to provide flood protection for the City of Sacramento
Non-SPFC Urban Levee Improvement costs estimated at $6 to $8 million per mile for approximately 120 miles of Non-SPFC Urban Levees because no levee evaluation data is available at this time.
These improvement costs are less than other improvement cost estimates because these levees are generally on smaller tributary streams and as a result are smaller than other levees, and certain improvements projects have already been completed.
[13] Risk Assessment, Feasibility, Engineering, and Permitting
Ranges by project from 0% to 20% depending on level of project development

Table A-6-11. Rural-Agricultural Improvement Costs for the Enhance Flood System Capacity Approach

REGION	Small Community Improvement[14]	Non-Urban - Design Capacity Improvements[15]	Rural Setback Levees[16]			Site-Specific Rural Agricultural Improvement[17]			Estimated Total Costs[18]			Risk Assessment, Feasibility, Engineering, and Permitting (25%)			Range of Estimated Total Cost over Program Duration		
	Levee Improvement to Provide 100-Year Protection for Small Communities					Miles of Rural Levees	Levee Improvements	Known and Identified Erosion Repairs									
			Low		High				Low		High	Low		High	($)		
1 Upper Sacramento Region	$0	$408	$0	to	$0	0	$0 to $0	$0	$408	to	$510	$102	to	$128	**$510**	**to**	**$638**
2 Mid-Sacramento Region	$95	$2,577	$1,733	to	$2,426	0	$0 to $0	$0	$4,405	to	$5,743	$1,102	to	$1,436	**$5,508**	**to**	**$7,179**
3 Feather River Region	$33	$1,630	$603	to	$844	0	$0 to $0	$0	$2,267	to	$2,915	$567	to	$729	**$2,834**	**to**	**$3,644**
4 Lower Sacramento Region	$0	$1,147	$0	to	$0	0	$0 to $0	$0	$1,147	to	$1,434	$287	to	$359	**$1,434**	**to**	**$1,793**
5 Delta North Region	$200	$3,111	$0	to	$0	0	$0 to $0	$0	$3,311	to	$4,089	$828	to	$1,023	**$4,139**	**to**	**$5,112**
6 Delta South Region	$0	$503	$0	to	$0	0	$0 to $0	$0	$503	to	$629	$126	to	$158	**$629**	**to**	**$787**
7 Lower San Joaquin Region	$0	$272	$0	to	$0	0	$0 to $0	$0	$272	to	$340	$68	to	$85	**$340**	**to**	**$425**
8 Mid-San Joaquin Region	$2	$378	$716	to	$1,002	0	$0 to $0	$0	$1,096	to	$1,477	$274	to	$370	**$1,370**	**to**	**$1,847**
9 Upper San Joaquin Region	$15	$1,043	$0	to	$0	0	$0 to $0	$0	$1,059	to	$1,320	$265	to	$330	**$1,324**	**to**	**$1,650**
Total	**$345**	**$11,069**	**$3,052**	**to**	**$4,272**	**0**	**$0 to $0**	**$0**	**$14,469**	**to**	**$18,453**	**$3,618**	**to**	**$4,614**	**$18,088**	**to**	**$23,075**

Table A-6-11. Rural-Agricultural Improvement Costs for the Enhance Flood System Capacity Approach (contd.)

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million.
The Enhance Flood System Capacity Approach is one of three preliminary approaches initially considered for the CVFPP.
Assumptions:
[13] Small Community Improvements:
Attachment 8J, Appendix D, provides detailed information about small community improvements.
Provides 100-year level of protection for small communities within the SPFC that are not protected by other systemwide and/or urban level improvements. Cost of implementation is less than $30,000 per person protected (about $100,000 per house).
Non-structural measures will be taken when the cost of protection exceeds $100,000 per house (see Residual Risk Management)
Total population in protected small communities is estimated at 47,000 people, and requires about 60 miles of new levees. The costs associated with the approximately 60 miles of levee improvements are included as part of NULE Design Capacity Improvements.
Assumed construction costs includes a combination of levee improvements and construction of new levees for each individual community.
Small communities protected by Region are listed below:
1 Upper Sacramento: Durham, Gerber-Las Flore
2 Mid-Sacramento: Knights Landing, Meridian, Colusa, Glenn, Grimes, Butte City, Robbins, Princeton
3 Feather River: Verona, Biggs, Wheatland, Gridley, Live Oak, Nicolaus, Sutter, Tierra Buena
4 None
5 Delta North: Rio Vista, Clarksburg, Courtland, Hood, Walnut Grove, Isleton
6 None
7 None
8 Mid-San Joaquin: Grayson
9 Upper San Joaquin: Firebaugh, Dos Palos, South Dos Palos
[15] Non-Urban - Design Capacity Improvements:
Estimates from NULE program for improvements to non-urban project levees (see Attachment 8J, Appendix C) to address SPFC project levee deficiencies such as under-seepage, through-seepage, stability, erosion, and freeboard.
The NULE improvements include Levee Crown Road All Weather resurfacings for all rural levees.
[16] Rural Setback Levees:
Includes updated levee setback costs for land purchase, old levee removal, fixing existing levees, and construction of new levees.
New lands introduced to the floodplain by the setback levee will be subjected to future riparian processes to provide ecosystem restoration.
[17] Site-Specific Rural Agricultural Improvements:
Not included in this approach
[18] High estimate includes 25% increase for Non-Urban Design Capacity Improvements to account for upper cost estimate range.

Table A-6-12. Residual Risk Management Costs for the Enhance Flood System Capacity Approach

REGION	Enhanced Flood Emergency Response					Enhanced Operation and Maintenance					Floodplain Management					Estimated Total Costs	Risk Assessment, Feasibility, Engineering, and Permitting (25%)	Range of Estimated Total Cost over Program Duration
	Additional Flood Information Collection and Sharing[19]	All Weather Roads on Levee Crowns[20]	Local Flood Emergency Response Planning[18,21]		Additional Forecasting and Notification[22]	Identification and Repair of After Event Erosions[23]		Develop and Implement Enhanced O&M Programs and Regional Organizations[24]		Sacramento Channel and Levee Management and Bank Protection[25]	Raising and Waterproofing Structures and Building Berms[26]		Purchasing and Relocating Homes in Floodplains[27]		Land Use and Floodplain Management Integration[28]			
			Number of Levee Flood Protection Zones	Cost		Miles of Rural Levees	Cost of Repairs	Number of LFPZs	Cost of Repairs		Potential Number of Homes	Costs	Potential Number of Homes	Costs	Costs			
				Low High			Low High		Low High	Low High		Low High		Low High	Low High	Low High	($)	($)
1 Upper Sacramento Region	$8	$0	10	$5 to $6	$0	71	$7 to $9	10	$4 to $6	$12 to $15	0	$0 to $0	0	$0 to $0	$3.8 to $5	**$40 to $49**	**$0 to $0**	**$40 to $49**
2 Mid-Sacramento Region	$8	$0	16	$8 to $10	$0	301	$29 to $38	16	$7 to $9	$49 to $65	0	$0 to $0	0	$0 to $0	$16.5 to $22	**$117 to $152**	**$0 to $0**	**$117 to $152**
3 Feather River Region	$8	$0	25	$13 to $15	$0	162	$16 to $21	25	$11 to $14	$ 2 7 to $35	0	$0 to $0	0	$0 to $0	$6.8 to $9	**$81 to $102**	**$0 to $0**	**$81 to $102**
4 Lower Sacramento Region	$8	$0	38	$19 to $23	$0	43	$5 to $6	38	$16 to $22	$8 to $10	0	$0 to $0	0	$0 to $0	$3 to $4	**$59 to $72**	**$0 to $0**	**$59 to $72**
5 Delta North Region*	$8	$0	19	$95 to $97	$0	252	$24 to $320	19	$8 to $11	$0 to $0	0	$0 to $0	0	$0 to $0	$9.8 to $13	**$145 to $161**	**$0 to $0**	**$145 to $161**
6 Delta South Region	$8	$0	17	$9 to $11	$0	54	$6 to $7	17	$7 to $10	$0 to $0	0	$0 to $0	0	$0 to $0	$6.8 to $9	**$37 to $45**	**$0 to $0**	**$37 to $45**
7 Lower San Joaquin Region	$8	$0	37	$19 to $23	$0	38	$4 to $5	37	$16 to $21	$0 to $0	0	$0 to $0	0	$0 to $0	$1.5 to $2	**$48 to $59**	**$0 to $0**	**$48 to $59**
8 Mid-San Joaquin Region	$8	$0	19	$10 to $12	$0	51	$6 to $7	19	$8 to $11	$0 to $0	0	$0 to $0	0	$0 to $0	$3 to $4	**$35 to $42**	**$0 to $0**	**$35 to $42**
9 Upper San Joaquin Region	$8	$0	40	$20 to $24	$0	228	$22 to $29	40	$17 to $23	$0 to $0	0	$0 to $0	0	$0 to $0	$24 to $32	**$91 to $116**	**$0 to $0**	**$91 to $116**
Total	**$72**	**$0**	**221**	**$198 to $221**	**$0**	**1,200**	**$119 to $150**	**221**	**$94 to $125**	**$96 to $125**	0	**$0 to $0**	0	**$0 to $0**	**$75 to $100**	**$653 to $798**	**$0 to $0**	**$653 to $798**

Table A-6-12. Residual Risk Management Costs for the Enhance Flood System Capacity Approach (contd.)

Notes:
All cost estimates are based on 2011 costs rounded to the nearest $million.
The Enhance Flood System Capacity Approach is one of three preliminary approaches initially considered for the CVFPP.
Residual Risk Management Assumptions:

[19] Additional Flood Information Collection and Sharing:
Includes $8 million per region to improve:
- Identification and notification of the flood hazards to residents
- Effectively broadcasting real-time flood information to rural areas
- Mapping evacuation routes and provide them to public
- Additional flood monitoring stations in rural areas

[20] All Weather Roads on Levee Crowns:
Improvement would be made as part of NULE Program and costs are included in the non-urban design capacity component of the rural-agricultural improvement element.

[21] Local Flood Emergency Response Planning:
Includes a one-time expenditure of $500,000 to $600,000 per Levee Flood Protection Zone to improve:
- Assist local agencies to prepare flood emergency response plan
- Train flood patrolling and flood fight
- Conduct flood exercises with local entities
- Develop communication tool and process for flood emergency response
- *Includes $80 million for purchase of Delta Flood fight materials and $5 million for increased Delta Communications

[22] Additional Forecasting and Notification:
Forecasting and Notification will continue to operate at its current level. No enhancements are included for this approach.

[23] Identification and Repair of After Event Erosions:
Inspect the flood system after any major flood event to identify erosion sites. Repair erosion sites in a timely manner before they are expected to become a major remain project.
Costs are estimated to be approximately $5 million per year for 25 years and are distributed across regions proportionally based on number of rural levee miles.

[24] Develop and Implement Enhanced O&Ms:
Includes annual expenditures of $4,000,000 to $5,000,000 per year for 25 years, regionally distributed according to the number of Local Flood Protection Zones to:
- Develop and implement an enhanced O&M program and establish regional maintenance organizations.

[25] Sacramento Channel and Levee Management and Bank Protection:
Channel and levee management program includes system capacity evaluation and remediation's and Sacramento River Bank Protection. Assumes $4 to $5 million per year over next 25 years. Distribution of the cost between the various regions is preliminary and is subject to refinement. The State will assume responsibilities for O&M of the bypasses as well as the water side of the project levees in Sacramento River System

[26] Raising and Waterproofing Structures and Building Berms:
Not included in this approach

[27] Purchasing and Relocating Homes in Floodplains:
Not included in this approach

[28] Land Use and Floodplain Management Integration:
Land use and floodplain management integration including preparing multi-hazard plans, multi-hazard plans, floodplain management plan, local general plan updates, etc.
Costs estimated to be up to $100 million, and were regionally distributed based on the number of houses in rural areas.

Table A-6-13. System Improvement Costs for the State Systemwide Investment Approach

REGION	Land Acquisition[1]		Agricultural Conservation Easement[2]		Ecosystem Restoration and Enhancement[3]		LEVEES: New Levee Construction[4]		LEVEES: Improve Existing Levees[5]		Flood System and Fish Passage Structures)	Reservoir Operations: Coordinated Operations / Forecast-Based	Reservoir Operations: New Reservoir Storage[8]	Easements[9]	System Erosion and Bypass Sediment Removal Project[10]	Estimated Total Cost	Risk Assessment, Feasibility, Engineering, and Permitting (25%)	Range of Estimated Total Cost over Program Duration
	Acreage	Cost	Acreage (1,000)	Cost	Acreage	Cost	Length	Cost	Length	Cost	Cost	Cost	Cost	Cost	Cost			
	(acres)	Low High	Low High	Low High	(acres)	Low High	(miles)	Low High	(miles)	Low High	Low High	Low High	Low High	Low High	Low High	Low High	Low High	Low High
1 Upper Sacramento Region	0	$0 to $0	5 to 10	$18 to $42	0	$0 to $0	0	$0 to $0	0	$0 to $0	$60 to $90	$9 to $12	$0 to $0	$0 to $0	$0 to $0	**$87 to $144**	**$22 to $36**	**$109 to $180**
2 Mid-Sacramento Region	0	$0 to $0	10 to 15	$35 to $63	0	$0 to $0	0	$0 to $0	0	$0 to $0	$122 to $174	$0 to $0	$0 to $0	$0 to $0	$30 to $35	**$187 to $272**	**$47 to $68**	**$234 to $340**
3 Feather River Region	9,000	$87 to $98	15 to 25	$79 to $150	3,300	$165 to $198	31	$671 to $793	15	$210 to $270	$135 to $190	$9 to $12	$0 to $0	$0 to $0	$0 to $0	**$1,356 to $1,711**	**$339 to $428**	**$1,695 to $2,139**
4 Lower Sacramento Region	18,900	$256 to $284	5 to 10	$32 to $70	4,900	$258 to $307	21	$462 to $546	2	$28 to $36	$230 to $280	$5 to $6	$0 to $0	$0 to $0	$30 to $40	**$1,301 to $1,569**	**$326 to $393**	**$1,627 to $1,962**
5 Delta North Region	7,900	$72 to $83	5 to 10	$21 to $49	2,000	$94 to $114	19	$407 to $481	0	$0 to $0	$0 to $0	$9 to $12	$0 to $0	$0 to $0	$0 to $0	**$603 to $739**	**$151 to $185**	**$754 to $924**
6 Delta South Region	1,000	$9 to $11	10 to 15	$42 to $74	300	$14 to $17	8	$165 to $195	7	$91 to $117	$20 to $25	$0 to $0	$0 to $0	$0 to $0	$0 to $0	**$341 to $439**	**$86 to $110**	**$427 to $549**
7 Lower San Joaquin Region	0	$0 to $0	0 to 0	$0 to $0	0	$0 to $0	0	$0 to $0	0	$0 to $0	$0 to $0	$5 to $6	$0 to $0	$0 to $0	$0 to $0	**$5 to $6**	**$2 to $2**	**$7 to $8**
8 Mid-San Joaquin Region	0	$0 to $0	10 to 15	$39 to $69	0	$0 to $0	0	$0 to $0	0	$0 to $0	$0 to $0	$9 to $12	$0 to $0	$0 to $0	$0 to $0	**$48 to $81**	**$12 to $21**	**$60 to $102**
9 Upper San Joaquin Region	0	$0 to $0	10 to 15	$39 to $69	0	$50 to $50	0	$0 to $0	0	$0 to $0	$71 to $88	$23 to $30	$0 to $0	$0 to $0	$0 to $0	**$183 to $237**	**$46 to $60**	**$229 to $297**
Total	36,800	$424 to $476	70 to 115	$305 to $586	10,500	$581 to $686	79	$1,705 to $2,015	24	$329 to $423	$638 to $847	$69 to $90	$0 to $0	$0 to $0	$60 to $75	**$4,111 to $5,198**	**$1,028 to $1,300**	**$5,142 to $6,501**

Table A-6-13. System Improvement Costs for the State Systemwide Investment Approach (contd.)

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million.
The State Systemwide Investment Approach is the State's preferred approach for the CVFPP.
System Improvement Assumptions:

[1] Land Acquisition: includes purchase of land (fee title)

Land Purchase Cost Assumptions by Region

1	Upper Sacramento	$10,000 to $12,000/acre
2	Mid-Sacramento	$10,000 to $12,000/acre
3	Feather River	$15,000 to $17,000/acre
4	Lower Sacramento	$18,000 to $20,000/acre
5	Delta North	$12,000 to $14,000/acre
6	Delta South	$12,000 to $14,000/acre
7	Lower San Joaquin	$15,000 to $17,000/acre
8	Mid-San Joaquin	$11,000 to $13,000/acre
9	Upper San Joaquin	$11,000 to $13,000/acre

[2] Agricultural Conservation Easement: would preserve agricultural land uses with no provision for storage of flood flows within the easement

Agricultural Conservation Assumed 35% of Land Acquisition by Region

[3] Ecosystem Restoration and Enhancement:

Assumes 25% of land purchased for bypasses will be developed for conservation and other 75% will be leased back to farmers for environmentally friendly agricultural practices such as corn, rice, and other grains, except for the Sutter Bypass Expansion, where environmental conservation is designated for 50 percent of lands acquired.
Environmental conservation cost includes development of or improvement to habitat, and is estimated at $35,000 to $45,000 per acre.
Also includes $50 million for Upper San Joaquin River Restoration Projects.

[4] New Levee Design and Construction:

$22 to $26 million/mile based on recent urban levee projects in the Central Valley.

[5] Improve Existing Levees:

$14 to $18 million/mile

[6] Flood System and Fish Passage Structures:

Where available, facility-specific cost estimates were used. Otherwise, programmatic costs were approximated based on similar projects elsewhere in California.

[7] F-CO / F-BO:

Includes up to 15 F-CO/F-BO in the Sacramento Basin (up to seven reservoirs) and the San Joaquin Basin (up to eight reservoirs) , with $4.5 to $6 million per reservoir

[8] New Reservoirs:

Not included in this approach

[9] Easements:

Not included in this approach

[10] System Erosion and Bypass Sediment Removal Project:

Represents a one-time expenditure for sediment removal from bypasses and weirs to address deferred maintenance

Table A-6-14. Urban Improvement Costs for the State Systemwide Investment Approach

REGION	Estimated Project Cost[11]			Risk Assessment, Feasibility, Engineering, and Permitting [13]			Range of Estimated Total Cost over Program Duration		
	Low		High	Low		High	Low		High
Upper Sacramento Region	**$100**	**to**	**$120**	**$20**	**to**	**$24**	**$120**	**to**	**$144**
Chico Urban Levee Improvements	$100	to	$120	$20	to	$24	$120	to	$144
Mid-Sacramento Region	**$0**	**to**	**$0**	**$0**	**to**	**$0**	**$0**	**to**	**$0**
	$0	to	$0	$0	to	$0	$0	to	$0
Feather River Region	**$760**	**to**	**$891**	**$131**	**to**	**$157**	**$891**	**to**	**$1,048**
Sutter County Feasibility Study	$8.5	to	$10.2	$1.7	to	$2	$10.2	to	$12.2
Feather River West Levee SBFCA	$245	to	$294	$49	to	$58.8	$294	to	$352.8
LD1-EIP-Lower Feather River Setback Levee at Star Bend	$20.8	to	$20.8	$0	to	$0	$20.8	to	$20.8
Marysville Ring Levee Reconstruction	$161.9	to	$194.3	$32.4	to	$38.9	$194.3	to	$233.1
Yuba River Basin GRR	$15.4	to	$18.5	$3.1	to	$3.7	$18.5	to	$22.2
TRLIA-EIP Feather River Levee Improvement Project	$222	to	$266.4	$44.4	to	$53.3	$266.4	to	$319.7
TRLIA-EIP-Upper Yuba River Levee Improvement Project	$68	to	$68	$0	to	$0	$68	to	$68
RD 2103-EIP-Bear River North Levee Rehabilitation Project	$18.2	to	$18.2	$0	to	$0	$18.2	to	$18.2
Lower Sacramento Region	**$3,117**	**to**	**$3,726**	**$145**	**to**	**$173**	**$3,261**	**to**	**$3,899**
American River Common Features Project/GRR	$12.8	to	$15.4	$2.6	to	$3.1	$15.4	to	$18.4
American River Common Features-WRDA96/99 Projects/Remaining Sites	$282	to	$338.4	$0	to	$0	$282	to	$338.4
Folsom Dam Modifications-Joint Federal Project (Gated Auxiliary Spillway)	$800	to	$1,000	$0	to	$0	$800	to	$1,000
Folsom Dam Raise, Bridge Element Study and Implementation	$130	to	$140	$0	to	$0	$130	to	$140
Folsom Dam Raise - Reservoir Enlargement	$125	to	$130	$0	to	$0	$125	to	$130
South Sacramento County Streams	$104	to	$124.8	$0	to	$0	$104	to	$124.8
SAFCA-EIP-NCC Natomas Levee Improvement Project	$70	to	$84	$0	to	$0	$70	to	$84
SAFCA-NLIP,CO Natomas Levee Improvement Project	$310	to	$372	$0	to	$0	$310	to	$372
Natomas Basin Design and Construction (Future)	$385	to	$462	$0	to	$0	$385	to	$462
Magpie Creek Project (Future)	$9.8	to	$11.8	$2	to	$2.4	$11.8	to	$14.1
American River South and Sacramento River Future Improvements	$500	to	$600	$100	to	$120	$600	to	$720
Slip Repair	$53	to	$63.6	$10.6	to	$12.7	$63.6	to	$76.4
WSAFCA-EIP-CO West Sacramento	$105	to	$126	$21	to	$25.2	$126	to	$151.2
West Sacramento Project GGR	$10	to	$12	$2	to	$2.4	$12	to	$14.4
Woodland/ Lower Cache Creek Feasibility Study and Implementation	$190	to	$210	$0	to	$0	$190	to	$210
Davis-Willow Slough	$30	to	$36	$6	to	$7.2	$36	to	$43.2
Delta North Region	**$0**	**to**	**$0**	**$0**	**to**	**$0**	**$0**	**to**	**$0**
	$0	to	$0	$0	to	$0	$0	to	$0
Delta South Region	**$0**	**to**	**$0**	**$0**	**to**	**$0**	**$0**	**to**	**$0**
	$0	to	$0	$0	to	$0	$0	to	$0

Table A-6-14. Urban Improvement Costs for the State Systemwide Investment Approach (contd).

REGION	Estimated Project Cost (11)			Risk Assessment, Feasibility, Engineering, and Permitting (13)			Range of Estimated Total Cost over Program Duration		
	Low		High	Low		High	Low		High
Lower San Joaquin Region	**$162**	**to**	**$194**	**$33**	**to**	**$39**	**$194**	**to**	**$233**
Lower San Joaquin Feasibility Study	$15.4	to	$18.5	$3.1	to	$3.7	$18.5	to	$22.2
RD 17-EIP-100-Year Levee Seepage Area Project	$76	to	$91.2	$15.2	to	$18.2	$91.2	to	$109.4
Mormon Slough Bypass/ Stockton Diverter Canal	$40	to	$48	$8	to	$9.6	$48	to	$57.6
Smith Canal Closure Structure (EIP Project)	$30	to	$36	$6	to	$7.2	$36	to	$43.2
Mid-San Joaquin Region	**$0**	**to**	**$0**	**$0**	**to**	**$0**	**$0**	**to**	**$0**
	$0	to	$0	$0	to	$0	$0	to	$0
Upper San Joaquin Region	**$138**	**to**	**$166**	**$28**	**to**	**$34**	**$166**	**to**	**$199**
Merced County Streams Group (Bear Creek Unit)	$137.7	to	$165.2	$27.5	to	$33	$165.2	to	$198.3
Identified Urban Improvements Subtotal	**$4,277**	**to**	**$5,097**	**$357**	**to**	**$427**	**$4,632**	**to**	**$5,523**

Non-SPFC Urban Levee Improvements[12]

REGION	Estimated Project Cost (11)			Risk Assessment, Feasibility, Engineering, and Permitting (13)			Range of Estimated Total Cost over Program Duration		
	Low		High	Low		High	Low		High
1 Upper Sacramento Region	$0		$0	$0		$0	$0		$0
2 Mid-Sacramento Region	$0		$0	$0		$0	$0		$0
3 Feather River Region	$0		$0	$0		$0	$0		$0
4 Lower Sacramento Region	$240		$320	$48		$64	$288		$384
5 Delta North Region	$120		$160	$24		$32	$144		$192
6 Delta South Region	$0		$0	$0		$0	$0		$0
7 Lower San Joaquin Region	$360		$480	$72		$96	$432		$576
8 Mid-San Joaquin Region	$0		$0	$0		$0	$0		$0
9 Upper San Joaquin Region	$0		$0	$0		$0	$0		$0
Non-SPFC Urban Levee Improvements Subtotal	**$720**		**$960**	**$144**		**$192**	**$864**		**$1,152**
Urban Improvements Total	**$4,997**	**to**	**$5,817**	**$501**	**to**	**$571**	**$5,496**	**to**	**$6,675**

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million.
The State Systemwide Investment Approach is the State's preferred approach for the CVFPP.
Assumptions:
[11] Estimated Project Costs:
Urban Flood Protection Projects would provide a 200-year level of protection for urban areas. Project-specific costs were collected from ongoing feasibility studies or other information provided by local flood and other agencies Folsom Dam Raise is an authorized project to provide flood protection for the City of Sacramento
Non-SPFC Urban Levee Improvement costs estimated at $6 to $8 million per mile for approximately 120 miles of Non-SPFC Urban Levees because no levee evaluation data are available at this time. These improvement costs are less than other improvement cost estimates because these levees are generally on smaller tributary streams and as a result are smaller than other levees, and certain improvements projects have already been completed.
[13] Risk Assessment, Feasibility, Engineering, and Permitting
Ranges by project from 0% to 20% depending on level of project development

Table A-6-15. Rural-Agricultural Improvement Costs for the State Systemwide Investment Approach

REGION	Small Community Improvement[14]	Non-Urban - Design Capacity Improvements[15]	Rural Setback Levees[16]	Site-Specific Rural Agricultural Improvement[17]				Estimated Total Costs			Risk Assessment, Feasibility, Engineering, and Permitting (25%)			Range of Estimated Total Cost over Program Duration		
	Levee Improvement to Provide 100-Year Protection for Small Communities			Miles of Rural Levees	Levee Improvements			Known and Identified Erosion Repairs								
					Low		High		Low		High	Low		High	($)	
1 Upper Sacramento Region	$74	$0	$0	71	$46	to	$57	$3	$123	to	$134	$31	to	$34	**$154**	**to**	**$168**
2 Mid-Sacramento Region	$107	$0	$0	301	$62	to	$77	$119	$288	to	$303	$72	to	$76	**$360**	**to**	**$379**
3 Feather River Region	$173	$0	$0	162	$24	to	$30	$28	$225	to	$231	$57	to	$58	**$282**	**to**	**$289**
4 Lower Sacramento Region	$0	$0	$0	43	$37	to	$46	$24	$61	to	$70	$16	to	$18	**$77**	**to**	**$88**
5 Delta North Region	$77	$0	$0	252	$93	to	$117	$313	$483	to	$507	$121	to	$127	**$604**	**to**	**$634**
6 Delta South Region	$0	$0	$0	54	$18	to	$22	$19	$37	to	$41	$10	to	$11	**$47**	**to**	**$52**
7 Lower San Joaquin Region	$0	$0	$0	38	$8	to	$10	$5	$13	to	$15	$4	to	$4	**$17**	**to**	**$19**
8 Mid-San Joaquin Region	$3	$0	$0	51	$25	to	$31	$10	$38	to	$44	$10	to	$11	**$48**	**to**	**$55**
9 Upper San Joaquin Region	$121	$0	$0	228	$19	to	$24	$6	$146	to	$151	$37	to	$38	**$183**	**to**	**$189**
Total	**$555**	**$0**	**$0**	**1,200**	**$332**	**to**	**$414**	**$523**	**$1,410**	**to**	**$1,492**	**$353**	**to**	**$373**	**$1,772**	**to**	**$1,873**

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million.
The State Systemwide Investment Approach is the State's preferred approach for the CVFPP.
Assumptions:

[14] Small Community Improvements:

Attachment 8J, Appendix D, provides detailed information about small community improvements.

Provides 100-year level of protection for small communities within the SPFC that are not protected by other systemwide and/or urban level improvements. Cost of implementation is less than $30,000 per person protected (about $100,000 per house).

Non-structural measures will be taken when the cost of protection exceeds $100,000 per house (see Residual Risk Management)

Total population in protected small communities is estimated at 47,000 people, and requires about 60 miles of new levees. The costs associated with the approximately 60 miles of levee improvements are included as part of NULE Design Capacity Improvements.

Assumed construction costs include a combination of levee improvements and construction of new levees for each individual community.

Small communities protected by Region are listed below:

1 Upper Sacramento: Durham, Gerber-Las Flores
2 Mid-Sacramento: Knights Landing, Meridian, Colusa, Glenn, Grimes, Butte City, Robbins, Princeton
3 Feather River: Verona, Biggs, Wheatland, Gridley, Live Oak, Nicolaus, Sutter, Tierra Buena
4 None
5 Delta North: Rio Vista, Clarksburg, Courtland, Hood, Walnut Grove, Isleton
6 None
7 None
8 Mid-San Joaquin: Grayson
9 Upper San Joaquin: Firebaugh, Dos Palos, South Dos Palos

[15] Non-Urban - Design Capacity Improvements:

Not included in this approach.

[16] Rural Setback Levees:

Not included in this approach.

[17] Site-Specific Rural Agricultural Improvements:

Site-specific repair needs were identified in 2011 levee inspections and include erosion repairs and freeboard improvements.

Table A-6-16. Residual Risk Management Costs for the State Systemwide Investment Approach

REGION	Enhanced Flood Emergency Response						Enhanced Operation and Maintenance							Floodplain Management											
	Additional Flood Information Collection and Sharing[18]	All Weather Roads on Levee Crowns[19]	Local Flood Emergency Response Planning[20]			Additional Forecasting and Notification[19]	Identification and Repair of After Event Erosions[21]			Develop and Implement Enhanced O&M Programs and Regional Organizations[23]			Sacramento Channel and Levee Management and Bank Protection[24]		Raising and Waterproofing Structures and Building Berms[25]			Purchasing and Relocating Homes in Floodplains[26]			Land Use and Floodplain Management Integration[27]			Estimated Total Costs		Risk Assessment, Feasibility, Engineering, and Permitting (25%)		Range of Estimated Total Cost over Program Duration	
			Number of Levee Flood Protection Zones	Cost			Miles of Rural Levees	Cost of Repairs		Number of LFPZs	Cost of Repairs				Potential Number of Homes	Costs		Potential Number of Homes	Costs		Costs								
				Low	High			Low	High		Low	High	Low	High		Low	High		Low	High	Low	High		Low	High	($)		($)	
1 Upper Sacramento Region	$15	$4	10	$5	$6	$10	71	$14	$18	10	$5	$6	$12	$15	150	$11.3	$15	150	$11.3	$15	$7.5	$10	**$95**	**$114**	**$0**	**$0**	**$95**	**$114**
2 Mid-Sacramento Region	$15	$14	16	$8	$10	$10	301	$57	$76	16	$7	$9	$18	$23	660	$49.5	$66	660	$49.5	$66	$33	$44	**$261**	**$333**	**$0**	**$0**	**$261**	**$333**
3 Feather River Region	$15	$9	25	$13	$15	$10	162	$31	$41	25	$11	$14.1	$ 2 7	$36	270	$20.3	$27	270	$20.3	$27	$13.5	$18	**$170**	**$212**	**$0**	**$0**	**$170**	**$212**
4 Lower Sacramento Region	$15	$3	38	$19	$23	$10	43	$9	$11	38	$17	$21.5	$41	$54	120	$9	$12	120	$9	$12	$6	$8	**$138**	**$169**	**$0**	**$0**	**$138**	**$169**
5 Delta North Region*	$15	$11	19	$95	$97	$10	252	$48	$63	19	$9	$10.7	$0	$0	390	$29.3	$39	390	$29.3	$39	$19.5	$26	**$266**	**$311**	**$0**	**$0**	**$266**	**$311**
6 Delta South Region	$15	$3	17	$9	$11	$10	54	$11	$14	17	$8	$9.6	$0	$0	270	$20.3	$27	270	$20.3	$27	$13.5	$18	**$110**	**$135**	**$0**	**$0**	**$110**	**$135**
7 Lower San Joaquin Region	$15	$2	37	$19	$23	$10	38	$8	$10	37	$16	$20.9	$0	$0	60	$4.5	$6	60	$4.5	$6	$3	$4	**$82**	**$97**	**$0**	**$0**	**$82**	**$97**
8 Mid-San Joaquin Region	$15	$3	19	$10	$12	$10	51	$10	$13	19	$9	$10.7	$0	$0	120	$9	$12	120	$9	$12	$6	$8	**$81**	**$96**	**$0**	**$0**	**$81**	**$96**
9 Upper San Joaquin Region	$15	$11	40	$20	$24	$10	228	$43	$57	40	$17	$22.6	$0	$0	960	$72	$96	960	$72	$96	$48	$64	**$308**	**$396**	**$0**	**$0**	**$308**	**$396**
Total	**$135**	**$60**	**221**	**$198**	**$221**	**$90**	**1,200**	**$231**	**$300**	**221**	**$99**	**$125**	**$98**	**$125**	3,000	**$225**	**$300**	3,000	**$225**	**$300**	**$150**	**$200**	**$1,511**	**$1,863**	**$0**	**$0**	**$1,511**	**$1,863**

Table A-6-16. Residual Risk Management Costs for the State Systemwide Investment Approach (contd.)

Notes:
All cost estimates are based on 2011 costs rounded to nearest $million.
The State Systemwide Investment Approach is the State's preferred approach for the CVFPP.
Residual Risk Management Assumptions:

[18] Additional Flood Information Collection and Sharing:
- Includes $15 million per region to improve:
  - Identification and notification of the flood hazards to residents
  - Effectively broadcasting real-time flood information to rural areas
  - Mapping evacuation routes and provide them to public
  - Additional flood monitoring stations in rural areas

[19] All Weather Roads on Levee Crowns:
- Includes Levee Crown Road All Weather resurfacings for all rural levees (total 1200 miles) at cost of $50,000 per mile

[20] Local Flood Emergency Response Planning:
- Includes a one-time expenditure of $500,000 to $600,000 per Levee Flood Protection Zone to improve:
  - Assist local agencies to prepare flood emergency response plan
  - Train flood patrolling and flood fight
  - Conduct flood exercises with local entities
  - Develop communication tool and process for flood emergency response
  - *Includes $80 million for purchase of Delta Flood fight materials and $5 million for increased Delta Communications

[21] Additional Forecasting and Notification:
- Includes a one-time expenditure of $10,000,000 per Region to improve:
  - Improve timing and accuracy of flood forecasts
  - Develop additional forecasting points to effectively serve rural communities
  - Develop an effective way of distribution forecasts to rural areas

[22] Identification and Repair of After Event Erosions:
- Inspect the flood system after any major flood event to identify erosion sites. Repair erosion sites in a timely manner before they are expected to become a major remain project.
- Costs are estimated to be approximately $10 million per year for 25 years and are distributed across regions proportionally based on number of rural levee miles.

[23] Develop and Implement Enhanced O&M Programs and Regional Organizations:
- Includes annual expenditures of $4,000,000 to $5,000,000 per year for 25 years, regionally distributed according to the number of Local Flood Protection Zones to:
  - Develop and implement an enhanced O&M program and establish regional maintenance organizations.

[24] Sacramento Channel and Levee Management and Bank Protection:
Channel and levee management program includes system capacity evaluation and remediation's and Sacramento River Bank Protection. Assumes $4,000,000 to $5,000,000 per year over next 25 years. Distribution of the cost between the various regions is preliminary and is subject to refinement. The State will assume responsibilities for O&M of the bypasses as well as the water side of the project levees in Sacramento River System

[25] Raising and Waterproofing Structures and Building Berms:
- Includes removing or raising structures within floodplains within rural areas.
- Estimated in include about 3,000 homes
- Costs estimated at $75,000 to $100,000 per house
- A grant program to flood proof structures in rural floodplains (up to $100,000 per house and up to3,000 houses: totals up to $300 million)
- Regional distribution of costs is proportional to the distribution of houses in the rural areas.

[26] Purchasing and Relocating Homes in Floodplains:
- Purchasing of houses in high risk areas of rural floodplains (up to $100,000 per house and up to 3,000 houses (totals $300 million)
- Regional distribution of costs is proportional to the distribution of houses in the rural areas.

[27] Land Use and Floodplain Management Integration:
- Land use and floodplain management integration including preparing multi-hazard plans, multi-hazard plans, floodplain management plan, local general plan updates, etc.
- Costs estimated to be up to $200 million, and were regionally distributed based on the number of houses in rural areas.

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CENTRAL VALLEY
FLOOD MANAGEMENT
PLANNING PROGRAM

FloodSAFE
CALIFORNIA

2012 Central Valley Flood Protection Plan

Attachment 8J: Cost Estimates Appendix B – Urban Levee Evaluations Project Remediation Alternatives and Cost Estimate Report

June 2012

STATE OF CALIFORNIA
THE NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

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Appendix B

This appendix describes the remediation alternative analysis and cost estimates for addressing identified hazard factors for urban SPFC levees. Most of the hazard factors for achieving 200-year level protection were considered in the cost estimates, but not all. Non-structural levee improvements and encroachments which may negatively impact 200-year protection for some areas will likely still need to be addressed to achieve the protection required and these locally specific costs are not included. The urban 200-year cost estimates are incorporated into the overall total costs described in Appendix A.

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Memorandum
DRAFT

ARCHITECTURAL AND ENGINEERING CONTRACTS
FLOOD CONTROL SYSTEM STATUS REPORT (FCSSR)
CONCEPTUAL COST ESTIMATING

Date:	July __, 2011
To:	Mike Inamine, Principal Engineer, Levees Portfolio Manager, DWR Steve Mahnke, Chief, Urban Levee Evaluations, DWR
From:	Richard Millet, URS Corporation Sujan Punyamurthula, URS Corporation Joseph Barnes, URS Corporation
Reviewed By:	_____, URS Corporation
Contract:	4600008101, Task Order U14
Subject:	Conceptual Estimate of Levee Remediation Costs for Urban Levees

1.0 BACKGROUND AND SCOPE

The Department of Water Resources (DWR) is undertaking a program to determine the approximate cost to repair urban levees in 15 urban study areas covering the Sacramento and San Joaquin river systems to support preparation of the Flood Control System Status Report (FCSSR). On January 24, 2011, URS received written authorization to begin work on Task Order U14, which included providing geotechnical, civil engineering, and cost estimating support services for DWR relative to the FCSSR.

In general, the scope of work for Task Order U14 consists of:

Task 14-1: Adapting and using the Non-Urban Levee Evaluation (NULE) estimating protocol template to develop conceptual cost estimates to remediate structural and freeboard deficiencies identified for the 55/57 and 200-year design water surface elevations for the 15 Urban Levee Evaluation (ULE) study areas

Task U14-2: Coordinating the work

Task U14-3: Travel

This memorandum documents the following work performed for each of the 15 ULE study areas under Task U14-1:

1. Establishing ULE estimating protocol by using and updating the existing NULE estimating tool.
2. Applying the estimating protocol to ULE FCSSR deficiencies identified by preliminary geotechnical evaluations completed for the reaches within ULE study areas.
3. Identifying remediation alternatives based on engineering judgment for each reach to address the applicable deficiency (seepage, stability and freeboard). The “rule of thumb” engineering guidance developed in the NULE program was used to establish the physical dimensions for selected remediations and remediation alternatives. No engineering analyses of selected remediations were performed.
4. Preparing conceptual cost estimates for each reach requiring remediation.

5. Presenting results to DWR reviewers and any applicable stakeholders, and modifying estimate results as necessary based upon comments received.

6. Preparing this memorandum to present cost estimating results.

Under Task U14-1, URS updated the Draft Parametric Cost Estimating Tool (Estimating Tool) developed for the NULE program. In general, the same types of remediations used for the NULE program were adapted for the ULE program. However, two special cases were added for the ULE program. These included jet grouting and mixed-in-place soil-cement auger piles (secant piles), which are described later in this memorandum. Adapting the use of the NULE Estimating Tool for the ULE program study areas provides a consistent methodology for generating levee repair alternative cost estimates for both programs.

Under Task U14-1, URS selected levee remediation alternatives for levee reaches in ULE study areas that address deficiencies identified in FCSSR Tables and on Traffic Light Maps. Remediation estimates were prepared for reaches assigned ratings of “Does Not Meet Criteria” “Marginal Mets Criteria” or “Lacks Data” for freeboard, erosion, throughseepage, under seepage, or stability evaluations. Reaches that meet all criteria do not require remediation and have no remediation costs. The list below summarizes the number of reaches in each study area for which one remediation or more is required and for which URS prepared remediation cost estimates:

Number of Reaches Requiring Remediation Cost Estimates		
ULE Study Area	**Design Water Surface**	
	55/57	**200-Year**
American River		
Davis		
Marysville		
Natomas North, West and South		
Natomas East Main Drainage Canal (NEMDC) East		
NEMDC West		
Reclamation District (RD) 17		
RD 404		
RD 784		
Sacramento River		
San Joaquin Area Flood Control Agency (SJAFCA) (Bear)		
SJAFCA (Calaveras)		
Sutter		
West Sacramento		
Woodland		

As noted above, deficiencies were identified with regard to under seepage, throughseepage, stability, erosion, and freeboard deficiencies along levee reaches for the two design water levels. Deficiencies were identified based on limited, existing surface and subsurface levee data, past performance history, and preliminary analyses.

Cost estimates presented in this memorandum provide a base case for flood mitigation planning by DWR for ULE study areas. These estimates reflect an estimated cost to remediate levees so that remediated levees would conform to applicable design-basis hydraulic and freeboard requirements stipulated in one or more of the following agreements between the federal government and the state of California:

- 1953 Memorandum of Understanding Respecting the Sacramento River Flood Control Project between the USA (United States Army Corps of Engineers) and the State of California, dated November 6,1953 (MOU1953)
- Supplement 1 to MOU1953, dated November 25, 1957
- Supplement 2 to MOU1953, dated June 5, 1958

2.0 TECHNICAL APPROACH TEAM MEETINGS

No Technical Approach Team (TAT) meetings were conducted for the ULE Project work described in this memorandum. However, 13 such meetings were conducted for the NULE Project between June and October 2010 and the work approach for remediation selection and cost estimating developed from these meetings has been carried forward into the estimating work for the ULE program wherever applicable.

3.0 IDENTIFICATION OF REMEDIAL ALTERNATIVES AND DEVELOPMENT OF UNIT COSTS FOR ULE PROJECT LEVEES

3.1 Key Estimating Assumptions

Based upon issues, questions discussed, and recommendations made during the prior NULE TAT meetings, URS developed a draft list of key estimating assumptions. These have been adapted to the ULE estimating work. Attachment 1 contains a list of the key estimating assumptions used for ULE. Some key assumptions are further described below.

3.1.1 Environmental Mitigation

Due to lack of site-specific environmental information, and lack of time to develop specific data, the current Estimating Tool provides only two mitigation percentages: 25 and 35 percent of the total direct construction cost. The cost estimates presented in this memorandum use the higher percentage in all ULE program study areas, as agreed upon with DWR.

3.1.2 Land Acquisition

The estimates include allowances for temporary and permanent easement acquisitions required for each remediation based upon the estimated footprint for the remediation. Figure 1 shows basic land acquisition requirements for various seepage/stability berm and seepage cutoff wall remediations. Allowances include land required for remediation, land required for a 20-foot-wide permanent Central Valley Flood Protection Board (CVFPB) easement along the landside toe, and land required for a 5-foot-wide additional temporary easement that provides a 25-foot construction corridor when combined with the CVFPB easement. **Because of the lack of available easement data for many levee reaches in the ULE Project, URS assumed that no easements currently exist in the estimates provided in this memorandum.**

There are four categories for land use identified in the Estimating Tool:

- Agricultural
- Orchard
- Commercial
- Residential

Attachment 1 identifies the input cost parameters for each of these land uses. Note that the cost for residential land in ULE program study areas is $1,000,000 per acre compared to $300,000 per acre used in the NULE program. When assigning remediations to a levee reach, an estimate of the percentage of

each land category potentially impacted by the remediation was determined. These percentages are an input parameter to the Estimating Tool. The Estimating Tool calculates a composite real estate rate per acre based on the input percentages, and uses this composite rate to estimate real estate costs for the remediation alternative's required area.

3.1.3 *Freeboard, Geometry, and Rock Slope Protection for Erosion Remediation*

All reaches within the 15 ULE study areas identified as having a freeboard deficiency were remediated as described later in this memorandum.

A geometry check against the applicable standard template described in the MOU1953 was performed as part of the Tier 1 erosion investigation. If the geometry check failed, but there was no performance history of erosion, no remediation or remediation cost for erosion was deemed necessary. If performance history indicated erosion was a problem (usually a sub-reach length), then erosion was remediated for that length and a rock slope protection erosion repair cost was included in the cost estimate for the affected lengths in a reach. Where erosion remediation is required, rock slope protection was considered as the remediation method for costing purposes.

If the geometry check failed, and a remediation was also required in the reach for another deficiency (seepage, stability, etc.), a geometry remediation was specified and estimated. To date in the Urban Program, except for West Sacramento, only Tier 1 of the three tier erosion program has been completed. All erosion evaluations will be completed in the GERs. Therefore, a geometry check against the USACE design MOU was used as a proxy for initial assessment in the FCSSR review. However, it was decided by DWR (planners) that, although the geometry check may not be satisfied, no remediation would be required unless there had been a past history of erosion issues in a reach.

3.1.4 *Revegetation*

For the estimates presented in this memorandum, revegetation of disturbed areas and new construction areas (other than rock slope protection areas) was assumed to be limited to hydroseeding. This is the customary treatment for recent levee remediation projects. The cost for special plantings, irrigation systems, and ongoing maintenance included as part of the emergency levee repair program was not reflected in the estimates presented in this memorandum.

3.1.5 *Escalation*

Cost estimates include escalation for one year from October 2010 to October 2011 as requested by the Central Valley Flood Protection Planning Group. Escalation is assumed at 3 percent per year.

3.1.6 *Other Direct and Indirect Costs*

In addition to escalation and other factors mentioned previously in this memorandum, cost estimates provided in this memorandum also include appropriate allowances (as a percentage of direct construction cost) for engineering and design, engineering support during construction, construction management, and owner legal costs. The respective allowances for these costs are presented in Attachment 1.

3.1.7 *Burrowing Animal Infestation*

Levees can have significant burrowing animal infestation. As agreed upon in the NULE program by TAT participants, such infestations were not taken as a cause for remediation by themselves. Continuing this concept, no estimated costs to treat burrowing animal infestation are included for ULE program levee reaches in this memorandum.

DWR has evaluated an approximate cost to repair burrowing animal damage as a maintenance activity by evaluating historical data for a 23-mile-long reach of levee. The results of the evaluation indicate that the material, equipment, and labor cost to backfill holes can range from $2,000 to $3,000 per mile for one treatment cycle. The need for addition and/or ongoing treatment cycles would increase this estimated cost.

3.1.8 *Guidance for Defining Dimensions for Slurry Walls and Seepage Berms for Estimating*

There are locations in ULE study areas (at the two design water surfaces) where the width of seepage berm or depth of slurry wall cannot be determined based on currently available information. In such cases, an approximation method was used to select wall depths and seepage berm widths that would provide comparable levels of protection. Selection criteria for wall depth and berm width for ULE is based on landside height of levee and is the same criteria agreed upon by TAT participants for the NULE program. This criteria is discussed further in the Estimating Assumptions (Attachment 1).

3.1.9 Handling Levee Reaches with Overbuilt Crest Width

When selecting remediations and preparing cost estimates for the ULE program, analysts noted that a significant number of reaches within the study areas had overbuilt crest widths that exceeded the applicable criteria. For overbuilt reaches requiring slurry wall or DSM wall remediation for throughseepage or under seepage, analysts initially assumed that the degraded levee section would only be rebuilt back to the criteria width to avoid overestimating the cost of earthwork. However, during DWR's review of draft estimates DWR asked URS to modify the estimates to include levee reconstruction to the existing width. Because of the normal variation in existing width and construction tolerance that can existing along a levee reach, URS adopted the following criteria to estimate reconstruction earthwork costs:

- If the existing levee width is less than 20 feet, then use the existing crest width, but do not use less than 12 feet in any case.
- If the existing width is between 20 and 23 feet, use 20 feet for the crest width.
- If the existing levee crest is between 24 and 39 feet, use the existing crest width.
- If the existing levee crest is greater than 40 feet, then assume no levee degrade is necessary for cutoff wall construction and that the cutoff wall is constructed from the level of the exiting crest.

3.1.10 Limitations

The assumptions described in this section and those documented in Attachment 1 are for a conceptual-level planning effort. They are reasonable and appropriate given the limited physical and geotechnical data and the lack of specific remediation designs. Because of these limitations, URS recommends the estimates presented in this memorandum are solely used as a tool for levee remediation program planning. **These cost estimates should not be used for actual construction budget planning, and should never be used on a reach-by-reach basis.**

3.2 Estimating Tool Background and Update

The Estimating Tool used for the ULE program is the same tool use for the NULE program, except that two additional remedial alternatives were added:

- Using in situ-mixed soil-cement auger holes to form a series of parallel secant walls perpendicular to the levee center line where landside slope stability is a deficiency in densely residential areas and/or where property acquisition to construct a stability berm is not practical
- Using jet grouting for seepage control in areas where there are existing gaps in slurry wall cutoffs due to obstructions such as pipelines, bridges, etc. (particularly along American River reaches).

Attachment 2 is a technical memorandum providing information about the auger hole (secant pile) remedial alternative.

3.3 Unit Rates and Cost Elements for Estimating

Unit rates and the various indirect cost and overhead factors used in the Estimating Tool are shown on Table 1. When selecting the rates shown on Table 1, analysts used caution and avoided adopting any highly competitive lower rates seen during bidding happening in the recent economic downturn.

3.4 Identifying Remedial Alternatives

The remedial alternatives that are used individually or in combination to address all deficiencies identified in the FCSSR process are listed below.

Alternative	Type of Deficiency Remediated
Drained stability berm	Throughseepage and stability deficiencies
Seepage berm	Underseepage deficiency
Combination drained stability and seepage berm	Throughseepage, underseepage, stability deficiencies
Conventional soil-bentonite slurry wall (up to 75 feet remediation depth)	Throughseepage and underseepage deficiencies
Deep Soil Mixing (DSM) wall (greater than 70 feet remediation depth)	Throughseepage and underseepage deficiencies
Rock slope protection	Waterside erosion deficiency
Replacement levee	Throughseepage and stability deficiencies
Freeboard/geometry remediation	Freeboard and/or geometry deficiencies
Secant Walls (soil-cement auger holes)	Slope stability where property acquisition is not feasible
Jet grouting	Throughseepage and underseepage

Standardized details were developed for each remedial alternative to be used. These alternatives were used as building blocks that could be estimated separately or combined with others to provide a complete remediation estimate for any given set of deficiencies. Typical remediation details for berms and seepage cutoff walls are shown on Figure 2. Lettered dimensions on Figure 2 are those typically used as input for the Estimating Tool. Figure 3 shows typical details for the rock slope protection remediation. Different remediation combinations could be used to provide alternative remediation sets for comparison and selection of the minimum cost. For example, a slurry wall and stability berm combination could be compared against a combination berm where underseepage, throughseepage, and stability deficiencies exist. Figure 4 shows typical details for the freeboard remediation. Note that the remediation assumes that landside levee widening would be used to provide acceptable freeboard configurations and to minimize environmental remediation costs associated with work on the waterside of the levee. Details for the secant wall and jet grouting alternatives are shown in Attachment 2.

As mentioned above, the drained stability berm, combination berm, slurry and DSM cutoff wall, and freeboard/geometry remediations were developed to be used as building blocks. These building blocks can be put together, as needed, to address one or more deficiencies without duplicating earthwork or other major cost items. For example, if a slurry wall is needed along with a freeboard/geometry remediation for a particular alternative, the components would be assembled and estimated as follows:

- Levee degrade and reconstruction earthwork volumes and costs for the slurry wall would be for the existing levee height and crest width.
- After reconstruction to existing conditions, the earthwork for the freeboard/geometry prism would be added over and landside of the existing levee prism. This avoids earthwork overlap for the two operations and avoids degrading the levee by 50 percent of the raised height. Taken together, the sum of the two earthwork volumes represents the total earthwork required.

If a drained stability berm is needed along with a freeboard/geometry remediation for a particular alternative, the components would be estimated as follows:

- The earthwork for the freeboard/geometry prism would be added over and landside of the existing levee prism. This provides the required geometry and provides a 2.5:1 landside slope.
- The drained stability berm would then be added to the freeboard/geometry repair. Freeboard/geometry repair volumes do not overlap with the stability berm volumes, but taken together, the sum of the two volumes represents the total earthwork required.

Another condition involves seepage and non-seepage related stability. For seepage related stability, a slurry cutoff wall and drained stability berm would be appropriate alternatives. However, for non-seepage related stability, both the wall and the stability berm would be required for a complete remediation. This difference is reflected in the database evaluation of the alternatives and, for non-seepage related stability, the cost of the wall and berm are added together to develop the remediation cost.

3.5 ULE Levee Reaches Evaluated

Of the ___ levee reaches in the 15 ULE study areas, __ meet applicable criteria and do not require remediation at this time. This leaves ___ reaches that are assigned to the categories *Does Not Meet Criteria, Marginally Mets Criteria,* or *Lacks Data* for one or more potential failure modes. For these reaches, remediations were selected and cost estimates were prepared to address all identified deficiencies.

4.0 SELECTION OF REMEDIAL ALTERNATIVES AND DEVELOPMENT OF COST ESTIMATES FOR ULE LEVEE REACHES

4.1 Selecting Remedial Alternatives

Technical teams were established to review and select remedial alternatives for each reach where one or more deficiencies were identified. For continuity, teams were established and assigned reaches so that team members already would be familiar with the reaches from their previous work on the FCSSR evaluations. All reaches with deficiencies categorized as *Does Not Meet Criteria, Marginally Mets Criteria,* or *Lacks Data* are remediated. Reaches that met all applicable criteria but had a freeboard deficiency were remediated for the freeboard deficiency.

Teams used a standardized Remediation Selection Form (Figure 5) to identify remediations to be estimated, including an alternative where possible, and to fill in the basic data required for the estimate (length, depth, width of the remediation, etc.).

After remedial alternatives were selected by each team, the selections shown on the Remediation Selection Forms were reviewed and critiqued by an independent URS senior review committee familiar with the levee system. After the review process was completed for reaches, the Remediation Selection Forms were used by the estimating team to prepare the cost estimates.

4.2 Preparing Cost Estimates

The Estimating Tool was used to prepare estimates for remediation combinations identified on the Remediation Selection Forms.

4.3 Compiling Estimate Data for Presentation

Because of the large volume of estimating data generated, URS used a Microsoft Access database to compile the results. The database was then used as a tool to analyze the data and tabulate the results in a series of summary tables discussed further in Section 5.0. The content and format of the summary tables is the same as was used for NULE program reporting, which was discussed and agreed to in NULE TAT meetings. The database compares costs and selected the minimum cost where alternative remediations were evaluated, then added the minimum alternative cost to other fixed remediation costs (erosion, secant wall, jet grouting) to provide the total remediation cost for each reach within the 15 study areas. Costs are summarized in the various tables described below in Section 5.0.

5.0 OPINION OF PROBABLE COST

5.1 Remediation Costs for Levee Reaches Included in the FCSSR

Estimating results are presented on Tables 2 through 5. Table 2 presents an over-all summary. Costs based upon the type of remediation required are provided on Tables 3 through 5 as follows:

- Table 3: Structural Remediations
- Table 4: Waterside Erosion Remediations
- Table 5: Freeboard Remediations

For each type of remediation, costs are typically sorted and grouped first by study area, then by overall hazard categorization, then by reach name.

Table 3 summarizes costs specifically for structural remediations to address throughseepage, under seepage, and stability deficiencies.

Table 4 summarizes costs specifically for erosion remediations based upon the individual reach categorization for erosion provided in the FCSSR. Estimated costs are for rock slope protection remediation only.

Table 5 summarizes costs to remediate freeboard deficiencies through crest raising and landside widening, if necessary.

Detailed information for all estimates (reach by reach) from the database is provided in Attachment 3. Tables 2 through 5 described above were developed by sorting the information presented in Attachment 3.

6.0 ESTIMATE LIMITATIONS AND FUTURE UPDATES

The estimates provided in this memorandum are order-of-magnitude estimates based on limited data and evaluation provided in the FCSSR. Simplifying assumptions were made by URS and agreed to by DWR to facilitate estimating. These assumptions are reasonable and appropriate considering the limited physical and geotechnical data and lack of specific remediation designs. The extent and depth of selected remediations used to address deficiencies identified in the FCSSR and estimate costs are based on engineering judgment without detailed analysis, which is beyond the scope of work authorized by the task order. Cost estimate results presented in this memorandum should only be used by DWR as a tool for levee remediation program planning and not for actual construction budget planning, particularly on an individual reach-by-reach basis.

TABLES

Table 1 Unit Price Cost Data

Table 2 Estimated Remediation Costs Grouped By Study Area and Assigned Category

Table 3 Estimated Throughseepage, Under seepage and Stability Remediation Costs Grouped by Study Area and Assigned Category

Table 4 Estimated Erosion Remediation Costs Grouped by Study Area and Assigned Category

Table 5 Estimated Freeboard Costs Grouped by Study Area

TABLE 1 – UNIT PRICE COST DATA

Item	Percent	Unit Price (Dollars)	Unit
Escalation to October 2011	3	-	LS
Contingency	30	-	LS
Design and Engineering	15	-	LS
Owner Permitting and Legal	5	-	LS
Engineering During Construction	2	-	LS
Construction Management/Site Inspection	15	-	LS
Mobilization and Demobilization	5	-	LS
Permanent Right Of Way, Agricultural		10,000.00	Acre
Permanent Right Of Way, Orchard		30,000.00	Acre
Permanent Right Of Way, Commercial		150,000.00	Acre
Permanent Right Of Way, Residential		1,000,000.00	Acre
Temporary Easement		5,000.00	Acre
Clearing and Grubbing		5,000.00	Acre
Stripping		3,000.00	
Excavation		5.00	CY
Select Levee Fill		16.00	CY
Berm Fill		10.00	
Bedding Layer		60.00	Ton
Aggregate Base		35.00	Ton
Hydroseeding		2,000.00	Acre
Soil-Bentonite Slurry Wall		10.00	SF
Deep Soil Mixing (DM) Slurry Wall		22.50	SF
Environmental Mitigation	35	-	LS
Drain Rock, Filter Layer, Geotextile		60.00	CY
Unallocated Items	15	-	LS
Unsuitable Material Disposal		4.00	CY
Stockpile And Reuse Suitable Material		4.00	CY
Place Reusable Material		6.00	CY
Rock slope protection, levee height 5’		523.00	LF
Rock Slope Protection, levee height 10’		1,070.00	LF
Rock Slope Protection, levee height 15’		1,642.00	LF
Rock Slope Protection, levee height 20’		2,240.00	LF

TABLE 1 – UNIT PRICE COST DATA

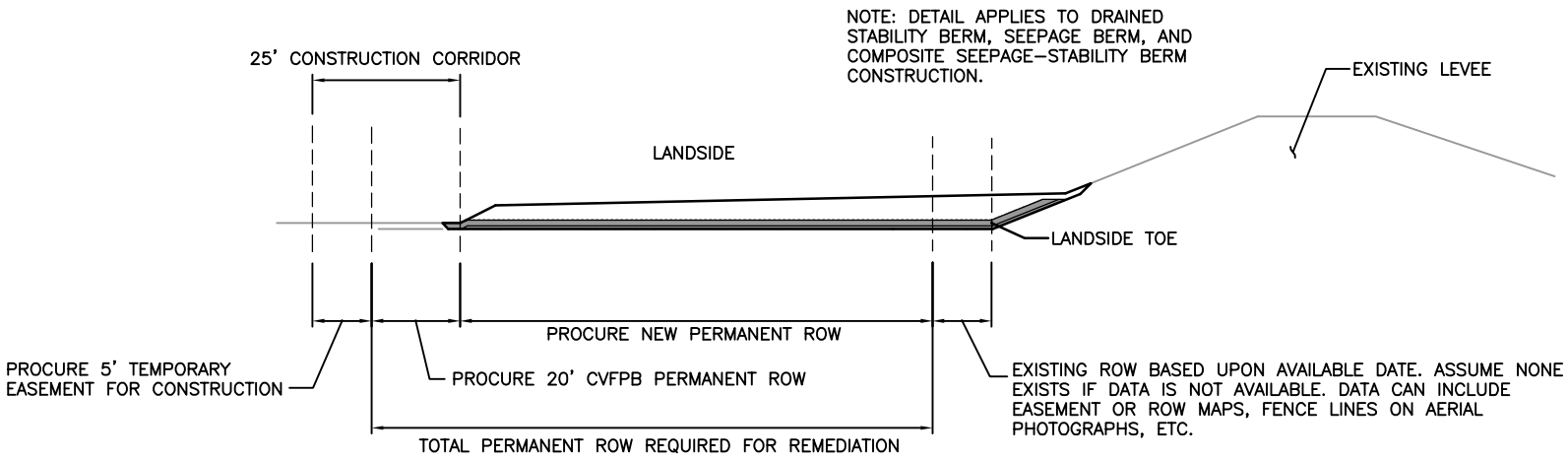
Item	Percent	Unit Price (Dollars)	Unit
Pier Wall, Dry Method, Levee Height 10’		450.00	LF
Pier Wall, Dry Method, Levee Height 15’		540.00	LF
Pier Wall, Dry Method, Levee Height 20’		660.00	LF
Pier Wall, Dry Method, Levee Height 25’		780.00	LF
Pier Wall, Dry Method, Levee Height 30’		900.00	LF
Pier Walls, Wet Method, Levee Height 10’		890.00	LF
Pier Walls, Wet Method, Levee Height 15’		1,120.00	LF
Pier Walls, Wet Method, Levee Height 20’		1,350.00	LF
Pier Walls, Wet Method, Levee Height 25’		1,590.00	LF
Pier Walls, Wet Method, Levee Height 30’		1,820.00	LF
Jet Grouting		100.00	CY

Note:
1. Pier wall cost (either wet or dry method) is interpolated from the costs provided above based upon the actual height of the levee.
2. Rock slope protection cost is interpolated from the costs provided above based upon the actual height of the levee.

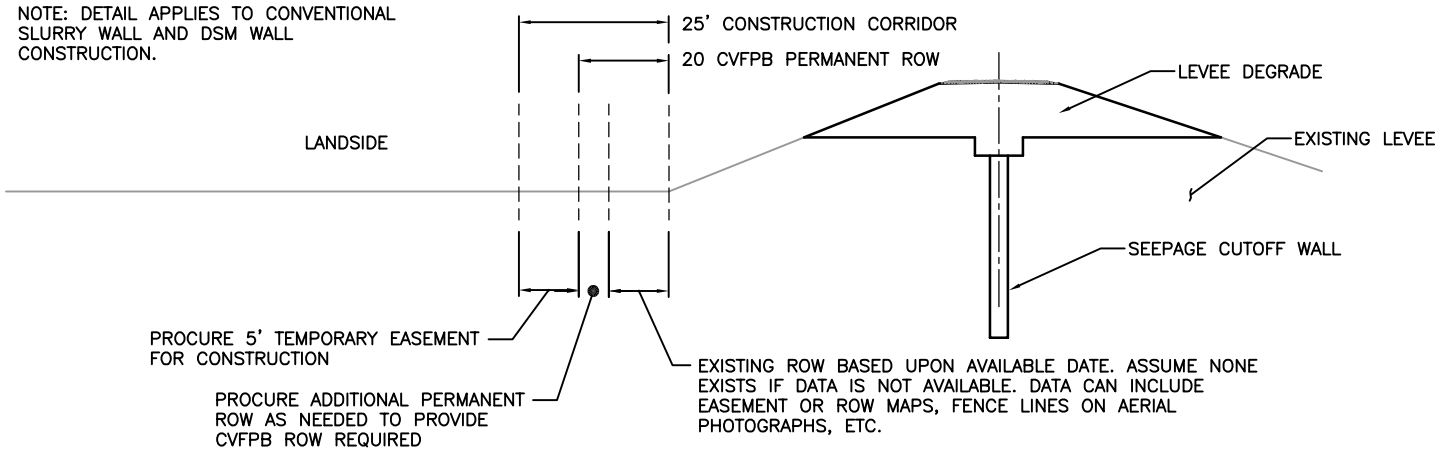
Figures

Figure 1 Proposed Land Acquisition Approach
Figure 2 Typical Remediation Details
Figure 3 Rock Slope Protection
Figure 4 Freeboard and Geometry Repair
Figure 5 Remediation Selection Form

PLOT BY: JOSEPH_BARNES - Jul 11, 2011 - 3:38:11pm
DRAWING: G:\DWR-7418\WorkZone\ULE Cost Estimates\Draft Memorandum\Figures\Figure 1 Easement Limits.dwg



LAND ACQUISITION – BERM REMEDIATIONS



LAND ACQUISITION – SEEPAGE CUTOFF WALL REMEDIATIONS

URS
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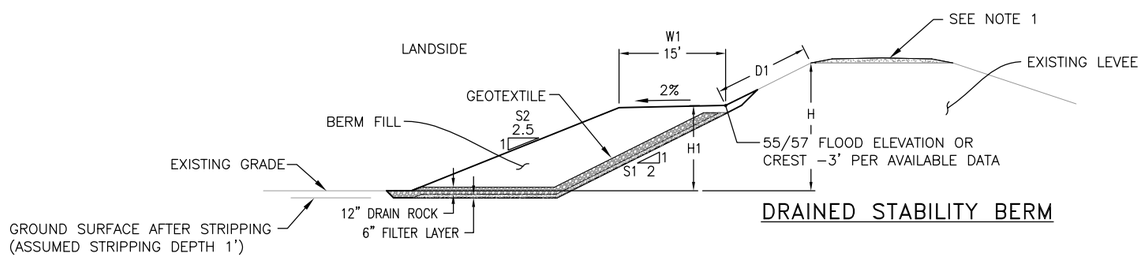
FAX: (916) 679-2900

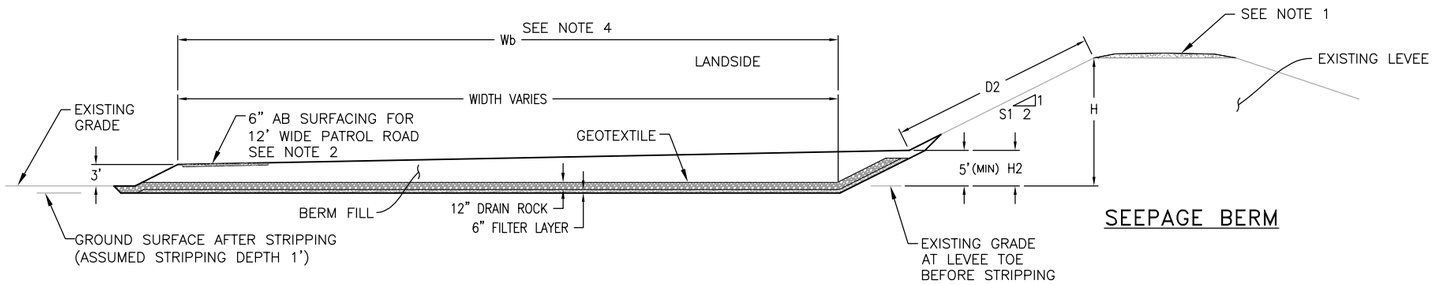
ULE FCSSR-COST ESTIMATING

FIGURE 1
PROPOSED LAND ACQUISITION APPROACH

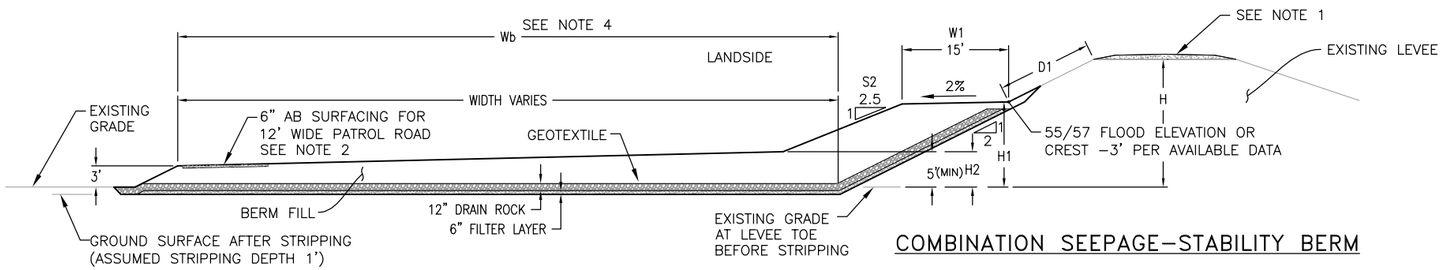
FIGURE 1



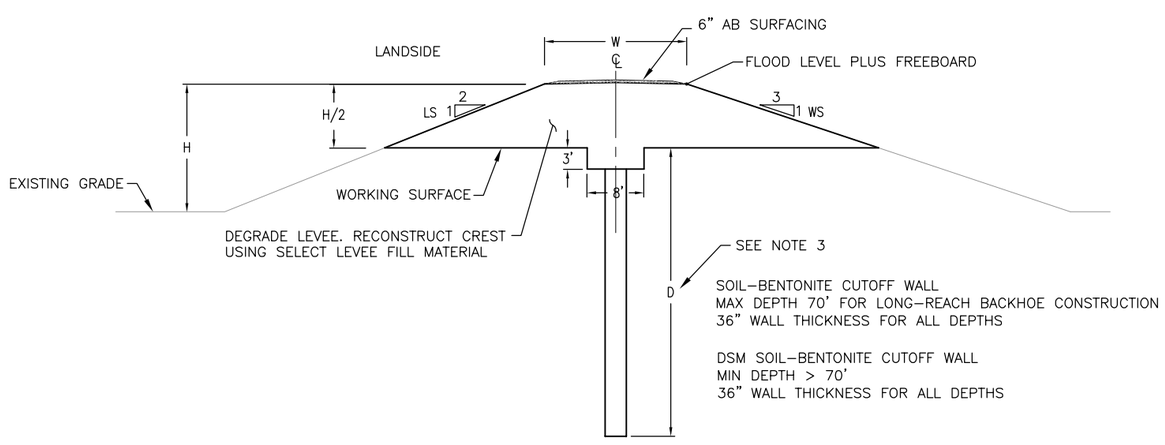
DRAINED STABILITY BERM



SEEPAGE BERM



COMBINATION SEEPAGE–STABILITY BERM



CUTOFF WALL

NOTES:

1. ASSUME THAT 4" OF AB IS ADDED TO THE CREST ROAD IN ALL LEVEE SEGMENTS OVER THE LENGTH WHERE REMEDIATIONS ARE INSTALLED TO ACCOUNT FOR DETERIORATION FROM CONSTRUCTION TRAFFIC.

2. PATROL ROAD COULD BE LOCATED IN CONSTRUCTION EASEMENT ALONG TOE OF SEEPAGE BERM.

3. SELECTION OF CUTOFF WALL DEPTH (D) IS BASED UPON LANDSIDE HEIGHT (H) OF LEVEE AND IS DETERMINED AS FOLLOWS:

   NO GEOTECHNICAL DATA AVAILABLE:
   SELECT H = LEVEE HEIGHT MEASURED FROM LANDSIDE TOE.
   DEPTH OF WALL MEASURED FROM FOUNDATION LEVEL IS 20' MINIMUM OR 3*H, WHICHEVER IS LARGER.
   ROUND RESULT TO THE NEAREST HIGHER FOOT AND ADD H/2 TO EXTEND TO DEGRADE LEVEL AND GET TOTAL WALL DEPTH FOR ESTIMATING.

   GEOTECHNICAL DATA AVAILABLE:
   SELECT H = LEVEE HEIGHT MEASURED FROM LANDSIDE TOE.
   IF AQUACLUDE >70' AND H<=23' THEN STOP WALL AT 70'
   ASSUME 70' IS MEASURED FROM DEGRADE LEVEL.
   (THIS ASSUMES GOING TO MAXIMUM WALL DEPTH FOR CONVENTIONAL WALL CONSTRUCTION)
   IF AQUACLUDE >70' AND H>23' THEN GO TO AQUACLUDE + 6' TOE–IN
   ADD H/2 TO EXTEND TO DEGRADE LEVEL AND GET TOTAL DSM WALL DEPTH FOR ESTIMATING.

4. SELECTION OF SEEPAGE BERM WIDTH (Wb) IS ALSO BASED UPON LANDSIDE HEIGHT OF LEVEE (H) AND IS DETERMINED AS FOLLOWS:

LEVEE LANDSIDE HEIGHT (FEET)	Wb (FEET)
LESS THAN 10'	4*H
10' TO 20'	5*H
GREATER THAN 20'	6*H

FIGURE 2

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fax: (916) 679-2900

REVISIONS

NO.	DESCRIPTION	DATE	BY

NOT FOR CONSTRUCTION

DRAWN BY:
DESIGNED BY:
REVIEWED BY:
APPROVED BY:
SCALE:
HORIZONTAL:
VERTICAL:

SUBMITTED:
SUBMITTAL APPROVED:

IF THIS BAR DOES NOT MEASURE 1" THEN ADJUST SCALE ACCORDINGLY

ULE FCSSR–COST ESTIMATING

FIGURE 2
TYPICAL REMEDIATION DETAILS

PROJECT NO.

SHEET NO.

SHEET SEQUENCE
of

PLOT BY: JOSEPH_BARNES – Jul 11, 2011 – 3:41:20pm
XREFS: R:\CADD_Reference\Standards\Borders\VR-BDR.dwg
DRAWING: G:\DWR-7418\WorkZone\ULE Cost Estimates\Draft Memorandum\Figures\Figure 2 Berm Details.dwg

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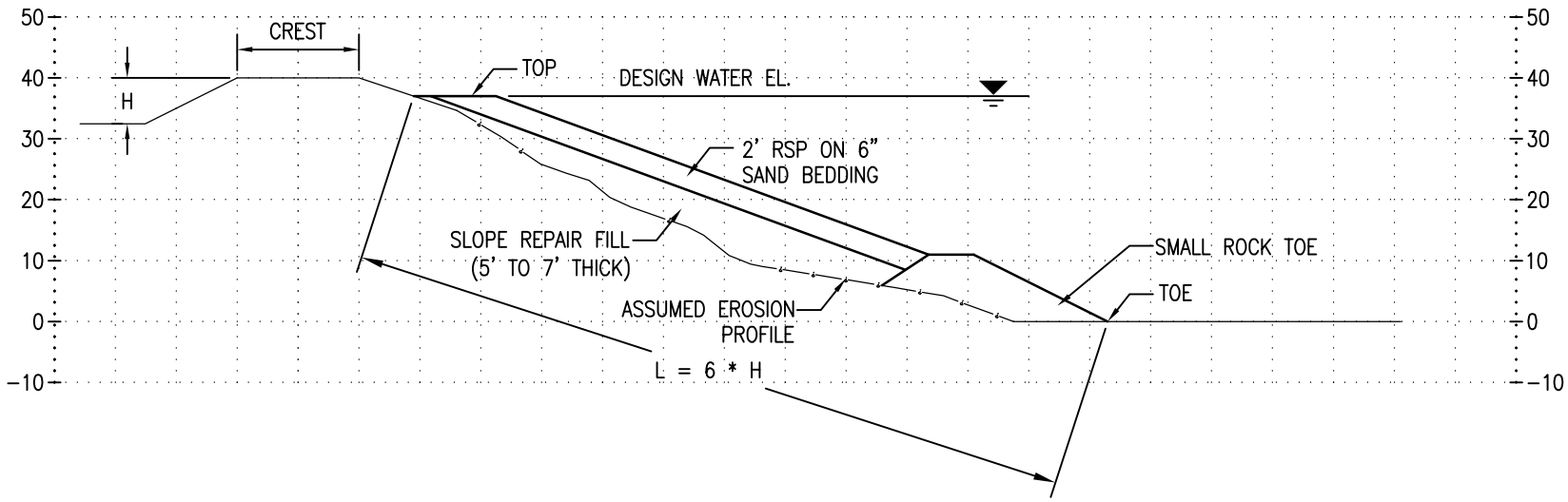
ULE FCSSR-COST ESTIMATING

FIGURE 3
ROCK SLOPE PROTECTION



NOTES:

1. ASSUME THAT 4" OF AB IS ADDED TO THE CREST ROAD IN ALL LEVEE SEGMENTS OVER THE LENGTH WHERE REMEDIATIONS ARE INSTALLED TO ACCOUNT FOR DETERIORATION FROM CONSTRUCTION TRAFFIC.

FIGURE 3

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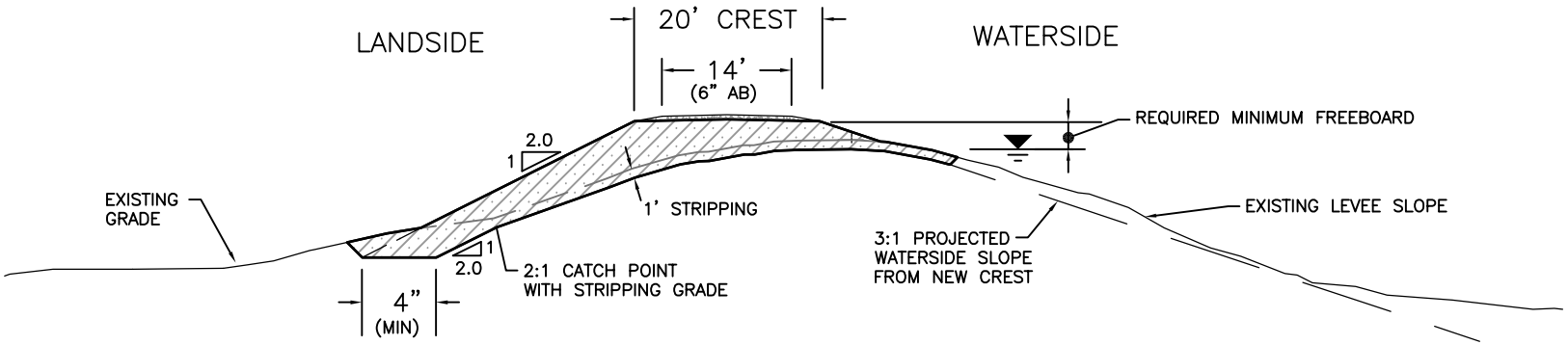

TYPICAL FREEBOARD AND GEOMETRY REPAIR FOR 20' CREST

NOTE: 12' CREST SIMILAR

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ULE FCSSR-COST ESTIMATING

FIGURE 4
FREEBOARD AND GEOMETRY REPAIR

FIGURE 4

DWR Non Urban Levee Evaluations (NULE) Program
Selection of Remediation Alternatives for NULE RACER

Segment Identification and Location

Segment ID:
Reach No.:
Total Length: (feet)
Name:
Agency: RD
Unit: Unit
Levee Mile: LM to LM
NULE Stationing: Right Bank Sta to Sta

LAT Data Summary from Draft GAR, Dated June 2010

Potential Failure Mode	Categorization	Deficiency Extent (% of Total Length)	Comments
Underseepage			
Stability			
Through Seepage			
Erosion			

Evaluated By:
Area Lead:
Date:
Prepared By:
Date:

Select Alternative Parameters for Estimating - Seepage and Stability

Deficiency	Located Between		Length	Existing ROW	Remediation Alternatives Selected													ROW Land Use (%)				Comments
					Drained Stability	Berm	Seepage Berm		Combination Berm			Slurry Wall (Pick Only One)										
												See Note 1	Crest Width	Conventional Backhoe		DSM Wall						
	From	To	(Feet)	Width	"H"	"H1"	"H"	"W_b"	"H"	"H1"	"W_b"	"%"	"W"	"H"	"D"	"H"	"D"	"Orch"	"Agr"	"Res"	"Com"	

Note 1: Provide the estimated % of levee degrade material that could be reused for levee reconstruction for either the conventional backhoe option or the DSM wall option.

Select Alternative Parameters for Estimating - Rock Slope Protection and Geometry Repairs

Deficiency	Located Between		Length	Existing ROW	Rock Slope Protection		Geometry Repair		Replacement Levee		ROW Land Use (%)				Comments
	From	To	(Feet)	Width	Slope Length		"H"	"h1"	"Crest"	"H"	"Orch"	"Agr"	"Res"	"Com"	

FIGURE 8

ATTACHMENT 1

LIST OF KEY ESTIMATING ASSUMPTIONS

	Assumptions and Discussion
1	Remediation estimates will be prepared for levee reaches with composite classifications of “MG,” “DNM,” or “L.” Estimates also should include levee reaches with an “L” classification that could become an “M” classification based upon additional information obtained in the future.
2	Because of the limited information available to evaluate levees for FCSSR, the cost estimate will be an order-of-magnitude cost estimate comparable to a Class 4 estimate as defined by the American Association for the Advancement of Cost Estimating, which can vary in accuracy from -30% on the low side to from +20% to +50-percent on the high side.
3	Cost estimates for remediation alternatives will include: • Direct construction costs • Contingencies (30% of construction cost) • Design, Engineering costs (15% of construction cost) • CM (15% of construction cost) • Permitting/Legal (5% of construction cost) (See Items 16 and 17 also) • Environmental mitigation (25% or 35% of construction cost) (see Item 23 also) • Escalation (3% per year)
4	The cost estimating tool is currently limited to eight remediation types: drained stability berm; seepage berm; combination seepage-stability berm; conventional slurry wall to maximum depth of 70 feet below working surface; deep soil mixing (DSM) wall for wall more than 70 feet deep measured below the working surface; erosion repair; levee replacement in place; and freeboard/geometry.
5	The only remediation being considered for waterside erosion is the placement of rock slope protection in deficient reaches. The length of slope repair on slope will be six times the landside levee height. The following costs per foot have been prepared for four levee heights: Levee Height Slope Length $ Per Foot 5 feet 30 feet $523 10 feet 60 feet $1,070 15 feet 90 feet $1,642 20 feet 120 feet $2,240 The estimating tool will interpolate the cost per foot from the above values based on the actual levee height where remediation is required.
6	For any remediation requiring additional land acquisition, existing right-of-way (ROW) can be estimated from existing readily available data (assessor’s maps, owner contact, fence lines on aerials, etc.). However, for this estimate, existing ROW width will be assumed to be zero.
7	For any berm-type remediation requiring land acquisition, 20 feet of addition permanent ROW will be acquired along the landside toe of the remediation to satisfy planned Central Valley Flood Protection Board (CVFPB) easement requirements (see Figure 1).
8	For any berm remediation requiring additional land acquisition, 5 feet of additional temporary easement will be obtained such that the 5-foot temporary easement plus the adjacent 20-foot permanent easement for CVFPB will provide a construction easement of 25 feet along the landside toe of the remediation (see Figure 1).
9	For slurry wall or DSM remediations, the 20-foot CVFPB permanent easement (less any existing easement) and 5-foot temporary easement will also be obtained along the landside toe of the levee (see Figure 1).

	Assumptions and Discussion
10	Costs for four land use categories are covered in the estimating tool: orchard, agricultural, industrial, and residential. Where remediations are required and land acquisition is needed, the percentage of each use category will be estimated from aerial photographs or other readily available information and a composite cost for temporary/permanent land acquisition based on the percentages will be used. The basic land costs currently being used in the cost estimating tool are: Agricultural $10,000 per acre Orchard $30,000 per acre Commercial $150,000 per acre Residential $300,000 per acre **(subsequently changed to $1,000,000 per acre.**
11	The temporary/permanent property acquisition costs described above address the cost of procuring the land. In addition, a 5% allowance for legal costs for land acquisition will also be included. The percentage will be multiplied by the total direct construction cost to obtain the legal cost percentage. Legal costs could be more expensive than the land acquisition cost depending upon the amount of land acquired.
12	Remediation of levee geometry deficiencies is based upon the levee configuration described in the 1953 Memorandum of Understanding between the USACE (USA) and State of California. In summary these configurations are: 3:1 waterside slopes for all levees, 20-foot- or 12-foot-wide crest depending upon location, 2.5:1 landside slopes for bypass levees, and 2:1 landside slopes for other levees.
13	Selection of remediation alternatives and extent of remediation required will be based upon information in the P1GER and GER wherever possible. Simplifying assumptions should be made where information is not available (see seepage berm and slurry wall items below as an example). Where specific lengths for required remediation alternatives cannot be readily determined, the percentage of total reach length requiring remediation as noted in the FCSSR will be used.
14	The estimate assumes the use of hydroseeding to revegetate new slopes or restore other areas disturbed during construction. The cost for plantings, irrigation systems, fencing, etc., installed as part of the emergency levee repair program will not be reflected in the ULE estimating tool.
15	For estimating purposes, all slurry walls and DSM walls are assumed to be 36 inches wide regardless of depth.
16	Levee degrade for slurry wall and DSM wall construction is assumed to be 50% of the height of the levee measured on the landside, and the 50% degrade is assumed to provide suitable working width for equipment. For low height levees (generally 5 feet high or less) that require a cutoff wall, the levee section would be removed to existing grade measured on the landside.
17	Imported or on-site material used to reconstruct levees within the levee prism or to construct drained stability berms is assumed to meet current USACE criteria for select levee fill. Material used to construct seepage berms (other than drain layers) can be any suitable material.

	Assumptions and Discussion
18	There may be areas where the length of seepage berm or depth of slurry wall cannot be determined based upon available information. In this case, an approximation method is used to select wall depths and seepage berm widths that would provide comparable levels of protection. Selections of wall depth and berm width are based upon landside height of levee and are as follows: <u>No Geotechnical Data Available:</u> Select H = Levee height measured from landside toe Depth of wall measured from foundation level is 20 feet minimum or 3*H, whichever is larger. Round result to the nearest higher foot and add H/2 to extend to degrade level and get total wall depth for estimating. <u>Geotechnical Data Available:</u> Select H = Levee height measured from landside toe If aquaclude >70 feet and H<= 23 feet then stop wall at 70 feet Assume 70 feet is measured from degrade level. (This assumes going to the maximum wall depth for conventional wall construction) If aquaclude >70 feet and H>23 feet then go to aquaclude + 6 feet toe-in Add H/2 to extend to degrade level and get total DSM wall depth for estimating
19	The cost estimate will not include any allowance for ongoing operation and maintenance costs of facilities after remediations are constructed.
20	The cost to make animal burrow repairs will not be included in the cost estimate.
21	For estimating purposes, all levee sections degraded to construct slurry walls will include a new crest road with 6 inches of aggregate base (AB). AB section will be placed above the levee crest elevation required for freeboard. Where paved public roads are known to exist on the crest of a levee, an allowance will be included for repaving.
22	For estimating purposes, levee sections where landside berms are constructed or erosion protection is placed will have up to 4 inches of AB added to the crest to supplement existing surfacing to address possible deterioration of the existing crest road due to construction activities.
23	A low environmental mitigation cost factor and a high environmental mitigation cost factor will be used. The low factor will be 25 percent and the high factor will be 35 percent. These factors will be multiplied by the direct construction cost for a remediation to estimate the environmental mitigation cost. All cost estimates will begin at 25 percent. A biologist will review available data for a levee region (such as state environmental databases, County General Plans, etc.) and determine those requiring the higher percentage based upon the possible presence of wetlands, wetland indicator species, or threatened or endangered species. Any main stem levee requiring waterside erosion remediation will also be assigned the higher environmental mitigation percentage. **(Subsequently determined that 35 percent environmental cost mitigation factor would be used for levee segments within the ULE Program Area.)**

ATTACHMENT 2

AUGER PILE MEMORANDUM

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Technical Memorandum

DRAFT

Prepared For:	Mike Inamine, Levee Evaluations PM Steve Mahnke, GE California Department of Water Resources
Project:	Urban Levee Conceptual Cost Evaluation Project Task Order U-10
Date:	April 5, 2011
Subject:	Evaluation of Cost for Proposed Alternative Remediation of Landside Slope Stability Deficiencies Using Drilled Piers as Shear Walls
Prepared By:	Joseph Barnes, PE
Reviewed By:	Richard Millet, GE

BACKGROUND

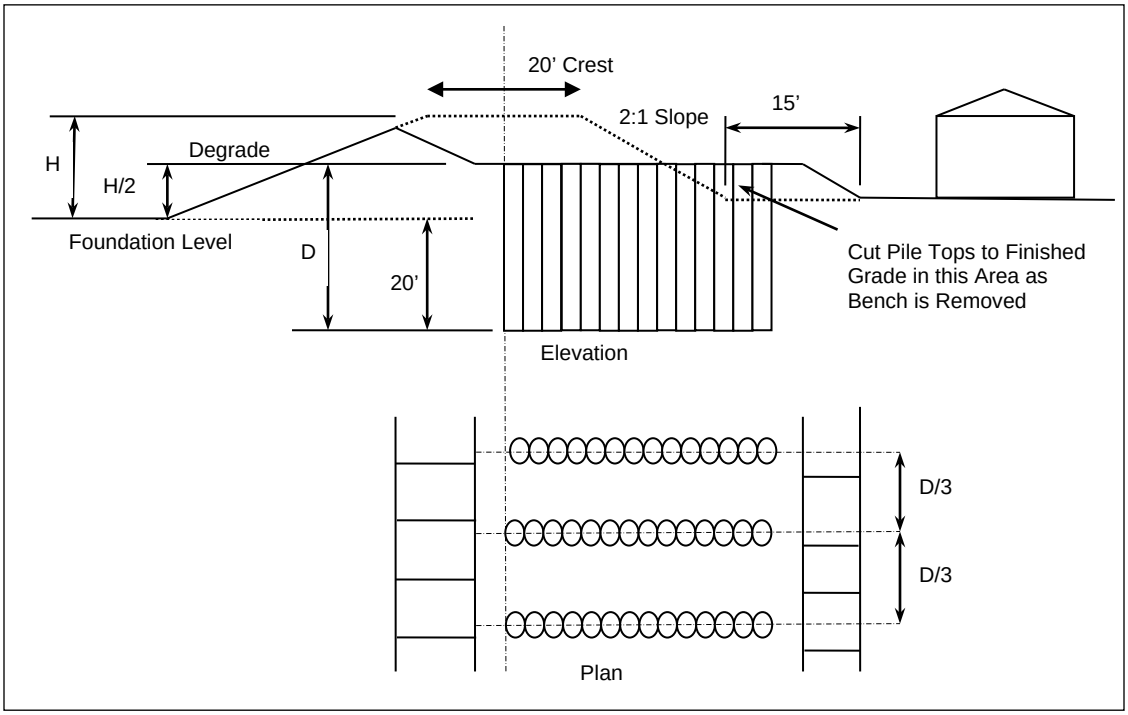
Some levee segments in the urban levee evaluation (ULE) program have landside stability deficiencies. Because of the proximity of residential development adjacent to the levee, the use of a landside stability berm is not practical due community disruption and the potential high cost of acquiring permanent landside easements for berm construction and maintenance. For this reason, an alternative stability remediation method is being proposed for use in these areas. The remediation utilizes auger-drilled, cast-in-place soil-cement piers to improve slope stability. The method and associated costs are described herein.

METHODS

The methods and installation costs described below were developed from information provided by Haywood-Baker, and the mix-in-place construction methods have been used previously on USACE projects in Louisiana.

Dry method: The dry method is intended for use in soils that have moisture contents generally greater than 40-percent (%) and 60%. A typical installation would be as shown in the Figure 1. The method involves auger drilling a series of soil-cement piers adjacent to each other in a line oriented perpendicular to the levee centerline to form a shear wall. The levee would be degraded approximately 50% of its height and the excavated material would be deposited in a bench on the landside to form the working platform for pier installation. The piers would be 0.8 meters (32-inches) in diameter. Parallel lines (secant) of auger holes would be spaced approximately D/3 along the centerline of the levee where D is approximately equal to [20’ + ½*H]. According to information provided by Haywood-Baker, budget pricing for the installed cost for each auger hole is approximately $10 per foot measured vertically. The installation method does not produce a significant quantity of waste material. Cement is added to produce a mix with strength between 100 psi and 200 psi. The tops of piers in the bench area would be cut to finished grade as the bench is removed to reconstruct the levee.

Figure 1



Wet method: The wet method is intended for use in all soil types. Typically, in very soft soil conditions, large diameter augers up to 8-foot diameter are used and they are placed side by side laterally and longitudinally along the levee. However, for the ULE FCSSR process, this severe installation condition is not expected. Thus, to support the cost analysis for pier installation in wet soils, it is assumed that the pier configuration would be the same at that proposed for pier installation in dry soils as shown on Figure 1. According to information provided by Haywood-Baker, budget pricing for the installed cost for each auger hole is approximately $70 per cubic yard of soil treated.

ESTIMATED UNIT COSTS FOR PIER INSTALLATION

Dry Method: Using the arrangements shown on Figure 1 and the unit cost of $10 per foot of depth drilled per pier, the estimated cost per lineal foot of levee to install the pier walls is shown in Table 1.

Table 1 – Dry Method Piers

Levee Height (Feet)	D (Feet)	Total Cost Per Shear Wall Line ($)	Equivalent Cost Per Lineal Foot of Levee for D/3 Wall Line Spacing ($)
10	25	3,750	450
15	27.5	4,950	540
20	30	6,600	660
25	32.5	8,450	780
30	35	10,500	900

Wet Method: Using the arrangements shown on Figure 1, assuming an equivalent wall thickness of 36 inches from the augering, and the unit cost of $70 per cubic yard of mixed-in-place pier, the estimated cost per lineal foot of levee to install the pier walls is shown in Table 2.

Table 2 – Wet Method Piers

Levee Height (Feet)	D (Feet)	Total Cost Per Shear Wall Line ($)	Equivalent Cost Per Foot of Levee for D/3 Wall Line Spacing ($)
10	25	7,390	890
15	27.5	10,270	1,120
20	30	13,530	1,350
25	32.5	17,190	1,590
30	35	21,230	1,820

The costs provided in Table 1 and Table 2 are for pier wall installation only. These costs per foot would be added to the cost per foot for the earthwork and other civil costs to degrade and rebuild the levee to arrive at the total cost to remediate using the pier wall method.

ATTACHMENT 3

ESTIMATE BACKUP

TABLE 9-A
OVERALL COST SUMMARY GROUPED BY FCSSR CATEGORY AND REMEDIATION
200-YEAR DESIGN WATER SURFACE

Overall Summary

Overall Reach Categorization	Total Reach Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	1,037,580	713,190	$2,508,650,000	11,700	$23,699,000	415,460	$341,415,000	13,410	$23,208,000
L	25,110	14,710	$44,199,000	0	$0	6,900	$2,774,000	650	$1,056,000
MG	139,360	128,600	$69,372,000	0	$0	0	$0	1,250	$2,757,000
Grand Total:	1,202,050	856,490	$2,622,221,000	11,700	$23,699,000	422,360	$344,189,000	15,310	$27,020,000

Notes:

1. Structural Remediations include through seepage, underseepage, and stability remediations.
2. Estimates are 2011 order of magnitude estimates to remediate levee reach deficiencies specified in the FCSSR.
3. Estimates include all direct, indirect, land acquisition, owner, and environmental mitigation costs; contingency; and escalation.

September 2, 2011

TABLE 9-B
REMEDIATION COSTS GROUPED BY ULE STUDY AREA AND FCSSR CATEGORY
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	58,840	0	$0	0	$0	12,470	$27,710,000	9,910	$16,153,000
Subtotal	58,840	0	$0	0	$0	12,470	$27,710,000	9,910	$16,153,000

ULE Study Area: Davis

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	71,500	58,760	$148,635,000	0	$0	67,040	$46,344,000	0	$0
Subtotal	71,500	58,760	$148,635,000	0	$0	67,040	$46,344,000	0	$0

ULE Study Area: Marysville

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	39,220	39,220	$188,051,000	0	$0	4,610	$1,539,000	0	$0
Subtotal	39,220	39,220	$188,051,000	0	$0	4,610	$1,539,000	0	$0

Notes:

1. Structural Remediations include through seepage, underseepage, and stability remediations.
2. Estimates are 2011 order of magnitude estimates to remediate levee reach deficiencies specified in the FCSSR.
3. Estimates include all direct, indirect, land acquisition, owner, and environmental mitigation costs; contingency; and escalation.

September 2, 2011

TABLE 9-B
REMEDIATION COSTS GROUPED BY ULE STUDY AREA AND FCSSR CATEGORY
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Natomas NWS

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	38,690	37,690	$118,367,000	0	$0	0	$0	1,000	$1,541,000
L	1,350	1,050	$2,660,000	0	$0	0	$0	300	$447,000
Subtotal	40,040	38,740	$121,027,000	0	$0	0	$0	1,300	$1,987,000

ULE Study Area: NEMDC East

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	45,840	35,650	$139,838,000	0	$0	0	$0	0	$0
MG	8,560	2,100	$3,157,000	0	$0	0	$0	0	$0
Subtotal	54,400	37,750	$142,994,000	0	$0	0	$0	0	$0

ULE Study Area: NEMDC West

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	60,880	58,370	$125,506,000	0	$0	39,670	$17,665,000	0	$0
MG	4,000	4,000	$8,343,000	0	$0	0	$0	0	$0
Subtotal	64,880	62,370	$133,849,000	0	$0	39,670	$17,665,000	0	$0

Notes:

1. Structural Remediations include through seepage, underseepage, and stability remediations.
2. Estimates are 2011 order of magnitude estimates to remediate levee reach deficiencies specified in the FCSSR.
3. Estimates include all direct, indirect, land acquisition, owner, and environmental mitigation costs; contingency; and escalation.

September 2, 2011

TABLE 9-B
REMEDIATION COSTS GROUPED BY ULE STUDY AREA AND FCSSR CATEGORY
200-YEAR DESIGN WATER SURFACE

ULE Study Area: RD 17

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	60,000	54,100	$166,191,000	0	$0	9,600	$9,199,000	0	$0
MG	116,900	115,100	$29,978,000	0	$0	0	$0	0	$0
Subtotal	176,900	169,200	$196,168,000	0	$0	9,600	$9,199,000	0	$0

ULE Study Area: RD 404

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	15,100	15,100	$30,149,000	0	$0	15,100	$7,227,000	0	$0
Subtotal	15,100	15,100	$30,149,000	0	$0	15,100	$7,227,000	0	$0

ULE Study Area: RD 784

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	20,110	20,110	$53,861,000	0	$0	11,110	$6,569,000	0	$0
L	1,980	1,980	$2,524,000	0	$0	1,700	$873,000	0	$0
Subtotal	22,090	22,090	$56,385,000	0	$0	12,810	$7,442,000	0	$0

Notes:

1. Structural Remediations include through seepage, underseepage, and stability remediations.
2. Estimates are 2011 order of magnitude estimates to remediate levee reach deficiencies specified in the FCSSR.
3. Estimates include all direct, indirect, land acquisition, owner, and environmental mitigation costs; contingency; and escalation.

September 2, 2011

TABLE 9-B
REMEDIATION COSTS GROUPED BY ULE STUDY AREA AND FCSSR CATEGORY
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sacramento River

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	62,800	26,100	$257,202,000	0	$0	42,800	$56,226,000	2,500	$5,514,000
MG	2,500	0	$0	0	$0	0	$0	1,250	$2,757,000
Subtotal	65,300	26,100	$257,202,000	0	$0	42,800	$56,226,000	3,750	$8,271,000

ULE Study Area: SJAFCA Bear Creek

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	142,170	12,360	$18,569,000	0	$0	84,750	$76,912,000	0	$0
Subtotal	142,170	12,360	$18,569,000	0	$0	84,750	$76,912,000	0	$0

ULE Study Area: SJAFCA Calaveras River

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	41,710	17,200	$53,131,000	0	$0	14,740	$19,304,000	0	$0
L	1,000	1,000	$3,909,000	0	$0	0	$0	0	$0
Subtotal	42,710	18,200	$57,041,000	0	$0	14,740	$19,304,000	0	$0

Notes:

1. Structural Remediations include through seepage, underseepage, and stability remediations.
2. Estimates are 2011 order of magnitude estimates to remediate levee reach deficiencies specified in the FCSSR.
3. Estimates include all direct, indirect, land acquisition, owner, and environmental mitigation costs; contingency; and escalation.

September 2, 2011

TABLE 9-B
REMEDIATION COSTS GROUPED BY ULE STUDY AREA AND FCSSR CATEGORY
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	221,220	209,820	$722,784,000	0	$0	48,810	$31,729,000	0	$0
L	15,590	5,480	$29,226,000	0	$0	0	$0	350	$609,000
Subtotal	236,800	215,300	$752,010,000	0	$0	48,810	$31,729,000	350	$609,000

ULE Study Area: West Sacramento

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	89,300	72,900	$400,479,000	1,700	$2,419,000	8,820	$7,033,000	0	$0
Subtotal	89,300	72,900	$400,479,000	1,700	$2,419,000	8,820	$7,033,000	0	$0

ULE Study Area: Woodland

Overall Reach Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations		Pier Wall or Jet Grout	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
DNM	70,200	55,800	$85,887,000	10,000	$21,280,000	55,950	$33,958,000	0	$0
L	5,200	5,200	$5,879,000	0	$0	5,200	$1,901,000	0	$0
MG	7,400	7,400	$27,895,000	0	$0	0	$0	0	$0
Subtotal	82,800	68,400	$119,660,000	10,000	$21,280,000	61,150	$35,859,000	0	$0

Notes:

1. Structural Remediations include through seepage, underseepage, and stability remediations.
2. Estimates are 2011 order of magnitude estimates to remediate levee reach deficiencies specified in the FCSSR.
3. Estimates include all direct, indirect, land acquisition, owner, and environmental mitigation costs; contingency; and escalation.

September 2, 2011

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-AC

Total Reach Length (Feet): 474

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	100	$276,360
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$276,360**
Total Remediation Cost for Estimate a			**$276,360**

Total Remediation Cost Estimated for Reach American River-AC **$276,360**

American River-B

Total Reach Length (Feet): 518

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	100	$794,267
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$794,267**
Total Remediation Cost for Estimate a			**$794,267**

Total Remediation Cost Estimated for Reach American River-B **$794,267**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-BA

Total Reach Length (Feet): 6,049

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	3.301	$177,807
Pier Wall Cost:	Length (%):	100	$11,340,377
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$11,518,184**
Total Remediation Cost for Estimate a			**$11,518,184**

Total Remediation Cost Estimated for Reach American River-BA **$11,518,184**

American River-BD

Total Reach Length (Feet): 199

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	100	$245,433
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$245,433**
Total Remediation Cost for Estimate a			**$245,433**

Total Remediation Cost Estimated for Reach American River-BD **$245,433**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-BF

Total Reach Length (Feet): 259

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	100	$381,306
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$381,306**
Total Remediation Cost for Estimate a			**$381,306**

Total Remediation Cost Estimated for Reach American River-BF **$381,306**

American River-BH

Total Reach Length (Feet): 7,098

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	17.963	$1,135,361
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,135,361**
Total Remediation Cost for Estimate a			**$1,135,361**

Total Remediation Cost Estimated for Reach American River-BH **$1,135,361**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-BI

Total Reach Length (Feet): 438

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	100	$390,026
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$390,026**
Total Remediation Cost for Estimate a			**$390,026**

Total Remediation Cost Estimated for Reach American River-BI **$390,026**

American River-BJ

Total Reach Length (Feet): 1,692

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	71.217	$1,073,008
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,073,008**
Total Remediation Cost for Estimate a			**$1,073,008**

Total Remediation Cost Estimated for Reach American River-BJ **$1,073,008**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-BK

Total Reach Length (Feet): 97

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	100	$133,106
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$133,106**
Total Remediation Cost for Estimate a			**$133,106**

Total Remediation Cost Estimated for Reach American River-BK **$133,106**

American River-BL

Total Reach Length (Feet): 627

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	100	$876,636
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$876,636**
Total Remediation Cost for Estimate a			**$876,636**

Total Remediation Cost Estimated for Reach American River-BL **$876,636**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-BM

Total Reach Length (Feet): 651

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	100	$882,467
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$882,467**
Total Remediation Cost for Estimate a			**$882,467**

Total Remediation Cost Estimated for Reach American River-BM **$882,467**

American River-BN

Total Reach Length (Feet): 2,821

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$2,512,015
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,512,015**
Total Remediation Cost for Estimate a			**$2,512,015**

Total Remediation Cost Estimated for Reach American River-BN **$2,512,015**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-BO

Total Reach Length (Feet): 141

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	100	$187,217
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$187,217**
Total Remediation Cost for Estimate a			**$187,217**

Total Remediation Cost Estimated for Reach American River-BO **$187,217**

American River-BP

Total Reach Length (Feet): 2,273

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	100	$3,947,275
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$3,947,275**
Total Remediation Cost for Estimate a			**$3,947,275**

Total Remediation Cost Estimated for Reach American River-BP **$3,947,275**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-BQ

Total Reach Length (Feet): 92

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	100	$81,923
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$81,923**
Total Remediation Cost for Estimate a			**$81,923**

Total Remediation Cost Estimated for Reach American River-BQ **$81,923**

American River-BR

Total Reach Length (Feet): 2,921

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	100	$7,544,113
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$7,544,113**
Total Remediation Cost for Estimate a			**$7,544,113**

Total Remediation Cost Estimated for Reach American River-BR **$7,544,113**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-BS

Total Reach Length (Feet): 156

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: Sn

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 100	$90,133
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$90,133**
Total Remediation Cost for Estimate a		**$90,133**

Total Remediation Cost Estimated for Reach American River-BS **$90,133**

American River-BT

Total Reach Length (Feet): 7,902

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 34.371	$7,014,647
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$7,014,647**
Total Remediation Cost for Estimate a		**$7,014,647**

Total Remediation Cost Estimated for Reach American River-BT **$7,014,647**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-BU

Total Reach Length (Feet): 171

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	100	$234,650
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$234,650**
Total Remediation Cost for Estimate a			**$234,650**

Total Remediation Cost Estimated for Reach American River-BU **$234,650**

American River-C

Total Reach Length (Feet): 8,406

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	2.625	$2,042,288
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,042,288**
Total Remediation Cost for Estimate a			**$2,042,288**

Total Remediation Cost Estimated for Reach American River-C **$2,042,288**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-G

Total Reach Length (Feet): 7,619

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	2.625	$189,774
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$189,774**
Total Remediation Cost for Estimate a			**$189,774**

Total Remediation Cost Estimated for Reach American River-G **$189,774**

American River-L

Total Reach Length (Feet): 243

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	100	$380,700
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$380,700**
Total Remediation Cost for Estimate a			**$380,700**

Total Remediation Cost Estimated for Reach American River-L **$380,700**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-N

Total Reach Length (Feet): 29

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost:	Category	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Pier Wall Cost:		Length (%): 0	$0
Jet Grout Cost:		Length (%): 100	$43,178
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$43,178**
Total Remediation Cost for Estimate a			**$43,178**

Total Remediation Cost Estimated for Reach American River-N **$43,178**

American River-R

Total Reach Length (Feet): 153

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost:	Category	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Pier Wall Cost:		Length (%): 0	$0
Jet Grout Cost:		Length (%): 100	$222,700
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$222,700**
Total Remediation Cost for Estimate a			**$222,700**

Total Remediation Cost Estimated for Reach American River-R **$222,700**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-V

Total Reach Length (Feet): 364

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	100	$448,933
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$448,933**
Total Remediation Cost for Estimate a			**$448,933**

Total Remediation Cost Estimated for Reach American River-V **$448,933**

American River-W

Total Reach Length (Feet): 218

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	100	$268,867
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$268,867**
Total Remediation Cost for Estimate a			**$268,867**

Total Remediation Cost Estimated for Reach American River-W **$268,867**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-X

Total Reach Length (Feet): 1,998

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	5.005	$241,551
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$241,551**
Total Remediation Cost for Estimate a			**$241,551**

Total Remediation Cost Estimated for Reach American River-X **$241,551**

American River-Y

Total Reach Length (Feet): 189

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	100	$223,650
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$223,650**
Total Remediation Cost for Estimate a			**$223,650**

Total Remediation Cost Estimated for Reach American River-Y **$223,650**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: American River

American River-Z

Total Reach Length (Feet): 5,046

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	3.964	$483,159
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$483,159**
Total Remediation Cost for Estimate a			**$483,159**

Total Remediation Cost Estimated for Reach American River-Z **$483,159**

Davis-C

Total Reach Length (Feet): 4,800

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	29.833	$636,581
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$636,581**
Total Remediation Cost for Estimate a			**$636,581**

Total Remediation Cost Estimated for Reach Davis-C **$636,581**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Davis

Davis-D — **Total Reach Length (Feet): 6,850**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 9.635

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$1,050,213
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$2,056,875
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,050,213**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	9.635	$244,735
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$244,735**
Total Remediation Cost for Estimate a			**$1,294,948**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 25.547

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$2,998,286
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$5,548,201
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,998,286**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	25.547	$861,323
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$861,323**
Total Remediation Cost for Estimate b			**$3,859,608**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 43.796

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$5,704,983
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$9,741,617
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,704,983**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	43.796	$2,083,502
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,083,502**
Total Remediation Cost for Estimate c			**$7,788,485**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Davis

Overall Reach Categorization: DNM

Estimate Run: d

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 20.438

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$2,934,966
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$4,655,276
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,934,966**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	20.438	$670,370
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$670,370**
Total Remediation Cost for Estimate d			**$3,605,336**

Total Remediation Cost Estimated for Reach Davis-D **$16,548,378**

Davis-E

Total Reach Length (Feet): 6,850

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	60.584	$2,514,992
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,514,992**
Total Remediation Cost for Estimate a			**$2,514,992**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	39.416	$1,510,514
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,510,514**
Total Remediation Cost for Estimate b			**$1,510,514**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Davis

Total Remediation Cost Estimated for Reach Davis-E **$4,025,506**

Davis-F

Total Reach Length (Feet): 9,500

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 62.105

Alternative Remediation Costs	
Drained Stability Berm Cost:	$6,923,581
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,923,581**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 62.105	$3,487,493
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,487,493**
Total Remediation Cost for Estimate a		**$10,411,075**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 21.579

Alternative Remediation Costs	
Drained Stability Berm Cost:	$2,193,216
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,193,216**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 21.579	$1,625,736
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,625,736**
Total Remediation Cost for Estimate b		**$3,818,952**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 16.316

Alternative Remediation Costs	
Drained Stability Berm Cost:	$1,484,559
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,484,559**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 16.316	$798,470
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$798,470**
Total Remediation Cost for Estimate c		**$2,283,029**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Davis

Total Remediation Cost Estimated for Reach Davis-F **$16,513,056**

Davis-G

Total Reach Length (Feet): 5,650

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+FG

Remediated Length (%): 28.319

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$4,751,170
Combo Berm Cost:	$0
Slurry Wall Cost:	$5,872,375
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,751,170**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 28.319	$1,315,198
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,315,198**
Total Remediation Cost for Estimate a		**$6,066,368**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: U+FG

Remediated Length (%): 47.788

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$7,749,826
Combo Berm Cost:	$0
Slurry Wall Cost:	$9,909,567
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,749,826**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 47.788	$1,875,151
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,875,151**
Total Remediation Cost for Estimate b		**$9,624,977**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: U+FG

Remediated Length (%): 23.894

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$4,506,614
Combo Berm Cost:	$0
Slurry Wall Cost:	$5,050,766
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,506,614**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 23.894	$1,131,192
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,131,192**
Total Remediation Cost for Estimate c		**$5,637,806**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Davis

Total Remediation Cost Estimated for Reach Davis-G **$21,329,151**

Davis-G1

Total Reach Length (Feet): 300

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$483,022
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$1,128,048
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$483,022**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$272,204
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$272,204**
Total Remediation Cost for Estimate a		**$755,226**

Total Remediation Cost Estimated for Reach Davis-G1 **$755,226**

Davis-G2

Total Reach Length (Feet): 850

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,196,137
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,196,137**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 29.41	$241,708
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$241,708**
Total Remediation Cost for Estimate a		**$3,437,845**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Davis

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	70.59	$544,422
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$544,422**
Total Remediation Cost for Estimate b			**$544,422**

Total Remediation Cost Estimated for Reach Davis-G2 **$3,982,266**

Davis-G3

Total Reach Length (Feet): 900

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 13.889

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$470,024
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$470,024**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	13.889	$90,517
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$90,517**
Total Remediation Cost for Estimate a			**$560,541**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 86.111

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,914,121
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,914,121**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	86.111	$749,339
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$749,339**
Total Remediation Cost for Estimate b			**$3,663,459**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ULE Study Area: Davis

Total Remediation Cost Estimated for Reach Davis-G3 **$4,224,000**

Davis-H

Total Reach Length (Feet): 11,850

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$39,925,317
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$59,999,737
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$39,925,317**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$10,400,902
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$10,400,902**
Total Remediation Cost for Estimate a		**$50,326,219**

Total Remediation Cost Estimated for Reach Davis-H **$50,326,219**

Davis-I

Total Reach Length (Feet): 4,450

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 10.112

Alternative Remediation Costs	
Drained Stability Berm Cost:	$618,178
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$618,178**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 10.112	$352,562
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$352,562**
Total Remediation Cost for Estimate a		**$970,740**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Davis

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 89.888

Alternative Remediation Costs

Drained Stability Berm Cost:	$6,304,498
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,304,498**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	89.888	$3,797,858
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$3,797,858**
Total Remediation Cost for Estimate b			**$10,102,356**

Total Remediation Cost Estimated for Reach Davis-I **$11,073,096**

Davis-J

Total Reach Length (Feet): 14,500

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+FG

Remediated Length (%): 20.517

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$7,769,930
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$12,139,456
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,769,930**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	20.517	$1,860,572
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,860,572**
Total Remediation Cost for Estimate a			**$9,630,502**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Sn+FG

Remediated Length (%): 16.379

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$5,978,902
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$9,633,640
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,978,902**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	16.379	$1,168,936
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,168,936**
Total Remediation Cost for Estimate b			**$7,147,838**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Davis

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: T+U+Sn+FG

Remediated Length (%): 34.828

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$18,679,453
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$22,173,380
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$18,679,453**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	34.828	$3,615,196
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$3,615,196**
Total Remediation Cost for Estimate c			**$22,294,649**

Overall Reach Categorization: DNM

Estimate Run: d

Deficiencies Being Remediated: T+U+Sn+FG

Remediated Length (%): 21.034

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$9,979,643
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$12,906,649
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$9,979,643**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	21.034	$2,676,964
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,676,964**
Total Remediation Cost for Estimate d			**$12,656,607**

Total Remediation Cost Estimated for Reach Davis-J **$51,729,596**

Davis-K

Total Reach Length (Feet): 5,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 20

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$1,965,447
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$3,801,925
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,965,447**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	20	$381,581
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$381,581**
Total Remediation Cost for Estimate a			**$2,347,028**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Davis

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 80

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$10,053,349
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$16,528,773
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,053,349**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	80	$1,435,527
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,435,527**
Total Remediation Cost for Estimate b			**$11,488,875**

Total Remediation Cost Estimated for Reach Davis-K **$13,835,903**

Marysville-A

Total Reach Length (Feet): 4,229

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$8,521,620
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,521,620**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$8,521,620**

Total Remediation Cost Estimated for Reach Marysville-A **$8,521,620**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Marysville

Marysville-B — **Total Reach Length (Feet): 4,017**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 68.982

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$25,861,077
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$25,861,077**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$25,861,077**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 31.018

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$11,388,318
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$11,388,318**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$11,388,318**

Total Remediation Cost Estimated for Reach Marysville-B **$37,249,395**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Marysville

Marysville-C1 — **Total Reach Length (Feet): 1,427**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$5,571,218
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,571,218**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$476,876
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$476,876**
Total Remediation Cost for Estimate a		**$6,048,093**

Total Remediation Cost Estimated for Reach Marysville-C1 **$6,048,093**

Marysville-C2 — **Total Reach Length (Feet): 2,318**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$7,514,126
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,514,126**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$7,514,126**

Total Remediation Cost Estimated for Reach Marysville-C2 **$7,514,126**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Marysville

Marysville-C3

Total Reach Length (Feet): 3,179

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$10,832,358
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,832,358**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$1,062,361
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,062,361**
Total Remediation Cost for Estimate a		**$11,894,719**

Total Remediation Cost Estimated for Reach Marysville-C3 **$11,894,719**

Marysville-D

Total Reach Length (Feet): 5,492

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 29.68

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$4,899,341
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,899,341**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$4,899,341**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Marysville

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 70.32

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$13,159,575
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,159,575**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$13,159,575**

Total Remediation Cost Estimated for Reach Marysville-D **$18,058,916**

Marysville-E

Total Reach Length (Feet): 3,270

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 83.731

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$11,114,964
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$11,114,964**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$11,114,964**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 16.269

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$4,126,237
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,126,237**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$4,126,237**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Marysville

Total Remediation Cost Estimated for Reach Marysville-E **$15,241,202**

Marysville-F

Total Reach Length (Feet): 2,974

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 57.767

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$19,196,311
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$19,196,311**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$19,196,311**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 18.494

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$5,452,827
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,452,827**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$5,452,827**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: T+U

Remediated Length (%): 23.739

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$6,973,515
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,973,515**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$6,973,515**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Marysville

Total Remediation Cost Estimated for Reach Marysville-F **$31,622,653**

Marysville-G

Total Reach Length (Feet): 2,500

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
T

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$5,558,634
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,558,634**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$5,558,634**

Total Remediation Cost Estimated for Reach Marysville-G **$5,558,634**

Marysville-H

Total Reach Length (Feet): 7,254

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
T

Remediated Length (%): 33

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$5,827,814
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,827,814**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$5,827,814**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Marysville

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated:
T

Remediated Length (%): 67

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$10,323,253
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,323,253**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$10,323,253**

Total Remediation Cost Estimated for Reach Marysville-H **$16,151,067**

Marysville-I

Total Reach Length (Feet): 2,557

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
T+U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$31,730,014
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$31,730,014**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$31,730,014**

Total Remediation Cost Estimated for Reach Marysville-I **$31,730,014**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Natomas NWS

Natomas NWS-NCC Gap 1

Total Reach Length (Feet): 300

Overall Reach Categorization: L

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 100	$446,667
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$446,667**
Total Remediation Cost for Estimate a		**$446,667**

Total Remediation Cost Estimated for Reach Natomas NWS-NCC Gap 1 **$446,667**

Natomas NWS-NCC Gap 2

Total Reach Length (Feet): 700

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 100	$1,088,889
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,088,889**
Total Remediation Cost for Estimate a		**$1,088,889**

Total Remediation Cost Estimated for Reach Natomas NWS-NCC Gap 2 **$1,088,889**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Natomas NWS

Natomas NWS-NCC Gap 3 — **Total Reach Length (Feet): 300**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 100	$451,667
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$451,667**
Total Remediation Cost for Estimate a		**$451,667**

Total Remediation Cost Estimated for Reach Natomas NWS-NCC Gap 3 **$451,667**

Natomas NWS-SAFCA Reach 1 American River — **Total Reach Length (Feet): 1,358**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$4,803,552
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,803,552**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$4,803,552**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 1 **$4,803,552**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Natomas NWS

Natomas NWS-SAFCA Reach 13

Total Reach Length (Feet): 3,300

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$7,683,387
Slurry Wall Cost:	$12,753,105
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,683,387**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$7,683,387**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 1 **$7,683,387**

Natomas NWS-SAFCA Reach 14

Total Reach Length (Feet): 3,200

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$7,523,974
Slurry Wall Cost:	$12,366,647
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,523,974**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$7,523,974**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 1 **$7,523,974**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Natomas NWS

Natomas NWS-SAFCA Reach 15

Total Reach Length (Feet): 4,800

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$10,878,502
Slurry Wall Cost:	$18,549,971
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,878,502**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$10,878,502**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 1 **$10,878,502**

Natomas NWS-SAFCA Reach 16

Total Reach Length (Feet): 5,200

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: Sn

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$5,076,248
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$18,348,340
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,076,248**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$5,076,248**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 1 **$5,076,248**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Natomas NWS

Natomas NWS-SAFCA Reach 17 — **Total Reach Length (Feet): 1,000**

Overall Reach Categorization: L

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$2,390,746
Slurry Wall Cost:	$3,985,869
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,390,746**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$2,390,746**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 1 **$2,390,746**

Natomas NWS-SAFCA Reach 18a — **Total Reach Length (Feet): 600**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$1,434,448
Slurry Wall Cost:	$2,391,521
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,434,448**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$1,434,448**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 1 **$1,434,448**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Natomas NWS

Natomas NWS-SAFCA Reach 18b — **Total Reach Length (Feet): 900**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$4,680,114
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,680,114**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$4,680,114**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 1 **$4,680,114**

Natomas NWS-SAFCA Reach 19a — **Total Reach Length (Feet): 1,800**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$4,303,344
Slurry Wall Cost:	$7,174,564
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,303,344**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$4,303,344**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 1 **$4,303,344**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Natomas NWS

Natomas NWS-SAFCA Reach 19b — **Total Reach Length (Feet): 5,000**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$32,367,343
Slurry Wall Cost:	$23,448,933
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$23,448,933**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$23,448,933**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 1 **$23,448,933**

Natomas NWS-SAFCA Reach 2 American River — **Total Reach Length (Feet): 5,199**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$18,393,573
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$18,393,573**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$18,393,573**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 2 **$18,393,573**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Natomas NWS

Natomas NWS-SAFCA Reach 20a — **Total Reach Length (Feet): 50**

Overall Reach Categorization: L

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$269,685
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$269,685**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$269,685**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 2 **$269,685**

Natomas NWS-SAFCA Reach 3 American River — **Total Reach Length (Feet): 499**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,413,142
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,413,142**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$2,413,142**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 3 **$2,413,142**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Natomas NWS

Natomas NWS-SAFCA Reach 4 American River

Total Reach Length (Feet): 5,834

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$27,727,346
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$27,727,346**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$27,727,346**

Total Remediation Cost Estimated for Reach Natomas NWS-SAFCA Reach 4 $27,727,346

NEMDC East-A

Total Reach Length (Feet): 7,167

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 55.075

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$22,040,034
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$22,040,034**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$22,040,034**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC East

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated:
U

Remediated Length (%): 43.447

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$14,370,762
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$14,370,762**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$14,370,762**

Total Remediation Cost Estimated for Reach NEMDC East-A **$36,410,796**

NEMDC East-A1

Total Reach Length (Feet): 3,128

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
Sn

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$13,593,004
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,593,004**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$13,593,004**

Total Remediation Cost Estimated for Reach NEMDC East-A1 **$13,593,004**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC East

NEMDC East-A3

Total Reach Length (Feet): 4,470

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$6,270,490
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,270,490**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$6,270,490**

Total Remediation Cost Estimated for Reach NEMDC East-A3 **$6,270,490**

NEMDC East-A4

Total Reach Length (Feet): 8,557

Overall Reach Categorization: MG

Estimate Run: a

Deficiencies Being Remediated: Sn

Remediated Length (%): 24.541

Alternative Remediation Costs

Drained Stability Berm Cost:	$3,156,508
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,156,508**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$3,156,508**

Total Remediation Cost Estimated for Reach NEMDC East-A4 **$3,156,508**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC East

NEMDC East-B

Total Reach Length (Feet): 6,011

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$24,406,181
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$24,406,181**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$24,406,181**

Total Remediation Cost Estimated for Reach NEMDC East-B **$24,406,181**

NEMDC East-B1

Total Reach Length (Feet): 7,906

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: Sn

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$12,002,983
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$12,002,983**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$12,002,983**

Total Remediation Cost Estimated for Reach NEMDC East-B1 **$12,002,983**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC East

NEMDC East-B2 — **Total Reach Length (Feet): 6,386**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss

Remediated Length (%): 19.464

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,869,215
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,869,215**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$3,869,215**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: U+Ss

Remediated Length (%): 30.536

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$6,181,324
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,181,324**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$6,181,324**

Total Remediation Cost Estimated for Reach NEMDC East-B2 **$10,050,538**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC East

NEMDC East-B3 — **Total Reach Length (Feet): 3,380**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 59.172

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$2,703,053
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,703,053**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$2,703,053**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: Sn

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$2,336,909
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,336,909**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$2,336,909**

Total Remediation Cost Estimated for Reach NEMDC East-B3 **$5,039,962**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC East

NEMDC East-C — **Total Reach Length (Feet): 7,397**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 69.944

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$25,009,473
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$25,009,473**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$25,009,473**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: U

Remediated Length (%): 30.057

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$7,054,318
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,054,318**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$7,054,318**

Total Remediation Cost Estimated for Reach NEMDC East-C **$32,063,791**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC West

NEMDC West-A — **Total Reach Length (Feet): 7,000**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 44.7

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$14,036,391
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$14,036,391**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$14,036,391**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: U+Ss

Remediated Length (%): 55.3

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$16,615,593
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$16,615,593**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$16,615,593**

Total Remediation Cost Estimated for Reach NEMDC West-A **$30,651,985**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC West

NEMDC West-B

Total Reach Length (Feet): 5,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$15,121,645
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$15,121,645**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$15,121,645**

Total Remediation Cost Estimated for Reach NEMDC West-B **$15,121,645**

NEMDC West-C

Total Reach Length (Feet): 2,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$6,971,028
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,971,028**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$6,971,028**

Total Remediation Cost Estimated for Reach NEMDC West-C **$6,971,028**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC West

NEMDC West-D

Total Reach Length (Feet): 4,000

Overall Reach Categorization: MG

Estimate Run: a

Deficiencies Being Remediated: Sn

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$8,343,075
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,343,075**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$8,343,075**

Total Remediation Cost Estimated for Reach NEMDC West-D **$8,343,075**

NEMDC West-E

Total Reach Length (Feet): 4,700

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 93.617

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$14,171,390
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$14,171,390**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$14,171,390**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC West

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 6.383

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$959,720
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$959,720**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$959,720**

Total Remediation Cost Estimated for Reach NEMDC West-E **$15,131,111**

NEMDC West-F

Total Reach Length (Feet): 10,300

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 5.282

Alternative Remediation Costs

Drained Stability Berm Cost:	$463,567
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$463,567**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	5.282	$193,043
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$193,043**
Total Remediation Cost for Estimate a			**$656,610**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 23.359

Alternative Remediation Costs

Drained Stability Berm Cost:	$2,749,819
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,749,819**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	23.359	$853,710
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$853,710**
Total Remediation Cost for Estimate b			**$3,603,529**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC West

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 21.456

Alternative Remediation Costs

Drained Stability Berm Cost:	$1,930,419
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,930,419**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	21.456	$784,161
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$784,161**
Total Remediation Cost for Estimate c			**$2,714,580**

Overall Reach Categorization: DNM

Estimate Run: d

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 17.35

Alternative Remediation Costs

Drained Stability Berm Cost:	$1,249,284
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,249,284**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	17.35	$634,097
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$634,097**
Total Remediation Cost for Estimate d			**$1,883,381**

Overall Reach Categorization: DNM

Estimate Run: e

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 11.728

Alternative Remediation Costs

Drained Stability Berm Cost:	$751,161
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$751,161**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	11.728	$351,157
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$351,157**
Total Remediation Cost for Estimate e			**$1,102,318**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC West

Overall Reach Categorization: DNM

Estimate Run: f

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 11.117

Alternative Remediation Costs

Drained Stability Berm Cost:	$1,192,579
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,192,579**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 11.117	$406,297
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$406,297**
Total Remediation Cost for Estimate f		**$1,598,876**

Total Remediation Cost Estimated for Reach NEMDC West-F **$11,559,294**

NEMDC West-G

Total Reach Length (Feet): 2,500

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss+FG

Remediated Length (%): 60

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$4,927,374
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,927,374**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 60	$532,243
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$532,243**
Total Remediation Cost for Estimate a		**$5,459,618**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: U+Ss+FG

Remediated Length (%): 40

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$2,057,616
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,057,616**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 40	$290,697
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$290,697**
Total Remediation Cost for Estimate b		**$2,348,313**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC West

Total Remediation Cost Estimated for Reach NEMDC West-G **$7,807,930**

NEMDC West-H **Total Reach Length (Feet): 7,500**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$932,745
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$932,745**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 20	$436,046
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$436,046**
Total Remediation Cost for Estimate a		**$1,368,791**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$1,048,614
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,048,614**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 20	$532,243
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$532,243**
Total Remediation Cost for Estimate b		**$1,580,857**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$1,426,369
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,426,369**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 20	$532,243
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$532,243**
Total Remediation Cost for Estimate c		**$1,958,612**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ULE Study Area: NEMDC West

Overall Reach Categorization: DNM

Estimate Run: d

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 20

Alternative Remediation Costs

Drained Stability Berm Cost:	$1,114,825
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,114,825**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 20	$532,243
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$532,243**
Total Remediation Cost for Estimate d		**$1,647,068**

Total Remediation Cost Estimated for Reach NEMDC West-H **$6,555,329**

NEMDC West-I

Total Reach Length (Feet): 3,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss+FG

Remediated Length (%): 33.333

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$2,086,425
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,086,425**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 33.333	$354,825
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$354,825**
Total Remediation Cost for Estimate a		**$2,441,250**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: U+Ss+FG

Remediated Length (%): 66.667

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,540,302
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,540,302**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 66.667	$709,662
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$709,662**
Total Remediation Cost for Estimate b		**$4,249,964**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC West

Total Remediation Cost Estimated for Reach NEMDC West-I **$6,691,214**

NEMDC West-N

Total Reach Length (Feet): 3,375

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$2,985,388
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,985,388**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$1,526,087
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,526,087**
Total Remediation Cost for Estimate a		**$4,511,475**

Total Remediation Cost Estimated for Reach NEMDC West-N **$4,511,475**

NEMDC West-O

Total Reach Length (Feet): 15,500

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 48.387

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$13,300,998
Slurry Wall Cost:	$25,862,712
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,300,998**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 48.387	$4,353,274
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$4,353,274**
Total Remediation Cost for Estimate a		**$17,654,272**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC West

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 9.677

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,623,306
Slurry Wall Cost:	$4,871,183
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,623,306**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	9.677	$870,619
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$870,619**
Total Remediation Cost for Estimate b			**$4,493,925**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 9.677

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$2,846,669
Slurry Wall Cost:	$5,276,487
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,846,669**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	9.677	$870,619
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$870,619**
Total Remediation Cost for Estimate c			**$3,717,288**

Overall Reach Categorization: DNM

Estimate Run: d

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 12.903

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,295,804
Slurry Wall Cost:	$6,764,351
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,295,804**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	12.903	$1,160,855
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,160,855**
Total Remediation Cost for Estimate d			**$4,456,659**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: NEMDC West

Overall Reach Categorization: DNM

Estimate Run: e

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 19.355

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$6,106,801
Slurry Wall Cost:	$10,778,709
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,106,801**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	19.355	$1,741,328
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,741,328**
Total Remediation Cost for Estimate e			**$7,848,128**

Total Remediation Cost Estimated for Reach NEMDC West-O **$38,170,272**

RD 17-A

Total Reach Length (Feet): 102,500

Overall Reach Categorization: MG

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,641,504
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,641,504**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$3,641,504**

Total Remediation Cost Estimated for Reach RD 17-A **$3,641,504**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: RD 17

RD 17-D

Total Reach Length (Feet): 5,900

Overall Reach Categorization: MG

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 69.492

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$10,405,933
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,405,933**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$10,405,933**

Total Remediation Cost Estimated for Reach RD 17-D **$10,405,933**

RD 17-E

Total Reach Length (Feet): 5,600

Overall Reach Categorization: MG

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 10.714

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$1,662,926
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,662,926**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$1,662,926**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: RD 17

Overall Reach Categorization: MG

Estimate Run: b

Deficiencies Being Remediated:
U

Remediated Length (%): 89.286

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$8,068,417
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,068,417**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$8,068,417**

Total Remediation Cost Estimated for Reach RD 17-E **$9,731,343**

RD 17-F

Total Reach Length (Feet): 6,100

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$9,843,437
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$9,843,437**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$9,843,437**

Total Remediation Cost Estimated for Reach RD 17-F **$9,843,437**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: RD 17

RD 17-G

Total Reach Length (Feet): 3,600

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$5,809,242
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,809,242**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$5,809,242**

Total Remediation Cost Estimated for Reach RD 17-G **$5,809,242**

RD 17-H

Total Reach Length (Feet): 2,900

Overall Reach Categorization: MG

Estimate Run: a

Deficiencies Being Remediated: T

Remediated Length (%): 44.828

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,211,098
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,211,098**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$3,211,098**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: RD 17

Overall Reach Categorization: MG

Estimate Run: b

Deficiencies Being Remediated:
T

Remediated Length (%): 55.172

Alternative Remediation Costs

Drained Stability Berm Cost:	$2,987,695
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,987,695**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$2,987,695**

Total Remediation Cost Estimated for Reach RD 17-H **$6,198,793**

RD 17-I

Total Reach Length (Feet): 17,800

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
T+U

Remediated Length (%): 89.326

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$27,684,315
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$27,684,315**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$27,684,315**

Total Remediation Cost Estimated for Reach RD 17-I **$27,684,315**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: RD 17

RD 17-J

Total Reach Length (Feet): 8,100

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$37,885,311
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$37,885,311**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$37,885,311**

Total Remediation Cost Estimated for Reach RD 17-J **$37,885,311**

RD 17-K

Total Reach Length (Feet): 14,800

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$56,598,932
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$56,598,932**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$56,598,932**

Total Remediation Cost Estimated for Reach RD 17-K **$56,598,932**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: RD 17

RD 17-L

Total Reach Length (Feet): 4,200

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$19,273,753
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$19,273,753**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	100	$1,899,130
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,899,130**
Total Remediation Cost for Estimate a			**$21,172,883**

Total Remediation Cost Estimated for Reach RD 17-L **$21,172,883**

RD 17-M

Total Reach Length (Feet): 4,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	100	$6,666,758
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$6,666,758**
Total Remediation Cost for Estimate a			**$6,666,758**

Total Remediation Cost Estimated for Reach RD 17-M **$6,666,758**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: RD 17

RD 17-N

Total Reach Length (Feet): 1,400

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$9,095,546
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$9,095,546**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$633,043
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$633,043**
Total Remediation Cost for Estimate a		**$9,728,590**

Total Remediation Cost Estimated for Reach RD 17-N **$9,728,590**

RD 404-B

Total Reach Length (Feet): 3,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 33.333

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$1,777,235
Slurry Wall Cost:	$2,231,627
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,777,235**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 33.333	$363,197
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$363,197**
Total Remediation Cost for Estimate a		**$2,140,431**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: RD 404

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 66.667

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$4,861,498
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,861,498**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	66.667	$885,675
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$885,675**
Total Remediation Cost for Estimate b			**$5,747,173**

Total Remediation Cost Estimated for Reach RD 404-B **$7,887,604**

RD 404-C

Total Reach Length (Feet): 1,800

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,006,228
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,006,228**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	100	$643,521
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$643,521**
Total Remediation Cost for Estimate a			**$3,649,749**

Total Remediation Cost Estimated for Reach RD 404-C **$3,649,749**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: RD 404

RD 404-D1 — **Total Reach Length (Feet): 1,600**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$5,051,535
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,051,535**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$1,482,135
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,482,135**
Total Remediation Cost for Estimate a		**$6,533,670**

Total Remediation Cost Estimated for Reach RD 404-D1 **$6,533,670**

RD 404-D2 — **Total Reach Length (Feet): 3,000**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$5,391,939
Slurry Wall Cost:	$7,307,543
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,391,939**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$1,328,506
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,328,506**
Total Remediation Cost for Estimate a		**$6,720,445**

Total Remediation Cost Estimated for Reach RD 404-D2 **$6,720,445**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: RD 404

RD 404-E — **Total Reach Length (Feet): 5,700**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$12,586,048
Slurry Wall Cost:	$10,060,863
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,060,863**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$2,524,161
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,524,161**
Total Remediation Cost for Estimate a		**$12,585,024**

Total Remediation Cost Estimated for Reach RD 404-E **$12,585,024**

RD 784-Dantoni Rd. to Griffith Rd. — **Total Reach Length (Feet): 2,767**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$6,388,182
Slurry Wall Cost:	$7,950,491
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,388,182**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$6,388,182**

Total Remediation Cost Estimated for Reach RD 784-Dantoni Rd. to Griffith **$6,388,182**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: RD 784

RD 784-Linda Break Sub-Reach

Total Reach Length (Feet): 275

Overall Reach Categorization: L

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$667,040
Minimum Alternative Remediation Cost:	**$667,040**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$667,040**

Total Remediation Cost Estimated for Reach RD 784-Linda Break Sub-Reac **$667,040**

RD 784-Patrol Rd. (Griffith Rd.) to LM 3.91

Total Reach Length (Feet): 11,107

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$27,255,625
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$94,862,912
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$27,255,625**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$6,568,616
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$6,568,616**
Total Remediation Cost for Estimate a		**$33,824,240**

Total Remediation Cost Estimated for Reach RD 784-Patrol Rd. (Griffith Rd.) **$33,824,240**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: RD 784

RD 784-Simpson Lane to Dantoni Rd. — **Total Reach Length (Feet): 6,240**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$20,217,333
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$20,217,333**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$20,217,333**

Total Remediation Cost Estimated for Reach RD 784-Simpson Lane to Dant **$20,217,333**

RD 784-TRLIA-WPIC-H1 — **Total Reach Length (Feet): 1,700**

Overall Reach Categorization: L

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$1,856,903
Slurry Wall Cost:	$3,664,017
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,856,903**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$873,069
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$873,069**
Total Remediation Cost for Estimate a		**$2,729,972**

Total Remediation Cost Estimated for Reach RD 784-TRLIA-WPIC-H1 **$2,729,972**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sacramento River

Sacramento River-A

Total Reach Length (Feet): 4,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	37.5	$1,020,770
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,020,770**
Total Remediation Cost for Estimate a			**$1,020,770**

Total Remediation Cost Estimated for Reach Sacramento River-A **$1,020,770**

Sacramento River-B

Total Reach Length (Feet): 6,500

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	61.538	$2,551,015
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,551,015**
Total Remediation Cost for Estimate a			**$2,551,015**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sacramento River

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	24.615	$1,704,461
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,704,461**
Total Remediation Cost for Estimate b			**$1,704,461**

Total Remediation Cost Estimated for Reach Sacramento River-B **$4,255,476**

Sacramento River-C

Total Reach Length (Feet): 2,500

Overall Reach Categorization: MG

Estimate Run: a

Deficiencies Being Remediated:
Sn

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	50	$2,756,991
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,756,991**
Total Remediation Cost for Estimate a			**$2,756,991**

Total Remediation Cost Estimated for Reach Sacramento River-C **$2,756,991**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sacramento River

Sacramento River-F

Total Reach Length (Feet): 2,500

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: Sn

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 100	$5,513,982
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$5,513,982**
Total Remediation Cost for Estimate a		**$5,513,982**

Total Remediation Cost Estimated for Reach Sacramento River-F **$5,513,982**

Sacramento River-G

Total Reach Length (Feet): 4,500

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss

Remediated Length (%): 71.111

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$34,281,614
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$34,281,614**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$34,281,614**

Total Remediation Cost Estimated for Reach Sacramento River-G **$34,281,614**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sacramento River

Sacramento River-H

Total Reach Length (Feet): 6,800

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$65,038,278
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$65,038,278**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	50	$3,488,310
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$3,488,310**
Total Remediation Cost for Estimate a			**$68,526,588**

Total Remediation Cost Estimated for Reach Sacramento River-H **$68,526,588**

Sacramento River-I

Total Reach Length (Feet): 4,100

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	51.22	$5,232,162
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$5,232,162**
Total Remediation Cost for Estimate a			**$5,232,162**

Total Remediation Cost Estimated for Reach Sacramento River-I **$5,232,162**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sacramento River

Sacramento River-J

Total Reach Length (Feet): 2,100

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$20,810,027
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$20,810,027**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	90.476	$2,048,708
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,048,708**
Total Remediation Cost for Estimate a			**$22,858,735**

Total Remediation Cost Estimated for Reach Sacramento River-J **$22,858,735**

Sacramento River-K

Total Reach Length (Feet): 5,300

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	92.453	$12,464,535
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$12,464,535**
Total Remediation Cost for Estimate a			**$12,464,535**

Total Remediation Cost Estimated for Reach Sacramento River-K **$12,464,535**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sacramento River

Sacramento River-L

Total Reach Length (Feet): 4,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$41,329,976
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$41,329,976**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	95	$3,979,933
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$3,979,933**
Total Remediation Cost for Estimate a			**$45,309,909**

Total Remediation Cost Estimated for Reach Sacramento River-L **$45,309,909**

Sacramento River-M

Total Reach Length (Feet): 7,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$64,587,158
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$64,587,158**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	94.286	$6,912,536
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$6,912,536**
Total Remediation Cost for Estimate a			**$71,499,694**

Total Remediation Cost Estimated for Reach Sacramento River-M **$71,499,694**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sacramento River

Sacramento River-N

Total Reach Length (Feet): 3,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$31,155,354
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$31,155,354**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	46.667	$1,389,874
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,389,874**
Total Remediation Cost for Estimate a			**$32,545,229**

Total Remediation Cost Estimated for Reach Sacramento River-N **$32,545,229**

Sacramento River-O

Total Reach Length (Feet): 3,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	76.667	$4,269,833
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$4,269,833**
Total Remediation Cost for Estimate a			**$4,269,833**

Total Remediation Cost Estimated for Reach Sacramento River-O **$4,269,833**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sacramento River

Sacramento River-P

Total Reach Length (Feet): 8,200

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	91.463	$9,494,571
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$9,494,571**
Total Remediation Cost for Estimate a			**$9,494,571**

Total Remediation Cost Estimated for Reach Sacramento River-P **$9,494,571**

Sacramento River-Q

Total Reach Length (Feet): 1,800

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	100	$1,669,499
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,669,499**
Total Remediation Cost for Estimate a			**$1,669,499**

Total Remediation Cost Estimated for Reach Sacramento River-Q **$1,669,499**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Bear Creek

SJAFCA Bear Creek-A

Total Reach Length (Feet): 4,162

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	7.206	$743,859
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$743,859**
Total Remediation Cost for Estimate a			**$743,859**

Total Remediation Cost Estimated for Reach SJAFCA Bear Creek-A **$743,859**

SJAFCA Bear Creek-E

Total Reach Length (Feet): 4,300

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	4.651	$118,833
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$118,833**
Total Remediation Cost for Estimate a			**$118,833**

Total Remediation Cost Estimated for Reach SJAFCA Bear Creek-E **$118,833**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Bear Creek

SJAFCA Bear Creek-F — **Total Reach Length (Feet): 12,698**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0.787	$48,705
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$48,705**
Total Remediation Cost for Estimate a			**$48,705**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0.787	$44,432
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$44,432**
Total Remediation Cost for Estimate b			**$44,432**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	14.173	$800,168
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$800,168**
Total Remediation Cost for Estimate c			**$800,168**

Total Remediation Cost Estimated for Reach SJAFCA Bear Creek-F **$893,305**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Bear Creek

SJAFCA Bear Creek-H

Total Reach Length (Feet): 11,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	17.273	$925,884
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$925,884**
Total Remediation Cost for Estimate a			**$925,884**

Total Remediation Cost Estimated for Reach SJAFCA Bear Creek-H **$925,884**

SJAFCA Bear Creek-I

Total Reach Length (Feet): 15,536

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	45.057	$3,411,123
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$3,411,123**
Total Remediation Cost for Estimate a			**$3,411,123**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Bear Creek

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	20.597	$8,139,962
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$8,139,962**
Total Remediation Cost for Estimate b			**$8,139,962**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	7.08	$394,921
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$394,921**
Total Remediation Cost for Estimate c			**$394,921**

Overall Reach Categorization: DNM

Estimate Run: d

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	7.08	$1,067,501
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,067,501**
Total Remediation Cost for Estimate d			**$1,067,501**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Bear Creek

Overall Reach Categorization: DNM

Estimate Run: e

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 20.185	$3,408,543
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,408,543**
Total Remediation Cost for Estimate e		**$3,408,543**

Total Remediation Cost Estimated for Reach SJAFCA Bear Creek-I **$16,422,050**

SJAFCA Bear Creek-J

Total Reach Length (Feet): 4,923

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$11,359,066
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$11,359,066**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$11,359,066**

Total Remediation Cost Estimated for Reach SJAFCA Bear Creek-J **$11,359,066**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Bear Creek

SJAFCA Bear Creek-M

Total Reach Length (Feet): 7,438

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$7,210,180
Combo Berm Cost:	$0
Slurry Wall Cost:	$22,800,024
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,210,180**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$7,210,180**

Total Remediation Cost Estimated for Reach SJAFCA Bear Creek-M **$7,210,180**

SJAFCA Bear Creek-N

Total Reach Length (Feet): 14,402

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 1.389	$103,347
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$103,347**
Total Remediation Cost for Estimate a		**$103,347**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Bear Creek

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0.694	$44,426
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$44,426**
Total Remediation Cost for Estimate b			**$44,426**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	12.5	$985,706
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$985,706**
Total Remediation Cost for Estimate c			**$985,706**

Total Remediation Cost Estimated for Reach SJAFCA Bear Creek-N **$1,133,480**

SJAFCA Bear Creek-Q

Total Reach Length (Feet): 18,205

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	100	$18,376,823
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$18,376,823**
Total Remediation Cost for Estimate a			**$18,376,823**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Bear Creek

Total Remediation Cost Estimated for Reach SJAFCA Bear Creek-Q **$18,376,823**

SJAFCA Bear Creek-R **Total Reach Length (Feet): 20,467**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 9.772	$1,874,607
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,874,607**
Total Remediation Cost for Estimate a		**$1,874,607**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 77.197	$16,835,609
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$16,835,609**
Total Remediation Cost for Estimate b		**$16,835,609**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 10.099	$2,005,987
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,005,987**
Total Remediation Cost for Estimate c		**$2,005,987**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Bear Creek

Total Remediation Cost Estimated for Reach SJAFCA Bear Creek-R **$20,716,204**

SJAFCA Bear Creek-S **Total Reach Length (Feet): 16,468**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 39.47	$4,639,596
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$4,639,596**
Total Remediation Cost for Estimate a		**$4,639,596**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 27.326	$3,255,038
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,255,038**
Total Remediation Cost for Estimate b		**$3,255,038**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 14.987	$1,589,275
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,589,275**
Total Remediation Cost for Estimate c		**$1,589,275**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Bear Creek

Total Remediation Cost Estimated for Reach SJAFCA Bear Creek-S **$9,483,908**

SJAFCA Bear Creek-T

Total Reach Length (Feet): 7,340

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$5,528,705
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$5,528,705**
Total Remediation Cost for Estimate a		**$5,528,705**

Total Remediation Cost Estimated for Reach SJAFCA Bear Creek-T **$5,528,705**

SJAFCA Bear Creek-U

Total Reach Length (Feet): 5,230

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 15.296	$505,668
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$505,668**
Total Remediation Cost for Estimate a		**$505,668**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Bear Creek

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	3.824	$126,417
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$126,417**
Total Remediation Cost for Estimate b			**$126,417**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	54.111	$1,936,845
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,936,845**
Total Remediation Cost for Estimate c			**$1,936,845**

Total Remediation Cost Estimated for Reach SJAFCA Bear Creek-U **$2,568,931**

SJAFCA Calaveras River-AB

Total Reach Length (Feet): 2,300

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	13.043	$246,175
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$246,175**
Total Remediation Cost for Estimate a			**$246,175**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Calaveras River

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-AB **$246,175**

SJAFCA Calaveras River-AC — **Total Reach Length (Feet): 800**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$1,410,490
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,410,490**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$1,410,490**

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-AC **$1,410,490**

SJAFCA Calaveras River-AE — **Total Reach Length (Feet): 150**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: Sn

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$544,056
Minimum Alternative Remediation Cost:	**$544,056**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$544,056**

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-AE **$544,056**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Calaveras River

SJAFCA Calaveras River-D

Total Reach Length (Feet): 2,475

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$13,699,751
Slurry Wall Cost:	$9,955,227
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$9,955,227**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$2,264,286
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,264,286**
Total Remediation Cost for Estimate a		**$12,219,513**

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-D **$12,219,513**

SJAFCA Calaveras River-F

Total Reach Length (Feet): 2,550

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 7.843	$140,376
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$140,376**
Total Remediation Cost for Estimate a		**$140,376**

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-F **$140,376**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Calaveras River

SJAFCA Calaveras River-G

Total Reach Length (Feet): 3,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	6.667	$159,855
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$159,855**
Total Remediation Cost for Estimate a			**$159,855**

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-G **$159,855**

SJAFCA Calaveras River-H

Total Reach Length (Feet): 10,650

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	33.803	$8,695,898
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$8,695,898**
Total Remediation Cost for Estimate a			**$8,695,898**

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-H **$8,695,898**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Calaveras River

SJAFCA Calaveras River-H-3

Total Reach Length (Feet): 1,000

Overall Reach Categorization: L

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,909,407
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,909,407**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$3,909,407**

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-H-3 **$3,909,407**

SJAFCA Calaveras River-J

Total Reach Length (Feet): 2,563

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$2,312,196
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,312,196**
Total Remediation Cost for Estimate a		**$2,312,196**

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-J **$2,312,196**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Calaveras River

SJAFCA Calaveras River-L

Total Reach Length (Feet): 4,175

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$17,240,595
Minimum Alternative Remediation Cost:	**$17,240,595**

Other Required Remediation Costs

Erosion Repair Cost:	Category	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Pier Wall Cost:		Length (%): 0	$0
Jet Grout Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$17,240,595**

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-L **$17,240,595**

SJAFCA Calaveras River-N

Total Reach Length (Feet): 5,100

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$17,053,194
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$17,053,194**

Other Required Remediation Costs

Erosion Repair Cost:	Category	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 100	$4,763,125
Pier Wall Cost:		Length (%): 0	$0
Jet Grout Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$4,763,125**
Total Remediation Cost for Estimate a			**$21,816,319**

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-N **$21,816,319**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Calaveras River

SJAFCA Calaveras River-P — **Total Reach Length (Feet): 3,450**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs			
Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	5.797	$481,186
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$481,186**
Total Remediation Cost for Estimate a			**$481,186**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs			
Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	2.899	$240,635
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$240,635**
Total Remediation Cost for Estimate b			**$240,635**

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-P **$721,821**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: SJAFCA Calaveras River

SJAFCA Calaveras River-Q

Total Reach Length (Feet): 1,150

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
T

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,002,675
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,002,675**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$2,002,675**

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-Q **$2,002,675**

SJAFCA Calaveras River-R

Total Reach Length (Feet): 3,350

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
T

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$4,925,143
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,925,143**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$4,925,143**

Total Remediation Cost Estimated for Reach SJAFCA Calaveras River-R **$4,925,143**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-A

Total Reach Length (Feet): 6,222

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$13,353,422
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$43,114,649
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,353,422**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$4,492,443
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$4,492,443**
Total Remediation Cost for Estimate a		**$17,845,865**

Total Remediation Cost Estimated for Reach Sutter-A **$17,845,865**

Sutter-AA

Total Reach Length (Feet): 3,069

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 52.525

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$10,392,284
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$11,481,736
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,392,284**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$10,392,284**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 47.47

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$9,392,132
Combo Berm Cost:	$0
Slurry Wall Cost:	$4,227,019
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,227,019**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$4,227,019**

Total Remediation Cost Estimated for Reach Sutter-AA **$14,619,303**

Sutter-B1

Total Reach Length (Feet): 4,102

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$8,894,090
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$28,223,260
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,894,090**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	59.995	$1,409,533
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,409,533**
Total Remediation Cost for Estimate a			**$10,303,623**

Total Remediation Cost Estimated for Reach Sutter-B1 **$10,303,623**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-B2

Total Reach Length (Feet): 2,500

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 90	$1,459,747
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,459,747**
Total Remediation Cost for Estimate a		**$1,459,747**

Total Remediation Cost Estimated for Reach Sutter-B2 **$1,459,747**

Sutter-BB

Total Reach Length (Feet): 5,023

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 51.622

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$16,716,527
Combo Berm Cost:	$0
Slurry Wall Cost:	$7,522,786
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,522,786**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$7,522,786**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 48.377

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$15,665,713
Combo Berm Cost:	$0
Slurry Wall Cost:	$6,108,985
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,108,985**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$6,108,985**

Total Remediation Cost Estimated for Reach Sutter-BB **$13,631,771**

Sutter-C

Total Reach Length (Feet): 5,101

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$17,190,286
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$38,052,118
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$17,190,286**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$3,813,716
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,813,716**
Total Remediation Cost for Estimate a		**$21,004,002**

Total Remediation Cost Estimated for Reach Sutter-C **$21,004,002**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-CC — **Total Reach Length (Feet): 8,356**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 12.147

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$6,690,345
Slurry Wall Cost:	$2,544,830
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,544,830**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$2,544,830**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 19.148

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$10,546,368
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$14,861,847
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,546,368**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$10,546,368**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 34.706

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$41,937,079
Slurry Wall Cost:	$12,376,216
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$12,376,216**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$12,376,216**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Overall Reach Categorization: DNM

Estimate Run: d

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 34

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$18,726,578
Slurry Wall Cost:	$7,673,054
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,673,054**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	0	$0
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate d			**$7,673,054**

Total Remediation Cost Estimated for Reach Sutter-CC **$33,140,467**

Sutter-D

Total Reach Length (Feet): 14,960

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$50,702,578
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$110,963,976
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$50,702,578**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	100	$13,154,573
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$13,154,573**
Total Remediation Cost for Estimate a			**$63,857,150**

Total Remediation Cost Estimated for Reach Sutter-D **$63,857,150**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-DD — **Total Reach Length (Feet): 10,578**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 57.828

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$12,976,119
Slurry Wall Cost:	$12,063,155
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$12,063,155**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$12,063,155**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 9.454

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$2,121,398
Slurry Wall Cost:	$2,359,314
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,121,398**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$2,121,398**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 5.039

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$1,130,709
Slurry Wall Cost:	$1,051,156
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,051,156**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$1,051,156**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Overall Reach Categorization: DNM

Estimate Run: d

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 4.415

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$2,993,248
Slurry Wall Cost:	$1,077,883
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,077,883**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate d			**$1,077,883**

Overall Reach Categorization: DNM

Estimate Run: e

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 9.454

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$6,409,550
Slurry Wall Cost:	$1,920,938
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,920,938**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate e			**$1,920,938**

Overall Reach Categorization: DNM

Estimate Run: f

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 13.812

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$9,364,154
Slurry Wall Cost:	$2,240,785
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,240,785**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate f			**$2,240,785**

Total Remediation Cost Estimated for Reach Sutter-DD **$20,475,315**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-EE — **Total Reach Length (Feet): 3,022**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 17.836

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,454,620
Slurry Wall Cost:	$988,194
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$988,194**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$988,194**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: U

Remediated Length (%): 82.164

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$15,914,186
Slurry Wall Cost:	$6,474,858
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,474,858**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$6,474,858**

Total Remediation Cost Estimated for Reach Sutter-EE **$7,463,051**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-FF — **Total Reach Length (Feet): 3,080**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 49.253

Alternative Remediation Costs	
Drained Stability Berm Cost:	$1,385,461
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,379,928
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,385,461**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$1,385,461**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 50.747

Alternative Remediation Costs	
Drained Stability Berm Cost:	$1,427,486
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,877,327
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,427,486**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$1,427,486**

Total Remediation Cost Estimated for Reach Sutter-FF **$2,812,947**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-GG — **Total Reach Length (Feet): 5,645**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 69.442

Alternative Remediation Costs	
Drained Stability Berm Cost:	$3,580,115
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$7,064,530
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,580,115**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$3,580,115**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 9.159

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$885,397
Combo Berm Cost:	$0
Slurry Wall Cost:	$983,593
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$885,397**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$885,397**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: T+U

Remediated Length (%): 21.399

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$2,068,634
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,064,222
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,064,222**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$2,064,222**

Total Remediation Cost Estimated for Reach Sutter-GG **$6,529,734**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-HH — **Total Reach Length (Feet): 7,274**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 10.888

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$1,356,275
Combo Berm Cost:	$0
Slurry Wall Cost:	$1,353,382
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,353,382**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$3,027,815
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,027,815**
Total Remediation Cost for Estimate a		**$4,381,196**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 50.866

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$6,336,174
Combo Berm Cost:	$0
Slurry Wall Cost:	$7,038,894
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,336,174**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$6,336,174**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: T+U

Remediated Length (%): 31.619

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$3,938,652
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,930,251
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,930,251**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$3,930,251**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Overall Reach Categorization: DNM

Estimate Run: d

Deficiencies Being Remediated: T+U

Remediated Length (%): 6.626

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$825,374
Combo Berm Cost:	$0
Slurry Wall Cost:	$1,196,812
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$825,374**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate d		**$825,374**

Total Remediation Cost Estimated for Reach Sutter-HH **$15,472,996**

Sutter-II

Total Reach Length (Feet): 2,843

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+FG

Remediated Length (%): 54.555

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$2,656,058
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,851,346
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,656,058**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$1,183,403
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,183,403**
Total Remediation Cost for Estimate a		**$3,839,462**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 45.445

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,096,858
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,096,858**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$2,096,858**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Total Remediation Cost Estimated for Reach Sutter-II **$5,936,320**

Sutter-KK **Total Reach Length (Feet): 9,175**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+Ss

Remediated Length (%): 35.695

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,909,541
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$3,808,910
Minimum Alternative Remediation Cost:	**$3,808,910**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$3,808,910**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: U

Remediated Length (%): 15.804

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,092,569
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,092,569**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$2,092,569**

Total Remediation Cost Estimated for Reach Sutter-KK **$5,901,480**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-LL

Total Reach Length (Feet): 2,578

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$5,799,183
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,799,183**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$5,799,183**

Total Remediation Cost Estimated for Reach Sutter-LL **$5,799,183**

Sutter-M

Total Reach Length (Feet): 133

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$525,403
Slurry Wall Cost:	$606,774
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$525,403**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$525,403**

Total Remediation Cost Estimated for Reach Sutter-M **$525,403**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-MM — **Total Reach Length (Feet): 8,941**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T

Remediated Length (%): 3.434

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$1,877,558
Slurry Wall Cost:	$289,463
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$289,463**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$289,463**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 3.915

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$876,175
Slurry Wall Cost:	$1,006,314
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$876,175**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$876,175**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: T

Remediated Length (%): 13.421

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,027,014
Slurry Wall Cost:	$2,985,166
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,985,166**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$2,985,166**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Overall Reach Categorization: DNM

Estimate Run: d

Deficiencies Being Remediated:
T

Remediated Length (%): 63.013

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$35,461,285
Slurry Wall Cost:	$18,596,244
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$18,596,244**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate d			**$18,596,244**

Overall Reach Categorization: DNM

Estimate Run: e

Deficiencies Being Remediated:
T

Remediated Length (%): 16.217

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,657,632
Slurry Wall Cost:	$4,785,922
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,657,632**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate e			**$3,657,632**

Total Remediation Cost Estimated for Reach Sutter-MM **$26,404,680**

Sutter-N **Total Reach Length (Feet): 8,101**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
T+U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$32,273,913
Slurry Wall Cost:	$37,247,112
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$32,273,913**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$32,273,913**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Total Remediation Cost Estimated for Reach Sutter-N **$32,273,913**

Sutter-NN **Total Reach Length (Feet): 5,920**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 26.14

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$9,932,619
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$9,932,619**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$9,932,619**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 29.825

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,205,576
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,205,576**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$3,205,576**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 44.035

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$8,265,280
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,265,280**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$8,265,280**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Total Remediation Cost Estimated for Reach Sutter-NN **$21,403,475**

Sutter-O

Total Reach Length (Feet): 4,799

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$32,212,273
Slurry Wall Cost:	$21,064,381
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$21,064,381**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$21,064,381**

Total Remediation Cost Estimated for Reach Sutter-O **$21,064,381**

Sutter-OO

Total Reach Length (Feet): 10,052

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 26.661

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$6,408,867
Slurry Wall Cost:	$8,475,370
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,408,867**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$6,408,867**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 73.339

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$14,689,654
Slurry Wall Cost:	$23,314,022
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$14,689,654**

Other Required Remediation Costs

Erosion Repair Cost:	Category	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Pier Wall Cost:		Length (%): 0	$0
Jet Grout Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$14,689,654**

Total Remediation Cost Estimated for Reach Sutter-OO **$21,098,521**

Sutter-P

Total Reach Length (Feet): 7,600

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 55.263

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$27,868,254
Slurry Wall Cost:	$17,612,765
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$17,612,765**

Other Required Remediation Costs

Erosion Repair Cost:	Category	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Pier Wall Cost:		Length (%): 0	$0
Jet Grout Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$17,612,765**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 44.737

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$11,337,593
Slurry Wall Cost:	$14,258,044
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$11,337,593**

Other Required Remediation Costs

Erosion Repair Cost:	Category	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Pier Wall Cost:		Length (%): 0	$0
Jet Grout Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$11,337,593**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Total Remediation Cost Estimated for Reach Sutter-P **$28,950,358**

Sutter-PP **Total Reach Length (Feet): 11,977**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 21.942

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$4,928,098
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$17,752,924
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,928,098**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$4,928,098**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 40.912

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$9,087,518
Slurry Wall Cost:	$8,811,029
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,811,029**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$8,811,029**

Total Remediation Cost Estimated for Reach Sutter-PP **$13,739,127**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-Q

Total Reach Length (Feet): 3,801

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$15,142,963
Slurry Wall Cost:	$17,476,395
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$15,142,963**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$15,142,963**

Total Remediation Cost Estimated for Reach Sutter-Q **$15,142,963**

Sutter-QQ

Total Reach Length (Feet): 5,685

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 11.451

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$4,472,238
Slurry Wall Cost:	$2,349,416
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,349,416**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$2,349,416**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 61.566

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$6,878,124
Slurry Wall Cost:	$11,984,719
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,878,124**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$6,878,124**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: T+U

Remediated Length (%): 26.983

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,014,528
Slurry Wall Cost:	$4,064,856
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,014,528**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate c			**$3,014,528**

Total Remediation Cost Estimated for Reach Sutter-QQ **$12,242,068**

Sutter-R

Total Reach Length (Feet): 5,199

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 73.072

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$15,235,281
Slurry Wall Cost:	$17,034,719
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$15,235,281**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$15,235,281**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 12.175

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$4,352,188
Slurry Wall Cost:	$1,931,580
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,931,580**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$1,931,580**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 14.753

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$5,273,743
Slurry Wall Cost:	$2,637,534
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,637,534**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate c			**$2,637,534**

Total Remediation Cost Estimated for Reach Sutter-R **$19,804,395**

Sutter-R1

Total Reach Length (Feet): 200

Overall Reach Categorization: L

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 100		$342,222
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$342,222**
Total Remediation Cost for Estimate a			**$342,222**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Total Remediation Cost Estimated for Reach Sutter-R1 **$342,222**

Sutter-RR **Total Reach Length (Feet): 6,166**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 31.885

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$14,736,604
Slurry Wall Cost:	$5,693,467
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,693,467**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$5,693,467**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 50.276

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$6,107,970
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$22,106,051
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,107,970**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$6,107,970**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 17.84

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$6,957,952
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$7,844,139
Replace Levee Cost:	$2,832,831
Minimum Alternative Remediation Cost:	**$2,832,831**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$2,832,831**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Total Remediation Cost Estimated for Reach Sutter-RR **$14,634,268**

Sutter-S

Total Reach Length (Feet): 5,400

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$35,235,914
Combo Berm Cost:	$0
Slurry Wall Cost:	$22,903,803
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$22,903,803**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$22,903,803**

Total Remediation Cost Estimated for Reach Sutter-S **$22,903,803**

Sutter-T2

Total Reach Length (Feet): 7,701

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$52,230,209
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$57,801,474
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$52,230,209**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$3,187,886
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,187,886**
Total Remediation Cost for Estimate a		**$55,418,095**

Total Remediation Cost Estimated for Reach Sutter-T2 **$55,418,095**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-U — **Total Reach Length (Feet): 5,400**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 88.26

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$15,243,920
Combo Berm Cost:	$0
Slurry Wall Cost:	$16,044,414
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$15,243,920**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$15,243,920**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 11.742

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$2,028,032
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$4,812,564
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,028,032**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$2,028,032**

Total Remediation Cost Estimated for Reach Sutter-U **$17,271,952**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-U1

Total Reach Length (Feet): 150

Overall Reach Categorization: L

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 100	$266,667
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$266,667**
Total Remediation Cost for Estimate a		**$266,667**

Total Remediation Cost Estimated for Reach Sutter-U1 **$266,667**

Sutter-V

Total Reach Length (Feet): 5,400

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 24.537

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$6,033,157
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$10,692,391
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,033,157**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$6,033,157**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 75.463

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$18,554,841
Slurry Wall Cost:	$14,556,615
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$14,556,615**

Other Required Remediation Costs

Erosion Repair Cost:	Category	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Pier Wall Cost:		Length (%): 0	$0
Jet Grout Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$14,556,615**

Total Remediation Cost Estimated for Reach Sutter-V **$20,589,772**

Sutter-W

Total Reach Length (Feet): 11,899

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 31.095

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$25,175,994
Slurry Wall Cost:	$16,461,500
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$16,461,500**

Other Required Remediation Costs

Erosion Repair Cost:	Category	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Pier Wall Cost:		Length (%): 0	$0
Jet Grout Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$16,461,500**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 32.776

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$26,537,011
Slurry Wall Cost:	$13,425,646
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,425,646**

Other Required Remediation Costs

Erosion Repair Cost:	Category	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Pier Wall Cost:		Length (%): 0	$0
Jet Grout Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$13,425,646**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 33.616

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$35,839,824
Slurry Wall Cost:	$18,491,951
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$18,491,951**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$18,491,951**

Overall Reach Categorization: DNM

Estimate Run: d

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 2.513

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$1,442,736
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,442,736**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate d		**$1,442,736**

Total Remediation Cost Estimated for Reach Sutter-W **$49,821,833**

Sutter-Y

Total Reach Length (Feet): 8,199

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 14.636

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$13,803,386
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,803,386**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$13,803,386**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 85.364

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$77,743,918
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$77,743,918**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$77,743,918**

Total Remediation Cost Estimated for Reach Sutter-Y **$91,547,304**

Sutter-Z1

Total Reach Length (Feet): 2,600

Overall Reach Categorization: L

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$10,608,882
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,608,882**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$10,608,882**

Total Remediation Cost Estimated for Reach Sutter-Z1 **$10,608,882**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-Z2 — **Total Reach Length (Feet): 1,681**

Overall Reach Categorization: L

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 35.693

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,004,563
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,004,563**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$3,004,563**

Overall Reach Categorization: L

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 64.307

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$4,199,538
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,199,538**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$4,199,538**

Total Remediation Cost Estimated for Reach Sutter-Z2 **$7,204,100**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-Z3 — **Total Reach Length (Feet): 10,957**

Overall Reach Categorization: L

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 4.563

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$4,504,344
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,504,344**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$4,504,344**

Overall Reach Categorization: L

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 6.389

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$6,908,405
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,908,405**

Other Required Remediation Costs		
Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$6,908,405**

Total Remediation Cost Estimated for Reach Sutter-Z3 **$11,412,749**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Sutter

Sutter-Z4

Total Reach Length (Feet): 5,314

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$23,423,979
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$23,423,979**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$23,423,979**

Total Remediation Cost Estimated for Reach Sutter-Z4 **$23,423,979**

West Sacramento-A

Total Reach Length (Feet): 2,900

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 27.586	$629,261
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$629,261**
Total Remediation Cost for Estimate a		**$629,261**

Total Remediation Cost Estimated for Reach West Sacramento-A **$629,261**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: West Sacramento

West Sacramento-AA

Total Reach Length (Feet): 2,400

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$5,836,219
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,836,219**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$5,836,219**

Total Remediation Cost Estimated for Reach West Sacramento-AA **$5,836,219**

West Sacramento-AD

Total Reach Length (Feet): 5,300

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: Sn

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$9,307,340
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$9,307,340**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$9,307,340**

Total Remediation Cost Estimated for Reach West Sacramento-AD **$9,307,340**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: West Sacramento

West Sacramento-AE

Total Reach Length (Feet): 2,100

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$12,367,945
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$12,367,945**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$12,367,945**

Total Remediation Cost Estimated for Reach West Sacramento-AE **$12,367,945**

West Sacramento-B

Total Reach Length (Feet): 3,900

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
U

Remediated Length (%): 43.59

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$6,370,459
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,370,459**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$6,370,459**

Total Remediation Cost Estimated for Reach West Sacramento-B **$6,370,459**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: West Sacramento

West Sacramento-C

Total Reach Length (Feet): 1,700

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$13,062,509
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,062,509**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$13,062,509**

Total Remediation Cost Estimated for Reach West Sacramento-C **$13,062,509**

West Sacramento-D

Total Reach Length (Feet): 900

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,404,576
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,404,576**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$2,404,576**

Total Remediation Cost Estimated for Reach West Sacramento-D **$2,404,576**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: West Sacramento

West Sacramento-E

Total Reach Length (Feet): 1,600

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
T

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$1,904,759
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,465,933
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,904,759**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$1,904,759**

Total Remediation Cost Estimated for Reach West Sacramento-E **$1,904,759**

West Sacramento-F

Total Reach Length (Feet): 2,700

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
T

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$6,383,428
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,383,428**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$6,383,428**

Total Remediation Cost Estimated for Reach West Sacramento-F **$6,383,428**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: West Sacramento

West Sacramento-G

Total Reach Length (Feet): 1,700

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$5,125,276
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,125,276**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 23.53	$413,785
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$413,785**
Total Remediation Cost for Estimate a		**$5,539,061**

Total Remediation Cost Estimated for Reach West Sacramento-G **$5,539,061**

West Sacramento-H

Total Reach Length (Feet): 1,100

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,660,008
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,660,008**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$3,660,008**

Total Remediation Cost Estimated for Reach West Sacramento-H **$3,660,008**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: West Sacramento

West Sacramento-I

Total Reach Length (Feet): 3,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$32,481,169
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$32,481,169**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$32,481,169**

Total Remediation Cost Estimated for Reach West Sacramento-I **$32,481,169**

West Sacramento-J

Total Reach Length (Feet): 3,500

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$12,521,082
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$11,645,482
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$11,645,482**

Other Required Remediation Costs

Erosion Repair Cost: Category MG	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Pier Wall Cost:	Length (%): 0		$0
Jet Grout Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$11,645,482**

Total Remediation Cost Estimated for Reach West Sacramento-J **$11,645,482**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: West Sacramento

West Sacramento-K1

Total Reach Length (Feet): 1,500

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$13,419,184
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,419,184**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$13,419,184**

Total Remediation Cost Estimated for Reach West Sacramento-K1 **$13,419,184**

West Sacramento-K2

Total Reach Length (Feet): 3,100

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 9.677	$705,708
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$705,708**
Total Remediation Cost for Estimate a		**$705,708**

Total Remediation Cost Estimated for Reach West Sacramento-K2 **$705,708**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: West Sacramento

West Sacramento-L

Total Reach Length (Feet): 3,400

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$31,898,262
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$31,898,262**

Other Required Remediation Costs

Erosion Repair Cost: Category DNM	Length (%):	50	$2,419,213
Freeboard/Geometry Cost:	Length (%):	5.882	$97,571
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,516,784**
Total Remediation Cost for Estimate a			**$34,415,046**

Total Remediation Cost Estimated for Reach West Sacramento-L **$34,415,046**

West Sacramento-M

Total Reach Length (Feet): 8,200

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	37.805	$2,506,493
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,506,493**
Total Remediation Cost for Estimate a			**$2,506,493**

Total Remediation Cost Estimated for Reach West Sacramento-M **$2,506,493**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: West Sacramento

West Sacramento-O — **Total Reach Length (Feet): 7,900**

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+FG

Remediated Length (%): 24.051

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$18,964,966
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$18,964,966**

Other Required Remediation Costs

Erosion Repair Cost: Category DNM	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 28.076	$2,059,702
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,059,702**
Total Remediation Cost for Estimate a		**$21,024,668**

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 75.949

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$15,729,769
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$51,345,204
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$15,729,769**

Other Required Remediation Costs

Erosion Repair Cost: Category DNM	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$15,729,769**

Total Remediation Cost Estimated for Reach West Sacramento-O **$36,754,437**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: West Sacramento

West Sacramento-P

Total Reach Length (Feet): 2,500

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$10,501,597
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,501,597**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$10,501,597**

Total Remediation Cost Estimated for Reach West Sacramento-P **$10,501,597**

West Sacramento-Q

Total Reach Length (Feet): 2,800

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$8,035,703
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$29,783,226
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,035,703**

Other Required Remediation Costs

Erosion Repair Cost: Category DNM	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 64.29	$620,816
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$620,816**
Total Remediation Cost for Estimate a		**$8,656,519**

Total Remediation Cost Estimated for Reach West Sacramento-Q **$8,656,519**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: West Sacramento

West Sacramento-R

Total Reach Length (Feet): 3,200

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$11,040,024
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$25,499,138
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$11,040,024**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$11,040,024**

Total Remediation Cost Estimated for Reach West Sacramento-R **$11,040,024**

West Sacramento-S

Total Reach Length (Feet): 8,900

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$98,937,396
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$103,529,131
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$98,937,396**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$98,937,396**

Total Remediation Cost Estimated for Reach West Sacramento-S **$98,937,396**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: West Sacramento

West Sacramento-X

Total Reach Length (Feet): 5,600

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$17,710,138
Combo Berm Cost:	$0
Slurry Wall Cost:	$18,206,377
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$17,710,138**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$17,710,138**

Total Remediation Cost Estimated for Reach West Sacramento-X **$17,710,138**

West Sacramento-Y

Total Reach Length (Feet): 9,400

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 13.83

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$2,926,550
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$13,608,928
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,926,550**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$2,926,550**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: West Sacramento

Overall Reach Categorization: DNM

Estimate Run: b

Deficiencies Being Remediated:
U

Remediated Length (%): 67.553

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$56,826,244
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$68,741,963
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$56,826,244**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$56,826,244**

Overall Reach Categorization: DNM

Estimate Run: c

Deficiencies Being Remediated:
U

Remediated Length (%): 18.617

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$3,939,521
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$18,319,408
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,939,521**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$3,939,521**

Total Remediation Cost Estimated for Reach West Sacramento-Y **$63,692,315**

Woodland-A

Total Reach Length (Feet): 10,000

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
T+U+Ss+E+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$26,791,773
Slurry Wall Cost:	$37,569,444
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$26,791,773**

Other Required Remediation Costs

Erosion Repair Cost: Category DNM	Length (%): 100	$21,280,000
Freeboard/Geometry Cost:	Length (%): 100	$7,289,083
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$28,569,083**
Total Remediation Cost for Estimate a		**$55,360,856**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Woodland

Total Remediation Cost Estimated for Reach Woodland-A **$55,360,856**

Woodland-B

Total Reach Length (Feet): 8,700

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 68.391	$3,860,230
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,860,230**
Total Remediation Cost for Estimate a		**$3,860,230**

Total Remediation Cost Estimated for Reach Woodland-B **$3,860,230**

Woodland-C

Total Reach Length (Feet): 5,700

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$2,533,906
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,533,906**
Total Remediation Cost for Estimate a		**$2,533,906**

Total Remediation Cost Estimated for Reach Woodland-C **$2,533,906**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Woodland

Woodland-E

Total Reach Length (Feet): 7,400

Overall Reach Categorization: MG

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$27,894,550
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$54,020,768
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$27,894,550**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$27,894,550**

Total Remediation Cost Estimated for Reach Woodland-E **$27,894,550**

Woodland-F

Total Reach Length (Feet): 4,700

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$14,764,413
Slurry Wall Cost:	$15,947,842
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$14,764,413**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$14,764,413**

Total Remediation Cost Estimated for Reach Woodland-F **$14,764,413**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Woodland

Woodland-G

Total Reach Length (Feet): 6,800

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$16,970,333
Slurry Wall Cost:	$25,547,222
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$16,970,333**

Other Required Remediation Costs

Erosion Repair Cost: Category M	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$16,970,333**

Total Remediation Cost Estimated for Reach Woodland-G **$16,970,333**

Woodland-H

Total Reach Length (Feet): 5,200

Overall Reach Categorization: L

Estimate Run: a

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$5,879,188
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,879,188**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$1,900,571
Pier Wall Cost:	Length (%): 0	$0
Jet Grout Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,900,571**
Total Remediation Cost for Estimate a		**$7,779,759**

Total Remediation Cost Estimated for Reach Woodland-H **$7,779,759**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

ATTACHMENT 6
ALTERNATIVE REMEDIATION COSTS GROUPED BY ULE STUDY AREA
200-YEAR DESIGN WATER SURFACE

ULE Study Area: Woodland

Woodland-I

Total Reach Length (Feet): 34,300

Overall Reach Categorization: DNM

Estimate Run: a

Deficiencies Being Remediated:
T+U+Ss+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$27,360,226
Slurry Wall Cost:	$37,203,980
Drained Stability Berm and Cutoff Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$27,360,226**

Other Required Remediation Costs

Erosion Repair Cost: Category	Length (%):	0	$0
Freeboard/Geometry Cost:	Length (%):	100	$20,274,836
Pier Wall Cost:	Length (%):	0	$0
Jet Grout Cost:	Length (%):	0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$20,274,836**
Total Remediation Cost for Estimate a			**$47,635,062**

Total Remediation Cost Estimated for Reach Woodland-I **$47,635,062**

Note: Estimates are 2011 order of magnitude estimates based upon deficiencies and remediation extents specified in the FCSSR.

CENTRAL VALLEY
FLOOD MANAGEMENT
PLANNING PROGRAM

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2012 Central Valley Flood Protection Plan

Attachment 8J: Cost Estimates Appendix C – Non-Urban Levee Evaluations Project Remediation Alternatives and Cost Estimate Report

June 2012

STATE OF CALIFORNIA
THE NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

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Appendix C

This appendix describes the remediation alternative analysis and cost estimates for addressing identified hazard factors for nonurban SPFC levees. The nonurban levee cost estimates are incorporated into the overall total costs described in Appendix A.

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Memorandum

NORTH NON-URBAN LEVEE EVALUATIONS (NULE) PROJECT
REMEDIATION ALTERNATIVES AND COST ESTIMATE REPORT (RACER)

Date:	December 22, 2010
To:	Mike Inamine, Principal Engineer, Levees Portfolio Manager, DWR Hamid Bonakdar, Chief, Non-Urban Levee Evaluations Branch, DWR
From:	Richard Millet, URS Corporation Sujan Punyamurthula, URS Corporation Joseph Barnes, URS Corporation
Reviewed By:	Jay Kamine, URS Corporation
Contract:	4600008101, Task Order U107
Subject:	Preliminary Estimate of Levee Remediation Costs for North NULE Levees

1.0 BACKGROUND AND SCOPE

The Department of Water Resources (DWR) is undertaking a program to determine the approximate cost to repair non-urban project and related non-urban non-project levees in the Sacramento (North NULE Study Area) and San Joaquin (South NULE Study Area) river systems. Under separate agreements with DWR, URS is responsible for preparing cost estimates for the North NULE Study Area and Kleinfelder is responsible for preparing estimates for the South NULE Study Area. This memorandum estimates costs for repair in the North NULE Study Area.

On May 20, 2010, URS received authorization to begin work on Task Order U107, which included providing geotechnical, civil engineering, and cost estimating support services for DWR. These services also entailed preparing a Remediation Alternatives and Cost Estimate Report (RACER) for the North NULE Study Area. Task Order U107 is comprised of five tasks; this memorandum documents and transmits work completed under the first two tasks:

- Task U107-1 (1a and 1b): Identification of Remediation Alternatives and Development of Unit Costs for Project and Non-Project Levees
- Task U107-2 (2a and 2b): Selection of Remediation Alternatives and Development of Cost Estimates for Project and Non-Project Levee Sections

As part of Task U107-1, URS updated the Draft Parametric Cost Estimating Tool (Estimating Tool) originally developed in 2008. This update created a consistent methodology for generating levee repair alternative cost estimates.

Under Task U107-2, URS selected levee remediation alternatives for levee segments in the North NULE Study Area. These remediation alternatives addressed deficiencies identified in the June 2010 Draft Phase 1 Geotechnical Assessment Report (GAR), and determined likely conceptual, planning-level remediation costs using the Estimating Tool. The Draft GAR identified under seepage, throughseepage, stability, erosion, and freeboard/geometry deficiencies that could exist along levee segments for the design-basis water level. As discussed in the Draft GAR, deficiencies were identified based on limited, existing surface and subsurface levee data and past performance history. The work performed under both Tasks U107-1 and U107-2, including cost estimating results, are summarized in this memorandum.

This memorandum serves as an interim report. The Final RACER will be completed in April 2011, approximately one month after the Final GAR is complete as identified on the NULE Project's current deliverables schedule.

Cost estimates presented in this memorandum provide a base case for future flood mitigation planning by DWR for the North NULE Study Area. These estimates reflect an estimated cost to remediate levees where remediated levees would conform to applicable design-basis hydraulic, geometric, and freeboard requirements stipulated in one or more of the following agreements between the federal government and the State of California:

- 1953 Memorandum of Understanding Respecting the Sacramento River Flood Control Project between the USA (United States Army Corps of Engineers) and the State of California, dated November 6,1953 (MOU1953)
- Supplement 1 to MOU1953, dated November 25, 1957
- Supplement 2 to MOU1953, dated June 5, 1958

Approximately 85 percent of the levee segments covered by this memorandum are evaluated for a design water surface elevation specified in one of the agreements listed above. Approximately 15 percent of the levee segments have no formal design water surface elevation specified in the agreements. Of the 15 percent, 13 percent are evaluated assuming the design water level is located 3 feet below the existing crest elevation and 2 percent are evaluated assuming the design water level is located 1.5 feet below the existing crest. Levees in the 2 percent category are typically low levees located in the Delta.

2.0 TECHNICAL APPROACH TEAM MEETINGS

A series of 13 Technical Approach Team (TAT) meetings were conducted between June and October 2010 to address and resolve administrative and technical questions identified during the execution of the remediation selection and cost estimating work. The TAT was composed of DWR representatives, senior URS Corporation (URS) geotechnical engineering staff who were already familiar with the North NULE Study Area from their involvement preparing the Draft GAR, and a representative of Kleinfelder, Inc. (Kleinfelder). As noted, Kleinfelder is responsible for estimating the remediation costs for the South NULE Study Area levees. Kleinfelder participated in the TAT meetings to ensure North NULE Study Area and South NULE Study Area work was being performed consistently, that both study area teams received the same direction from DWR, and that both interim and final cost estimating work products would be similar in format and content. Each TAT meeting was documented with an agenda, meeting notes, and a list of action items assigned during the meeting.

3.0 TASK U107-1, IDENTIFICATION OF REMEDIATION ALTERNATIVES AND DEVELOPMENT OF UNIT COSTS FOR PROJECT AND NON-PROJECT LEVEES

3.1 Key Estimating Assumptions

Based upon issues, questions discussed, and recommendations made during the first few TAT meetings, URS developed a draft list of key estimating assumptions applicable to the work (see Attachment 1 for complete list). Some key assumptions are described below.

3.1.1 Environmental Mitigation

The original Estimating Tool proposed a rigorous consideration of potential biological impacts and site conditions along a levee segment or reach to estimate an environmental impact cost expressed as a percentage of the direct construction cost. Due to lack of site-specific environmental information, and lack of time to develop specific data, the current Estimating Tool was modified to include only two mitigation percentages: 25 and 35 percent. The higher percentage was applied where wetland conditions were anticipated or wetland indicator species were suspected. It was also used for main river system levees where rock slope protection was required on the waterside and rock placement work would be required near or in the water. The lower percentage was used for all other segments. Using readily available

information, such as County General Plans, a URS biologist researched each segment and determined whether the higher or lower percentage should be applied. This method and its application were agreed upon in a meeting with a DWR biologist and by TAT meeting participants.

3.1.2 Land Acquisition

The estimate includes allowances for temporary and permanent easement acquisitions required for each remediation based upon the estimated footprint for the remediation. Figure 1 shows basic land acquisition requirements for various seepage/stability berm and seepage cutoff wall remediations. Allowances include land required for remediation, for a 20-foot-wide permanent Central Valley Flood Protection Board (CVFPB) easement along the landside toe, and a 5-foot-wide additional temporary easement that provides a 25-foot construction corridor when combined with the CVFPB easement. **Because of the lack of available easement data for many rural levee segments in the NULE Project, it was assumed that no easements currently exist for the estimates provided in this memorandum.**

The TAT identified four categories of land use:

- Agricultural
- Orchard
- Commercial
- Residential

Attachment 1 identifies the input cost parameters for each of these land uses. When assigning remediations to a levee segment, an estimate of the percentage of each land category potentially impacted by the remediation was determined. These percentages are an input parameter to the Estimating Tool. The tool calculates a composite real estate rate per acre based on the input percentages, and uses this rate to estimate real estate costs for the remediation alternative's required area.

3.1.3 *Rock Slope Protection for Erosion Remediation*

As agreed upon by TAT participants, only rock slope protection was considered as a remediation to address a waterside erosion deficiency. Rock slope protection costs were estimated for two scenarios. In the first scenario, rock slope protection costs were estimated assuming the full lengths of deficient levee specified in the Draft GAR were remediated. Because this cost is significant, the second scenario considered limiting rock slope protection to approximately 20 percent of the length specified in the Draft GAR. This 20 percent factor conservatively represents the length requiring immediate attention based on a review of the current approach being used by the local levee Reclamation and Maintenance Districts to address critical repair sites. Remediation in other areas (beyond the 20 percent factor) would be assumed completed as ongoing maintenance activities. Unit rates for rock and rock installation typical for non-state or federal projects were used to estimate costs, rather than using the higher rates seen in DWR's emergency levee repair program.

3.1.4 *Revegetation*

For the estimates presented in this memorandum, revegetation of disturbed areas and new construction areas (other than rock slope protection areas) was assumed to be limited to hydroseeding. This is the customary treatment for recent levee remediation projects. The cost for special plantings, irrigation systems, and ongoing maintenance included as part of the emergency levee repair program was not reflected in the estimates presented in this memorandum.

3.1.5 *Escalation*

Cost estimates include escalation for one year from October 2010 to October 2011 as requested by the Central Valley Flood Protection Planning Group. Escalation is assumed at 3 percent per year.

3.1.6 *Other Direct and Indirect Costs*

In addition to escalation, estimates provided with this memorandum include appropriate allowances for engineering and design, engineering support during construction, construction management, and owner legal costs. The respective factors for these costs are presented in Attachment 1.

3.1.7 *Levee Segments Not Covered by the Draft GAR*

Based on the current segment count available, there are approximately 16 levee segments totaling approximately 31 miles in length in the North NULE Study Area that are not currently analyzed in the Draft GAR due to lack of data, lack of access, or other programmatic reasons. These segments typically include small levees that range in length from 0.1 miles to 5.5 miles, with an average length of approximately 1.9 miles. These missing segments represent only approximately 3.5 percent of the total levee length under study in the North NULE Study Area. Section 5.1 addresses the cost to remediate the 16 levee segments that are not currently included in the Draft GAR. Note that the missing segments are being inspected and evaluated as part of the ongoing GAR evaluation work, and specific remediation costs for these segments will be included in the Final RACER estimate after the GAR is finalized.

3.1.8 *Burrowing Animal Infestation*

Numerous levee segments and reaches are identified in the Draft GAR as having significant burrowing animal infestation. As agreed upon by TAT participants, such infestations were not taken as a cause for remediation by themselves. No estimated costs to treat burrowing animal infestation are included for levee segments in this memorandum.

DWR has evaluated an approximate cost to repair burrowing animal damage as a maintenance activity by evaluating historical data for a 23-mile-long segment of levee. The results of the evaluation indicate that the material, equipment, and labor cost to backfill holes can range from $2,000 to $3,000 per mile for one treatment cycle. The need for addition and/or ongoing treatment cycles, particularly in orchard areas, would increase this estimated cost.

3.1.9 *Guidance for Defining Dimensions For Slurry Walls and Seepage Berms for Estimating*

There are locations in the North NULE Study Area where the width of seepage berm or depth of slurry wall cannot be determined based on available information. In such cases, an approximation method was used to select wall depths and seepage berm widths that would provide comparable levels of protection. Selections of wall depth and berm width were based on landside height of levee and were agreed upon by TAT participants. Width and depth selection criteria are discussed further in the Estimating Assumptions (Attachment 1).

The assumptions described above and those documented in Attachment 1 were all reviewed and agreed upon by TAT participants for a conceptual planning effort and are reasonable and appropriate considering the limited physical and geotechnical data and a lack of specific remediation designs. Because of these limitations, URS recommends the estimates presented in this memorandum are solely used as a tool for levee remediation program planning. **These cost estimates should not be used for actual construction budget planning, particularly on a segment-by-segment basis.**

3.2 Estimating Tool Background and Update

In 2008, URS developed a draft version of the Estimating Tool to prepare conceptual-level cost estimates to remediate seepage, stability, and erosion deficiencies. The Estimating Tool included 20 alternative remediations for seepage, 6 remediations for stability, and 6 remediations for erosion. In addition to the direct civil construction costs for major work items, the Estimating Tool also included estimates for significant indirect cost items, such as engineering and design, construction management, site restoration, environmental mitigation, temporary and permanent real estate acquisitions, permitting/legal costs, escalation, and contingency.

The Estimating Tool was the starting point for developing and refining a simplified version used to prepare the estimates described in this memorandum. Simplification entailed reducing the number of remediation options available as described in Section 3.4, and, as previously noted, simplifying the routine to estimate environmental impact costs and rock slope protection costs for erosion remediation. The amount of input data required to prepare an estimate was also reduced by incorporating more capability into the programming. New programming maximized the internal calculation of quantities for standardized alternative templates using readily available average levee dimensions along a segment or reach. Simplifications to the Estimating Tool are warranted and commensurate with the limited information available to prepare the Draft GAR. The Estimating Tool was discussed at several TAT meetings; a version was provided to DWR for review and comment before production estimating began.

The original Estimating Tool did not include alternatives to remediate freeboard and geometry deficiencies. A standardized freeboard and geometry template was added to the Estimating Tool to prepare freeboard and geometry estimates presented in this memorandum.

3.3 Unit Rates for Estimating

Unit rates used in the Estimating Tool are generally the same rate used in the 2008 version. Rates were updated in several instances to reflect recent bid results and other estimating experience on levee remediation projects in northern California. Caution was used to avoid adopting any highly competitive lower rates seen bidding during the recent economic downturn.

3.4 Identifying Remediation Alternatives

From TAT discussions, and as noted previously, it was determined that only eight alternative remediations would be included in the Estimating Tool. These remediations could be used individually, or in combinations, to address all of the deficiencies identified in the Draft GAR. The eight alternative remediations are listed below:

Alternative	Type of Deficiency Remediated
Drained stability berm	Throughseepage and stability deficiencies
Seepage berm	Underseepage deficiency
Combination drained stability and seepage berm	Throughseepage, underseepage, stability deficiencies
Conventional soil-bentonite slurry wall (up to 75 feet remediation depth)	Throughseepage and underseepage deficiencies
Deep Soil Mixing (DSM) wall (greater than 70 feet remediation depth)	Throughseepage and underseepage deficiencies
Rock slope protection	Waterside erosion deficiency
Replacement levee	Throughseepage and stability deficiencies
Freeboard/geometry remediation	Freeboard and/or geometry deficiencies

Standardized details were developed for each remediation to be used as building blocks that could be estimated separately and combined with others to provide a complete remediation estimate for any given set of deficiencies. Typical remediation details for berms and seepage cutoff walls are shown on Figure 2. Lettered dimensions on Figure 2 are those typically used as input for the Estimating Tool. Figure 3 shows typical details for the rock slope protection remediation. Different remediation combinations could be used to provide alternative remediation sets for comparison and selection of the minimum cost. For example, a slurry wall and stability berm combination could be compared against a combination berm where underseepage, throughseepage, and stability deficiencies exist. Figure 4 shows typical details for the freeboard and geometry remediation. Note that the remediation assumes that landside levee widening would be used to provide acceptable freeboard and geometry configurations and to minimize environmental remediation costs associated with work on the waterside of the levee.

3.5 Miscellaneous Remediations

Additional potential remediation costs other than those already mentioned were also evaluated for physical conditions and anomalous hazards that could affect levee performance. As segments and reaches were being evaluated for the Draft GAR, ancillary features were occasionally noted that could influence levee performance. These features include anomalous hazards such as pump stations with pipes through or under a levee, other utilities through or under levees, irrigation and drainage canals terminating at levees, minor bridges, reconstruction of paved roads on levees, etc. Because of the limited coverage of miscellaneous items available in the Draft GAR, the cost estimates presented herein do not include specific allowance for miscellaneous remediations. They are assumed covered in the 30 percent contingency applied to all estimates.

3.6 Levee Segments Evaluated

Based upon the current count of levees within the North NULE Study Area, approximately 191 levee segments and reaches fall within the North NULE Study Area. Of these, approximately 176 segments and reaches are covered by the Draft GAR, addressing approximately 810 miles of levee. The remaining segments (approximately 31 miles in total length) are not included as noted previously due to the lack of data, lack of entry for inspections, or other programmatic reasons.

Of the 176 levee segments and reaches analyzed for cost based upon the Draft GAR, 22 are assigned to Hazard Category A (no failure modes requiring remediation at this time). This leaves 154 segments and reaches that are assigned to Hazard Categories B, C, or LD for one or more potential failure modes. For the remaining 154 segments and reaches, remediations were selected and cost estimates were prepared.

4.0 TASK U107-2, SELECTION OF REMEDIATION ALTERNATIVES AND DEVELOPMENT OF COST ESTIMATES FOR PROJECT AND NON-PROJECT LEVEE SECTIONS

4.1 Selecting Remediation Alternatives

Four teams were established to review and select remediation alternatives for each segment in the Draft GAR where one or more deficiencies were identified. For continuity, teams were established and assigned segments so that team members already would be familiar with the segments from their previous work on the Draft GAR. All deficiencies categorized as B, C, or LD in the Draft GAR were assumed to require remediation. Segments with an overall Category A classification that had a freeboard/geometry deficiency identified in the Draft GAR were remediated for the freeboard/geometry deficiency.

Teams used a standardized Remediation Selection Form (Figure 5) to identify remediations to be estimated, including an alternative where possible, and to fill in the basic data required for the estimate (length, depth, width of the remediation, etc.).

After remediation alternatives were selected by each team, the selections shown on the Remediation Selection Forms were reviewed and critiqued by an independent senior review committee composed of URS and DWR representatives familiar with the levee system. Kleinfelder followed a similar process and representatives of Kleinfelder and URS participated in each other's review sessions to ensure consistency in the remediation selection and senior review process between the North and South NULE Study Areas. After the review process was completed for segments, the Remediation Selection Forms were used by the estimating team to prepare the cost estimates.

4.2 Preparing Cost Estimates

The Estimating Tool was used to prepare estimates for remediation combinations identified on the Remediation Selection Forms.

4.3 Compiling Estimate Data For Presentation

Because of the large volume of estimating data generated, URS used a Microsoft Access database to compile the results. The database was then used as a tool to analyze the data and tabulate the results in a series of summary tables discussed further in Section 5.0. The content and format of the summary tables were discussed at the TAT meeting and the table formats were approved before the tables were finalized. The database evaluated the cost of alternatives to remediate a deficiency and selected the minimum cost remediation, which then was carried forward to the various tables described below in Section 5.0.

5.0 OPINION OF PROBABLE COST

5.1 Remediation Costs for Levee Segments Included in the Draft GAR

Estimating results are presented using four tables presented at the end of this memorandum. As discussed during the TAT meetings, costs are segregated based upon the type of remediation required as follows:

- Structural Remediations (addressing throughseepage, under seepage, and stability deficiencies)
- Waterside Erosion Remediations
- Freeboard and Geometry Remediations

For each type of remediation, costs are typically sorted and grouped first by GAR Study Area (i.e., 1, 2, 3, 4, 5), then by overall hazard categorization (i.e., A, B, C, or LD), then by segment number and name (i.e., Segment 47, Chico Mud Unit 3a).

Table 1 provides an overall summary of costs by GAR study area and type of remediation that could be required.

Table 2 provides the summary of costs specifically for the structural remediations to address throughseepage, under seepage, and stability deficiencies.

Table 3 provides the summary of costs specifically for erosion remediations based upon the individual segment categorization for erosion provided in the Draft GAR. As mentioned previously, these costs were developed assuming the individual deficient lengths identified in the Draft GAR for each segment were repaired regardless of hazard categorization (B, C, LD). This represents an upper bound estimate of the erosion remediation cost. A lower bound cost estimate for erosion repair was also estimated by assuming that only about 20 percent of the deficient erosion length specified in the Draft GAR is remediated immediately, and the remainder is remediated on an ongoing basis using maintenance budgets. This assumption would result in reducing the costs provided in Table 3 by 80 percent. Another approach to remediating erosion might be to remediate only segments with Erosion Category C leaving Categories B and LD to be remediated as an ongoing maintenance activity. These costing approaches are summarized as follows:

Possible Waterside Erosion Remediation Strategies	Estimated Cost
1. Remediate All Deficient Lengths in Draft GAR (B, C, LD)	$2,648,000,000
2. Remediate Only Individual Erosion Category C Deficient Lengths in Draft GAR	$ 799,252,000
3. Remediate 20 Percent of All erosion Deficient Length in Draft GAR	$ 530,000,000
4. Remediate 20 Percent of Only Individual Erosion Category C Deficient Length in Draft GAR	$ 159,850,000

Table 4 provides the summary of costs to remediate freeboard and geometry deficiencies.

Detailed backup information for all estimates (segment by segment) is provided in Attachment 2. Tables 1 through 4 were developed by sorting the information from the database (Attachment 2) for this memorandum.

5.2 Remediation Costs for Levee Segment Not Included in the Draft GAR

As stated earlier, approximately 16 levee segments representing approximately 3.5 percent of the total levee length within the North NULE Study Area are not evaluated for deficiencies in the Draft GAR. The TAT agreed that a cost should be allowed in the cost estimate provided in this memorandum to cover the missing segments. A review of the missing segments typically shows them to be small levees relative to the ones already evaluated in the Draft GAR. Because of the nature of these levees, the possibility that several could be assigned to Hazard Category A, and the anticipated low remediation costs that would be anticipated to correct deficiencies, it is reasonable to assume at this time that the remediation cost would be covered within the 30 percent contingency used in all estimates prepared for levee segments covered by the Draft GAR. Costs for missing segments will be included in the Draft RACER Report due when the GAR is completed.

6.0 ESTIMATE LIMITATIONS AND FUTURE UPDATES

The estimates provided in this memorandum are order-of-magnitude estimates based on limited data provided in the Draft GAR. Simplifying assumptions were made by URS and agreed to by the TAT to facilitate estimating. The assumptions are reasonable and appropriate considering the limited physical and geotechnical data and lack of specific remediation designs. The extent and depth of selected remediations used to address deficiencies identified in the Draft GAR and estimate costs are based on engineering judgment without detailed analysis, which is beyond the scope of work authorized by the task order. Cost estimate results presented in this memorandum should only be used by DWR as a tool for levee remediation program planning and not for actual construction budget planning, particularly on a segment-by-segment basis.

Estimates provided here are based on the current Draft GAR. The Draft GAR is being updated and a revised estimate of remediation cost should be completed when the Final GAR is completed.

The extent of surface and subsurface information relative to the levees within the North NULE Study Area will continue to increase. As additional information on levee conditions continues to be obtained after completion of the GAR, further updates of the cost estimates presented in this memorandum will be necessary.

TABLES

Table 1 Remediation Costs Grouped By GAR Study Area and Assigned Category

Table 2 Throughseepage, Under seepage and Stability Remediation Costs Grouped by Study Area and Assigned Category

Table 3 Erosion Remediation Costs Grouped by Study Area and Assigned Category

Table 4 Freeboard and Geometry Costs Grouped by GAR Study Area

TABLE 1
NORTH NULE RACER
REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

Overall Summary

GAR Overall Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
A	159,330	0	$0	0	$0	90,400	$50,104,000
B	1,384,480	823,960	$1,380,670,000	382,980	$629,497,000	541,720	$197,252,000
C	2,327,710	2,065,980	$3,707,281,000	1,065,880	$1,979,208,000	875,480	$316,581,000
LD	211,670	126,360	$156,882,000	0	$0	121,970	$48,415,000
LD (A or B)	73,610	53,400	$49,953,000	0	$0	55,730	$21,389,000
LD (B or C)	100,000	73,420	$152,443,000	21,330	$39,308,000	44,150	$13,476,000
Grand Total:	4,256,810	3,143,120	$5,447,230,000	1,470,190	$2,648,012,000	1,729,440	$647,217,000

1 Structural Remediations include throughseepage, under seepage, and stability remediations.

Note: Estimates are order of magnitude estimates based upon repairing the full remediation extent specified in the Draft GAR.

TABLE 1
NORTH NULE RACER
REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 1

GAR Overall Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
A	51,130	0	$0	0	$0	32,830	$13,351,000
B	279,630	127,380	$201,147,000	92,230	$119,722,000	139,450	$51,042,000
C	85,110	54,010	$48,781,000	33,390	$45,572,000	22,960	$7,585,000
LD	77,830	50,530	$61,131,000	0	$0	59,080	$22,112,000
LD (A or B)	35,970	24,600	$29,767,000	0	$0	18,940	$5,198,000
Subtotal	529,670	256,530	$340,826,000	125,620	$165,294,000	273,260	$99,288,000

GAR Study Area: 2

GAR Overall Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
B	198,360	97,500	$137,389,000	41,570	$37,956,000	72,030	$20,793,000
C	1,006,330	850,260	$1,596,729,000	385,060	$724,355,000	391,530	$143,480,000
LD (B or C)	15,270	13,740	$26,089,000	4,580	$7,522,000	1,530	$502,000
Subtotal	1,219,960	961,500	$1,760,207,000	431,210	$769,833,000	465,080	$164,775,000

1 Structural Remediations include throughseepage, under seepage, and stability remediations.

Note: Estimates are order of magnitude estimates based upon repairing the full remediation extent specified in the Draft GAR.

TABLE 1
NORTH NULE RACER
REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 3

GAR Overall Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
B	211,830	149,130	$258,120,000	55,950	$105,966,000	71,080	$25,676,000
C	338,060	317,860	$448,578,000	119,050	$243,572,000	101,280	$35,460,000
LD	15,660	5,510	$8,304,000	0	$0	6,190	$3,775,000
LD (B or C)	27,550	24,330	$33,949,000	6,520	$9,270,000	8,390	$2,634,000
Subtotal	593,110	496,830	$748,952,000	181,520	$358,808,000	186,940	$67,545,000

GAR Study Area: 4

GAR Overall Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
A	56,700	0	$0	0	$0	26,670	$16,293,000
B	93,890	80,980	$147,971,000	45,250	$81,483,000	33,140	$12,760,000
C	313,570	313,570	$494,577,000	270,390	$481,100,000	167,430	$61,801,000
LD	57,940	42,630	$55,790,000	0	$0	36,320	$16,667,000
LD (A or B)	20,240	20,110	$13,293,000	0	$0	19,390	$8,869,000
Subtotal	542,330	457,290	$711,632,000	315,640	$562,583,000	282,960	$116,390,000

1 Structural Remediations include throughseepage, under seepage, and stability remediations.

Note: Estimates are order of magnitude estimates based upon repairing the full remediation extent specified in the Draft GAR.

TABLE 1
NORTH NULE RACER
REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 5

GAR Overall Categorization	Total Segment Length (Feet)	Structural Remediations [1]		Erosion Remediations		Freeboard/Geometry Remediations	
		Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)
A	51,500	0	$0	0	$0	30,900	$20,460,000
B	600,780	368,960	$636,044,000	147,970	$284,370,000	226,020	$86,981,000
C	584,640	530,280	$1,118,615,000	258,000	$484,609,000	192,280	$68,255,000
LD	60,240	27,680	$31,658,000	0	$0	20,370	$5,860,000
LD (A or B)	17,400	8,700	$6,893,000	0	$0	17,400	$7,322,000
LD (B or C)	57,180	35,350	$92,405,000	10,240	$22,516,000	34,230	$10,340,000
Subtotal	1,371,740	970,990	$1,885,614,000	416,210	$791,494,000	521,200	$199,219,000

1 Structural Remediations include throughseepage, under seepage, and stability remediations.

Note: Estimates are order of magnitude estimates based upon repairing the full remediation extent specified in the Draft GAR.

TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 1

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
	Overall Segment Categorization: B					
48.2	Chico-Mud Unit 3c	5,320	U+E+FG	2,610	$1,971,000	$3,991,000
68.0	LD 3-Glenn, Sacramento River (Glenn Co)	63,230	T+U+Ss	9,480	$19,268,000	$10,726,000
68.0	LD 3-Glenn, Sacramento River (Glenn Co)	63,230	T+U+Ss+E+FG	22,130	$32,978,000	$7,868,000
103.0	Maintenance Area No. 05 - Unit 1	42,050	U+Ss+E+FG	8,410	$12,365,000	$7,763,000
103.0	Maintenance Area No. 05 - Unit 1	42,050	U+FG	2,100	$2,979,000	$7,482,000
103.0	Maintenance Area No. 05 - Unit 1	42,050	U	2,100	$1,815,000	$4,558,000
104.0	Maintenance Area No. 05 - Unit 2c	42,280	Ss	6,340	$3,849,000	$3,205,000
104.0	Maintenance Area No. 05 - Unit 2c	42,280	U+FG	6,340	$5,755,000	$4,792,000
104.0	Maintenance Area No. 05 - Unit 2c	42,280	U+E+FG	6,340	$8,341,000	$6,945,000
104.0	Maintenance Area No. 05 - Unit 2c	42,280	Ss	6,340	$4,703,000	$3,916,000
161.0	Sacramento River East Levee Unit 1d	37,510	T	1,880	$1,522,000	$4,285,000
161.0	Sacramento River East Levee Unit 1d	37,510	T+U+E+FG	7,500	$11,604,000	$8,167,000
263.1	Maintenance Area No. 05 - Unit 2b	12,220	T+U	9,780	$27,554,000	$14,876,000
263.1	Maintenance Area No. 05 - Unit 2b	12,220	T+U+E+FG	2,440	$9,866,000	$21,305,000
272.0	Maintenance Area No. 13 - Unit 1c	28,100	Sn	8,430	$5,134,000	$3,216,000
381.1	Maintenance Area No. 05 - Unit 1	25,150	U	2,520	$6,224,000	$13,067,000
381.1	Maintenance Area No. 05 - Unit 1	25,150	T+U+E+FG	20,120	$41,209,000	$10,814,000

Note: Estimates are order of magnitude estimates based upon throughseepage, underseepage, and stability deficeincy extents specified in the Draft GAR.

Legend: T = Throughseepage Ss = Seepage Related Stability FG = Freeboard and Geometry
U = Under Seepage Sn = Non-seepage Related Stability E = Erosion

TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 1

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
381.1	Maintenance Area No. 05 - Unit 1	25,150	U+FG	2,520	$4,009,000	$8,416,000
	Subtotal for Categorization B	255,860		127,380	$201,147,000	$8,337,000
	Overall Segment Categorization: C					
160.0	Sacramento River East Levee Unit 1b, and Unit 1	50,080	T	15,020	$11,472,000	$4,032,000
160.0	Sacramento River East Levee Unit 1b, and Unit 1	50,080	U+E+FG	10,020	$13,612,000	$7,176,000
291.0	Sacramento River East Levee Unit 3, Colusa Wei	12,110	U+E+FG	6,050	$8,908,000	$7,770,000
383.2	Maintenance Area No. 13 - Unit 2e	22,920	Sn	7,790	$5,922,000	$4,013,000
383.2	Maintenance Area No. 13 - Unit 2e	22,920	Sn	15,130	$8,866,000	$3,095,000
	Subtotal for Categorization C	85,110		54,010	$48,781,000	$4,768,000
	Overall Segment Categorization: LD					
108.0	Maintenance Area No. 13 - Unit 1a	18,160	T+U	9,080	$8,703,000	$5,060,000
109.0	Maintenance Area No. 13 - Unit 2a	19,050	U	9,520	$8,414,000	$4,665,000
159.0	Sacramento River East Levee Unit 1a	17,750	T+U	9,050	$15,568,000	$9,081,000
263.2	Maintenance Area No. 05 - Unit 2b	12,220	T+U	3,060	$6,415,000	$11,083,000
263.2	Maintenance Area No. 05 - Unit 2b	12,220	T+U+FG	9,170	$13,653,000	$7,862,000
271.0	Maintenance Area No. 13 - Unit 2c	6,700	U	2,010	$1,946,000	$5,112,000
271.0	Maintenance Area No. 13 - Unit 2c	6,700	U	4,690	$3,268,000	$3,680,000
1,027.0	Segment 1027	3,950	T+U	3,950	$3,164,000	$4,230,000
	Subtotal for Categorization LD	77,830		50,530	$61,131,000	$6,387,000

Note: Estimates are order of magnitude estimates based upon throughseepage, underseepage, and stability deficeincy extents specified in the Draft GAR.

Legend: T = Throughseepage Ss = Seepage Related Stability FG = Freeboard and Geometry
U = Under Seepage Sn = Non-seepage Related Stability E = Erosion

TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 1

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
	Overall Segment Categorization: LD (A or B)					
45.2	Chico-Mud Unit 1a	13,760	T+U	13,760	$20,845,000	$8,001,000
47.0	Chico-Mud Unit 3a	11,410	U+FG	1,480	$1,137,000	$4,046,000
47.0	Chico-Mud Unit 3a	11,410	U+FG	3,990	$3,767,000	$4,979,000
48.1	Chico-Mud Unit 3c	4,560	U+FG	680	$466,000	$3,597,000
269.0	Chico-Mud Unit 2a	6,240	U	4,680	$3,552,000	$4,008,000
	Subtotal for Categorization LD (A or B)	35,970		24,600	$29,767,000	$6,390,000
Subtotal for GAR Study Area 1		454,770		256,530	$340,826,000	$7,015,000

Note: Estimates are order of magnitude estimates based upon throughseepage, underseepage, and stability deficeincy extents specified in the Draft GAR.

Legend: T = Throughseepage Ss = Seepage Related Stability FG = Freeboard and Geometry
U = Under Seepage Sn = Non-seepage Related Stability E = Erosion

TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 2

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
	Overall Segment Categorization: B					
57.0	Elder Creek Unit 4b - Tehama County	4,930	U+E+FG	2,020	$1,600,000	$4,181,000
58.0	Elder Creek Unit 4a - Tehama County	15,930	T+U	1,750	$2,961,000	$8,922,000
58.0	Elder Creek Unit 4a - Tehama County	15,930	T+U+E	6,210	$3,879,000	$3,297,000
59.0	Elder Creek Unit 5 - Tehama County	20,360	T+U+FG	6,110	$5,180,000	$4,477,000
59.0	Elder Creek Unit 5 - Tehama County	20,360	T+U+E+FG	6,310	$4,004,000	$3,349,000
65.0	LD 1-Glenn, Sacramento River	64,720	T+U+Ss	16,180	$20,174,000	$6,583,000
65.0	LD 1-Glenn, Sacramento River	64,720	U+E+FG	3,240	$3,664,000	$5,979,000
67.0	LD 2-Glenn, Sacramento River	25,920	T+U+Ss	5,180	$9,292,000	$9,466,000
67.0	LD 2-Glenn, Sacramento River	25,920	U+FG	7,770	$12,840,000	$8,720,000
100.0	Maintenance Area No. 01	13,400	T+U+FG	3,350	$6,962,000	$10,974,000
100.0	Maintenance Area No. 01	13,400	T	3,350	$2,954,000	$4,656,000
165.0	Tisdale Bypass Unit 1 - north bank	23,670	U+Sn	14,200	$24,236,000	$9,009,000
165.0	Tisdale Bypass Unit 1 - north bank	23,670	U	7,100	$11,871,000	$8,825,000
286.0	Maintenance Area No. 01	29,420	T+U	14,710	$27,771,000	$9,966,000
	Subtotal for Categorization B	198,360		97,500	$137,389,000	$7,440,000
	Overall Segment Categorization: C					
54.0	Deer Creek Unit 1b	16,320	T+U+E+FG	9,800	$8,097,000	$4,364,000
55.0	Deer Creek Unit 2	7,640	U+E+FG	3,590	$2,466,000	$3,628,000

Note: Estimates are order of magnitude estimates based upon throughseepage, underseepage, and stability deficeincy extents specified in the Draft GAR.

Legend: T = Throughseepage Ss = Seepage Related Stability FG = Freeboard and Geometry
U = Under Seepage Sn = Non-seepage Related Stability E = Erosion

TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 2

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
107.0	Maintenance Area No. 12	60,000	U+Ss	6,000	$4,880,000	$4,294,000
107.0	Maintenance Area No. 12	60,000	Ss	54,000	$43,924,000	$4,294,000
115.0	RD 0070 Unit 2	81,840	T+U+Sn	16,370	$34,313,000	$11,068,000
115.0	RD 0070 Unit 2	81,840	T	32,740	$34,109,000	$5,501,000
115.0	RD 0070 Unit 2	81,840	Sn	24,550	$25,582,000	$5,501,000
116.0	RD 0108 (Colusa Co, and Yolo Co)	107,480	Sn+E+FG	63,410	$61,195,000	$5,095,000
116.0	RD 0108 (Colusa Co, and Yolo Co)	107,480	Sn	53,740	$38,566,000	$3,789,000
137.0	RD 0787	23,480	Sn+E+FG	23,480	$27,607,000	$6,209,000
146.0	RD 1500 Unit 1	174,960	T+U+Sn	174,960	$334,227,000	$10,087,000
158.0	Sacramento River West Side Levee District	139,270	T+U+E+FG	69,640	$152,314,000	$11,549,000
166.0	Tisdale Bypass Unit 2 - south bank	23,380	U+Sn	14,030	$36,646,000	$13,793,000
166.0	Tisdale Bypass Unit 2 - south bank	23,380	T+U	9,350	$17,350,000	$9,795,000
248.0	RD 1660 Unit 2	48,160	T+U+Sn	19,270	$50,776,000	$13,916,000
248.0	RD 1660 Unit 2	48,160	T+Sn	9,630	$10,588,000	$5,804,000
248.0	RD 1660 Unit 2	48,160	T+U	19,270	$53,055,000	$14,541,000
287.0	Sacramento River West Side Levee District	28,120	T+U+Sn	7,030	$17,739,000	$13,325,000
287.0	Sacramento River West Side Levee District	28,120	T+U+E	21,090	$53,511,000	$13,399,000
288.0	Sacramento River West Side Levee District	93,200	U	13,980	$28,943,000	$10,931,000

Note: Estimates are order of magnitude estimates based upon throughseepage, underseepage, and stability deficeincy extents specified in the Draft GAR.

Legend: T = Throughseepage Ss = Seepage Related Stability FG = Freeboard and Geometry
U = Under Seepage Sn = Non-seepage Related Stability E = Erosion

TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 2

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
288.0	Sacramento River West Side Levee District	93,200	T+U+Sn+E+FG	18,640	$41,878,000	$11,862,000
293.0	RD 0070 Unit 1	41,800	T+U	31,350	$92,769,000	$15,625,000
293.0	RD 0070 Unit 1	41,800	U	10,450	$26,139,000	$13,208,000
294.0	RD 1500 Unit 2	109,500	T+U	54,750	$171,062,000	$16,498,000
294.0	RD 1500 Unit 2	109,500	T+U+Sn	54,750	$171,062,000	$16,498,000
380.0	Maintenance Area No. 01	45,880	T+U+E+FG	16,060	$27,836,000	$9,154,000
380.0	Maintenance Area No. 01	45,880	U	18,350	$30,093,000	$8,659,000
	Subtotal for Categorization C	1,001,030		850,260	$1,596,729,000	$9,916,000
	Overall Segment Categorization: LD (B or C)					
149.0	RD 1660 Unit 1	15,270	T+U+Sn	4,580	$8,696,000	$10,023,000
149.0	RD 1660 Unit 1	15,270	T+U	9,160	$17,393,000	$10,023,000
	Subtotal for Categorization LD (B or C)	15,270		13,740	$26,089,000	$10,023,000
Subtotal for GAR Study Area 2		1,214,660		961,500	$1,760,207,000	$9,666,000

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TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 3

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
	Overall Segment Categorization: B					
52.1	Marysville Unit 3 (NE extension)	20,150	T+U+Sn	2,010	$3,970,000	$10,405,000
52.1	Marysville Unit 3 (NE extension)	20,150	T+U+Sn	3,020	$10,381,000	$18,137,000
52.1	Marysville Unit 3 (NE extension)	20,150	U	2,010	$3,052,000	$7,999,000
52.1	Marysville Unit 3 (NE extension)	20,150	T+U+Sn	7,050	$13,895,000	$10,405,000
101.0	Maintenance Area No. 03	11,600	T	5,800	$3,606,000	$3,282,000
101.0	Maintenance Area No. 03	11,600	T+U+E	5,800	$18,600,000	$16,932,000
114.0	RD 0010 Unit 1	40,410	T+Sn	14,140	$18,393,000	$6,867,000
114.0	RD 0010 Unit 1	40,410	T	6,060	$4,402,000	$3,835,000
114.0	RD 0010 Unit 1	40,410	T+U	6,060	$20,178,000	$17,578,000
114.0	RD 0010 Unit 1	40,410	T+U+Sn	6,060	$18,712,000	$16,301,000
145.0	RD 1001 Unit 2	19,240	T+U+E+FG	9,620	$14,489,000	$7,955,000
145.0	RD 1001 Unit 2	19,240	U+Ss	1,920	$3,128,000	$8,587,000
145.0	RD 1001 Unit 2	19,240	U	1,920	$2,957,000	$8,117,000
163.0	Sutter Bypass - East Levee - north	22,700	Sn	5,680	$6,397,000	$5,952,000
163.0	Sutter Bypass - East Levee - north	22,700	U+E+FG	17,020	$42,619,000	$13,217,000
167.0	Wadsworth Canal Unit 1	11,600	U+E+FG	2,320	$2,194,000	$4,993,000
168.0	Wadsworth Canal Unit 2	24,300	U+E+FG	12,640	$27,034,000	$11,296,000

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NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 3

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
168.0	Wadsworth Canal Unit 2	24,300	T	6,080	$6,360,000	$5,527,000
275.0	RD 0010 Unit 3	14,850	T+U	740	$691,000	$4,913,000
275.0	RD 0010 Unit 3	14,850	T	8,170	$5,694,000	$3,681,000
275.0	RD 0010 Unit 3	14,850	T+U	3,710	$3,938,000	$5,601,000
275.0	RD 0010 Unit 3	14,850	T	2,230	$1,318,000	$3,124,000
285.0	RD 1001 Unit 6	24,820	Sn	6,200	$4,853,000	$4,130,000
285.0	RD 1001 Unit 6	24,820	U	6,200	$8,650,000	$7,361,000
392.0	RD 0784 Unit 5b	22,180	T+U+E	6,650	$12,611,000	$10,009,000
	Subtotal for Categorization B	200,230		149,130	$258,120,000	$9,139,000
	Overall Segment Categorization: C					
144.0	RD 1001 Unit 1	22,180	T+U+FG	11,530	$11,942,000	$5,468,000
144.0	RD 1001 Unit 1	22,180	U+Sn+FG	10,640	$18,540,000	$9,196,000
154.0	RD 2103 Unit 1b	17,950	T+U+E+FG	17,950	$18,598,000	$5,471,000
164.0	Sutter Bypass - East Levee - south	72,900	Sn	18,220	$18,514,000	$5,364,000
164.0	Sutter Bypass - East Levee - south	72,900	T+U	18,220	$45,384,000	$13,148,000
164.0	Sutter Bypass - East Levee - south	72,900	U+Sn	18,220	$45,384,000	$13,148,000
164.0	Sutter Bypass - East Levee - south	72,900	U+E+FG	18,220	$42,248,000	$12,240,000
246.0	RD 1001 Unit 3, and Unit 3a	49,630	T+U+Ss	6,450	$13,667,000	$11,184,000

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NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 3

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
246.0	RD 1001 Unit 3, and Unit 3a	49,630	T+U+Ss	5,960	$10,363,000	$9,187,000
246.0	RD 1001 Unit 3, and Unit 3a	49,630	T+U+FG	13,900	$23,888,000	$9,076,000
246.0	RD 1001 Unit 3, and Unit 3a	49,630	T+U+E+FG	23,330	$29,392,000	$6,653,000
247.0	RD 1001 Unit 4	70,220	T+U+Ss+E+FG	66,010	$1,870,000	$150,000
247.0	RD 1001 Unit 4	70,220	T+U+Ss+FG	700	$3,741,000	$28,126,000
247.0	RD 1001 Unit 4	70,220	T+U+Ss+FG	1,400	$5,161,000	$19,402,000
247.0	RD 1001 Unit 4	70,220	T+U+Ss+FG	4,210	$4,948,000	$6,201,000
283.0	RD 1001 Unit 3b	16,630	T+U+Ss+E+FG	1,830	$3,792,000	$10,944,000
283.0	RD 1001 Unit 3b	16,630	T+U+Ss	1,500	$5,161,000	$18,205,000
284.0	RD 1001 Unit 5	28,510	T+U	7,130	$17,859,000	$13,229,000
284.0	RD 1001 Unit 5	28,510	Sn	7,130	$7,902,000	$5,853,000
284.0	RD 1001 Unit 5	28,510	U+Sn	7,130	$17,859,000	$13,229,000
284.0	RD 1001 Unit 5	28,510	U+E	7,130	$16,392,000	$12,142,000
385.0	RD 0010 Unit 2	60,040	T+U	27,020	$57,942,000	$11,324,000
385.0	RD 0010 Unit 2	60,040	U	9,010	$12,682,000	$7,436,000
385.0	RD 0010 Unit 2	60,040	T	15,010	$15,350,000	$5,400,000
	Subtotal for Categorization C	338,060		317,860	$448,578,000	$7,451,000

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TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 3

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
	Overall Segment Categorization: LD					
62.0	Honcut Creek Area - Eastern	7,740	U	1,550	$1,963,000	$6,694,000
281.0	RD 0784 Unit 6	7,920	T+U	3,960	$6,341,000	$8,455,000
	Subtotal for Categorization LD	15,660		5,510	$8,304,000	$7,960,000
	Overall Segment Categorization: LD (B or C)					
135.0	RD 0784 Unit 3b	7,390	U	1,480	$2,439,000	$8,712,000
135.0	RD 0784 Unit 3b	7,390	T+U+E+FG	5,910	$10,945,000	$9,773,000
138.0	RD 0817 Unit 1	20,160	T+U	8,470	$5,564,000	$3,470,000
138.0	RD 0817 Unit 1	20,160	T+U+E+FG	8,470	$15,000,000	$9,354,000
	Subtotal for Categorization LD (B or C)	27,550		24,330	$33,949,000	$7,369,000
Subtotal for GAR Study Area 3		581,510		496,830	$748,952,000	$7,959,000

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TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 4

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
	Overall Segment Categorization: B					
78.0	Middle Creek - Unit 1a	5,680	T+E+FG	3,410	$1,438,000	$2,228,000
136.0	RD 0785 Unit 1	11,610	U+E+FG	11,610	$29,083,000	$13,226,000
139.0	RD 0827 Unit 1	7,390	T+U+E+FG	7,390	$17,315,000	$12,371,000
156.1	Sacramento Bypass Unit 1 - north bank	6,330	T+U+Ss	6,330	$15,855,000	$13,225,000
156.2	Sacramento Bypass Unit 1 - north bank	3,050	Sn+E	3,050	$3,380,000	$5,852,000
162.0	Service Area 6 - Yolo County	30,530	T+Sn	2,750	$2,866,000	$5,506,000
162.0	Service Area 6 - Yolo County	30,530	T+U+Sn+E+FG	24,430	$45,391,000	$9,812,000
172.0	Yolo Bypass West Levee Unit 1	13,800	T+U+Sn+E+FG	9,660	$20,908,000	$11,424,000
172.0	Yolo Bypass West Levee Unit 1	13,800	Sn	1,380	$1,436,000	$5,491,000
173.0	Yolo Bypass West Levee Unit 2	7,960	Sn+E+FG	7,960	$7,481,000	$4,961,000
174.0	Yolo Bypass West Levee Unit 3	7,530	Sn+E	3,010	$2,818,000	$4,941,000
	Subtotal for Categorization B	93,890		80,980	$147,971,000	$9,648,000
	Overall Segment Categorization: C					
41.0	Cache Creek - Yolo County Unit 1b	61,700	T+U+FG	30,230	$41,343,000	$7,220,000
41.0	Cache Creek - Yolo County Unit 1b	61,700	T+U+E+FG	31,470	$60,924,000	$10,223,000
81.2	Middle Creek - Unit 1e	13,260	T+U+Ss+E+FG	13,260	$15,725,000	$6,261,000
124.0	RD 0537 Unit 1 - northh of Sac Bypass	19,500	T+U+E	19,500	$47,489,000	$12,858,000
147.0	RD 1600 Unit 1	54,910	T+U+Ss+E+FG	54,910	$108,540,000	$10,437,000

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NORTH NULE RACER
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GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 4

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
150.0	RD 2035 Unit 2 - Yolo Bypass	16,400	T+U+Sn+E+FG	16,400	$30,625,000	$9,860,000
171.0	Yolo Bypass East Levee	10,560	Sn+E+FG	5,280	$6,399,000	$6,399,000
171.0	Yolo Bypass East Levee	10,560	U+Sn	5,280	$14,190,000	$14,190,000
216.0	Knights Landing Ridge Cut - Unit 1	35,060	Sn	3,510	$2,906,000	$4,376,000
216.0	Knights Landing Ridge Cut - Unit 1	35,060	T+Sn+E+FG	31,550	$26,152,000	$4,376,000
217.0	Knights Landing Ridge Cut - Unit 2	34,870	Sn	3,840	$5,798,000	$7,982,000
217.0	Knights Landing Ridge Cut - Unit 2	34,870	Sn+E+FG	31,030	$27,838,000	$4,737,000
241.0	RD 0827 Unit 2	14,780	Sn+E+FG	10,350	$13,585,000	$6,931,000
241.0	RD 0827 Unit 2	14,780	U+Sn	4,440	$5,821,000	$6,930,000
295.0	RD 1600 Unit 2	22,180	Sn+E+FG	8,870	$10,977,000	$6,534,000
295.0	RD 1600 Unit 2	22,180	U+Sn	13,310	$36,932,000	$14,655,000
297.0	RD 2035 Unit 3 - Willow Bypass	12,920	T+U+Sn+E	12,920	$18,972,000	$7,750,000
393.0	RD 0785 Unit 2	17,420	Sn+E+FG	17,420	$20,361,000	$6,170,000
	Subtotal for Categorization C	313,570		313,570	$494,577,000	$8,328,000
	Overall Segment Categorization: LD					
81.1	Middle Creek - Unit 1e	3,820	Ss	3,060	$2,933,000	$5,067,000
81.1	Middle Creek - Unit 1e	3,820	U+Ss+FG	760	$1,151,000	$7,958,000
112.0	Putah Creek Unit 2 - south bank	41,850	T+U+FG	12,560	$18,871,000	$7,936,000

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NORTH NULE RACER
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GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 4

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
112.0	Putah Creek Unit 2 - south bank	41,850	U	16,740	$25,287,000	$7,976,000
237.0	Middle Creek - Unit 4 Alley Creek-Channel	6,870	T	2,750	$1,700,000	$3,264,000
237.0	Middle Creek - Unit 4 Alley Creek-Channel	6,870	T+U+FG	1,370	$1,510,000	$5,799,000
267.0	Middle Creek - Unit 5 Alley Creek-Channel	5,390	T+U+FG	5,390	$4,337,000	$4,247,000
	Subtotal for Categorization LD	57,940		42,630	$55,790,000	$6,910,000
	Overall Segment Categorization: LD (A or B)					
80.0	Middle Creek - Unit 3 - Scotts Creek	13,070	T+Ss+FG	4,050	$2,282,000	$2,973,000
80.0	Middle Creek - Unit 3 - Scotts Creek	13,070	T+FG	1,960	$1,135,000	$3,057,000
80.0	Middle Creek - Unit 3 - Scotts Creek	13,070	T+U+Ss+FG	4,970	$3,750,000	$3,986,000
80.0	Middle Creek - Unit 3 - Scotts Creek	13,070	T	1,960	$1,141,000	$3,072,000
268.0	Middle Creek - Unit 3b Scotts Creek	7,160	T	6,450	$4,160,000	$3,407,000
268.0	Middle Creek - Unit 3b Scotts Creek	7,160	T+U+FG	720	$826,000	$6,086,000
	Subtotal for Categorization LD (A or B)	20,240		20,110	$13,293,000	$3,491,000
Subtotal for GAR Study Area 4		485,630		457,290	$711,632,000	$8,217,000

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TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 5

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
	Overall Segment Categorization: B					
113.1	RD 0003 Unit 1	22,840	T	11,420	$12,135,000	$5,610,000
113.1	RD 0003 Unit 1	22,840	T+Sn	2,280	$2,427,000	$5,610,000
113.1	RD 0003 Unit 1	22,840	T+U+Sn+E	4,570	$10,907,000	$12,607,000
113.1	RD 0003 Unit 1	22,840	U+Sn	4,570	$10,907,000	$12,607,000
119.0	RD 0341 Unit 1	17,500	T+U+Sn+E+FG	17,500	$33,406,000	$10,078,000
126.0	RD 0551	35,830	U	3,580	$13,835,000	$20,386,000
126.0	RD 0551	35,830	U+E	10,750	$25,761,000	$12,653,000
129.0	RD 0556 Unit 1	28,940	T	7,230	$6,649,000	$4,853,000
129.0	RD 0556 Unit 1	28,940	Sn	8,680	$7,979,000	$4,853,000
129.0	RD 0556 Unit 1	28,940	U+E+FG	4,340	$7,392,000	$8,992,000
142.0	RD 0999 Unit 1	81,470	Sn+FG	48,880	$60,132,000	$6,495,000
152.0	RD 2068 Unit 1	29,210	Sn+E+FG	8,760	$7,291,000	$4,393,000
244.0	RD 0999 Unit 5	49,960	T	19,990	$21,571,000	$5,699,000
244.0	RD 0999 Unit 5	49,960	T+U+E+FG	14,990	$37,822,000	$13,323,000
249.0	RD 2098 Unit 4	15,570	Sn+FG	4,670	$2,838,000	$3,209,000
303.0	RD 0999 Unit 4	6,510	U+E	1,950	$14,472,000	$39,139,000
304.0	RD 0999 Unit 2	12,060	U	3,620	$9,789,000	$14,283,000

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GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 5

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
304.0	RD 0999 Unit 2	12,060	U+Sn+E+FG	2,410	$7,046,000	$15,422,000
304.0	RD 0999 Unit 2	12,060	Sn	6,030	$6,699,000	$5,865,000
305.0	RD 0999 Unit 3	19,770	T+U	11,860	$22,759,000	$10,129,000
305.0	RD 0999 Unit 3	19,770	T+U+Sn+E+FG	5,930	$11,691,000	$10,406,000
309.0	RD 0501 Unit 3	40,670	T+U+Sn+E+FG	24,400	$32,511,000	$7,035,000
309.0	RD 0501 Unit 3	40,670	U	8,130	$26,023,000	$16,893,000
309.0	RD 0501 Unit 3	40,670	T	4,070	$5,418,000	$7,035,000
309.0	RD 0501 Unit 3	40,670	U+Sn	4,070	$5,418,000	$7,035,000
310.0	RD 0501 Unit 4	12,040	U	3,610	$7,552,000	$11,040,000
310.0	RD 0501 Unit 4	12,040	Sn	1,200	$1,224,000	$5,366,000
310.0	RD 0501 Unit 4	12,040	U+Sn+FG	7,220	$15,934,000	$11,647,000
314.0	RD 2060 Unit 3a	23,320	Sn+E+FG	8,160	$6,615,000	$4,279,000
316.1	RD 0536 Unit 2	18,040	Sn	3,610	$4,049,000	$5,926,000
316.1	RD 0536 Unit 2	18,040	U+FG	1,800	$4,523,000	$13,237,000
316.1	RD 0536 Unit 2	18,040	U+Sn	7,220	$19,434,000	$14,219,000
316.2	RD 0536 Unit 2	8,250	T+U+Sn+FG	4,120	$7,032,000	$9,001,000
316.2	RD 0536 Unit 2	8,250	T+U	2,480	$4,219,000	$9,001,000
384.1	RD 0003 Unit 2	6,000	U+Ss	6,000	$6,060,000	$5,333,000

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GAR Study Area: 5

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
384.2	Sacramento River Right Bank Levee	85,620	U	13,700	$31,696,000	$12,216,000
386.0	RD 0150 Unit 3	49,610	T	14,880	$14,337,000	$5,086,000
386.0	RD 0150 Unit 3	49,610	T+U+E+FG	14,880	$43,759,000	$15,524,000
390.0	RD 0556 Unit 2	30,260	U	12,100	$27,535,000	$12,012,000
390.0	RD 0556 Unit 2	30,260	T+U+E	6,050	$14,394,000	$12,558,000
390.0	RD 0556 Unit 2	30,260	T	12,100	$12,632,000	$5,511,000
1,040.0	Segment 1040	7,300	U+FG	2,920	$9,098,000	$16,451,000
1,040.0	Segment 1040	7,300	U+Sn	2,190	$3,071,000	$7,404,000
	Subtotal for Categorization B	600,780		368,960	$636,044,000	$9,102,000
	Overall Segment Categorization: C					
40.0	Brannan-Andrus LMD Unit 1	31,800	T+U+FG	3,180	$8,776,000	$14,572,000
40.0	Brannan-Andrus LMD Unit 1	31,800	T+U+Sn	6,360	$8,770,000	$7,281,000
40.0	Brannan-Andrus LMD Unit 1	31,800	T+U	17,490	$27,661,000	$8,351,000
40.0	Brannan-Andrus LMD Unit 1	31,800	U	1,590	$2,515,000	$8,351,000
106.0	Maintenance Area No. 09	46,690	T+U+Ss+E+FG	4,670	$34,398,000	$38,900,000
106.0	Maintenance Area No. 09	46,690	T+U+Ss	14,010	$33,336,000	$12,566,000
106.0	Maintenance Area No. 09	46,690	U	18,680	$42,127,000	$11,910,000
106.0	Maintenance Area No. 09	46,690	T+Ss	9,340	$10,084,000	$5,702,000

Note: Estimates are order of magnitude estimates based upon throughseepage, underseepage, and stability deficeincy extents specified in the Draft GAR.

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TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 5

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
113.2	RD 0003 Unit 1	37,300	U+Sn	7,460	$24,420,000	$17,284,000
113.2	RD 0003 Unit 1	37,300	T+U+Sn+E	11,190	$36,630,000	$17,284,000
113.2	RD 0003 Unit 1	37,300	T	18,650	$23,115,000	$6,544,000
118.0	RD 0307	34,590	T	10,380	$22,448,000	$11,423,000
118.0	RD 0307	34,590	U	3,460	$7,348,000	$11,218,000
118.0	RD 0307	34,590	U+E+FG	13,840	$101,519,000	$38,743,000
118.0	RD 0307	34,590	T	3,460	$3,487,000	$5,323,000
122.0	RD 0501 Unit 1	15,250	T+U+Sn+E	4,570	$13,428,000	$15,501,000
122.0	RD 0501 Unit 1	15,250	T+U	4,570	$13,428,000	$15,501,000
122.0	RD 0501 Unit 1	15,250	U	6,100	$17,009,000	$14,727,000
123.2	RD 0536 Unit 1	22,800	T+U+Sn+FG	1,140	$2,461,000	$11,400,000
123.2	RD 0536 Unit 1	22,800	Sn	6,840	$6,873,000	$5,305,000
123.2	RD 0536 Unit 1	22,800	U+Sn	10,260	$22,153,000	$11,400,000
130.0	RD 0563	64,110	T+Sn	12,820	$11,983,000	$4,935,000
130.0	RD 0563	64,110	T+U	32,060	$57,351,000	$9,447,000
130.0	RD 0563	64,110	T+E+FG	19,230	$17,975,000	$4,935,000
131.0	RD 0755	9,700	T+U+E	7,760	$17,319,000	$11,784,000
131.0	RD 0755	9,700	T	970	$980,000	$5,336,000

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TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 5

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
148.0	RD 1601	13,680	T+U+E+FG	10,950	$29,206,000	$14,088,000
148.0	RD 1601	13,680	T+U+Sn+E+FG	2,740	$4,798,000	$9,257,000
151.1	RD 2060 Unit 1	25,650	T+U+Sn	17,950	$35,868,000	$10,548,000
151.1	RD 2060 Unit 1	25,650	Sn	7,690	$7,382,000	$5,065,000
306.0	RD 0150 Unit 2	41,280	T	16,510	$16,853,000	$5,390,000
306.0	RD 0150 Unit 2	41,280	U+E+FG	20,640	$45,985,000	$11,765,000
306.0	RD 0150 Unit 2	41,280	U	4,130	$30,092,000	$38,495,000
307.0	RD 0349 Unit 2	22,870	T	13,720	$13,267,000	$5,104,000
307.0	RD 0349 Unit 2	22,870	T+U+Sn+E+FG	6,860	$22,442,000	$17,268,000
307.0	RD 0349 Unit 2	22,870	U+Sn	2,290	$5,521,000	$12,745,000
308.0	RD 0501 Unit 2	18,810	U+Sn	3,760	$5,230,000	$7,339,000
308.0	RD 0501 Unit 2	18,810	T	7,530	$10,073,000	$7,067,000
308.0	RD 0501 Unit 2	18,810	T+U+Sn+E+FG	7,530	$10,461,000	$7,339,000
312.0	RD 2098 Unit 3	10,220	Sn+E+FG	6,130	$5,080,000	$4,373,000
313.0	RD 2098 Unit 2	9,980	Sn	7,980	$7,358,000	$4,865,000
313.0	RD 2098 Unit 2	9,980	U+Sn+E+FG	2,000	$2,278,000	$6,024,000
378.0	Brannan-Andrus LMD Unit 2	60,900	T	12,180	$8,724,000	$3,782,000
378.0	Brannan-Andrus LMD Unit 2	60,900	Sn+E	18,270	$13,086,000	$3,782,000

Note: Estimates are order of magnitude estimates based upon throughseepage, underseepage, and stability deficeincy extents specified in the Draft GAR.

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TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 5

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
378.0	Brannan-Andrus LMD Unit 2	60,900	T	6,090	$7,934,000	$6,879,000
387.0	RD 0341 Unit 2	33,120	T+U+Sn+E+FG	33,120	$71,836,000	$11,453,000
388.0	RD 0349 Unit 3	34,340	U	3,430	$6,815,000	$10,477,000
388.0	RD 0349 Unit 3	34,340	U+Sn+E+FG	17,170	$51,129,000	$15,720,000
1,043.0	North Fork Mokelumne River Right Bank	51,550	U+E+FG	25,780	$66,535,000	$13,630,000
1,043.0	North Fork Mokelumne River Right Bank	51,550	T+U+Sn	25,780	$73,068,000	$14,968,000
	Subtotal for Categorization C	584,640		530,280	$1,118,615,000	$11,138,000
	Overall Segment Categorization: LD					
117.0	RD 0150 Unit 1	2,760	T+U+FG	2,760	$4,340,000	$8,296,000
120.0	RD 0349 Unit 1	8,320	T	4,160	$3,563,000	$4,519,000
120.0	RD 0349 Unit 1	8,320	T+U+FG	4,160	$7,824,000	$9,926,000
151.2	RD 2060 Unit 1	11,040	U	1,100	$1,655,000	$7,914,000
153.2	RD 2098 Unit 1	500	U+Sn+FG	500	$1,327,000	$14,008,000
251.0	RD 2104 - west levee	18,550	Sn+FG	9,280	$7,662,000	$4,361,000
315.0	RD 2060 Unit 2	19,060	Sn+FG	5,720	$5,288,000	$4,883,000
	Subtotal for Categorization LD	60,240		27,680	$31,658,000	$6,038,000
	Overall Segment Categorization: LD (A or B)					
155.0	RD 2104 - Hass Slough	17,400	Sn+FG	8,700	$6,893,000	$4,183,000
	Subtotal for Categorization LD (A or B)	17,400		8,700	$6,893,000	$4,183,000

Note: Estimates are order of magnitude estimates based upon throughseepage, underseepage, and stability deficeincy extents specified in the Draft GAR.

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TABLE 2
NORTH NULE RACER
THROUGHSEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS
GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 5

Segment Reach	Segment/Reach Name	Length (Feet)	Deficiencies Being Remediated	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
	Overall Segment Categorization: LD (B or C)					
132.0	RD 0755	9,190	T+U+E+FG	3,670	$8,684,000	$12,477,000
153.1	RD 2098 Unit 1	16,800	Sn+E+FG	6,720	$7,718,000	$6,065,000
1,041.0	Snodgrass Slough Right Bank Levee	31,200	U+FG	6,240	$16,881,000	$14,284,000
1,041.0	Snodgrass Slough Right Bank Levee	31,200	U+Sn+FG	9,360	$35,481,000	$20,015,000
1,041.0	Snodgrass Slough Right Bank Levee	31,200	U	9,360	$23,642,000	$13,336,000
	Subtotal for Categorization LD (B or C)	57,180		35,350	$92,405,000	$13,801,000
Subtotal for GAR Study Area 5		1,320,240		970,990	$1,885,614,000	$10,254,000

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TABLE 3
NORTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 1

Segment	Segment Name	Segment Length (Feet)	Erosion Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)
Erosion Catergory: B					
45.1	Chico-Mud Unit 1a	23,770	7,130	$4,578,000	$3,390,000
48.2	Chico-Mud Unit 3c	5,320	5,320	$3,985,000	$3,955,000
68	LD 3-Glenn, Sacramento River (Glenn Co)	63,230	12,650	$17,304,000	$7,225,000
103	Maintenance Area No. 05 - Unit 1	42,050	8,410	$11,968,000	$7,514,000
104	Maintenance Area No. 05 - Unit 2c	42,280	21,140	$22,617,000	$5,650,000
161	Sacramento River East Levee Unit 1d	37,510	9,380	$13,345,000	$7,514,000
263.1	Maintenance Area No. 05 - Unit 2b	12,220	3,060	$7,381,000	$12,751,000
381.1	Maintenance Area No. 05 - Unit 1	25,150	25,150	$38,543,000	$8,092,000
383.2	Maintenance Area No. 13 - Unit 2e	22,920	2,290	$2,739,000	$6,309,000
	Erosion Category B	274,450	94,520	$122,460,000	$6,841,000
Erosion Catergory: C					
160	Sacramento River East Levee Unit 1b, and Unit 1c	50,080	25,040	$32,893,000	$6,936,000
291	Sacramento River East Levee Unit 3, Colusa Weir	12,110	6,050	$9,941,000	$8,670,000
	Erosion Category C	62,190	31,090	$42,833,000	$7,273,000
Total for GAR Study Area: 1		336,640	125,620	$165,294,000	$6,948,000

Note: Estimates are order of magnitude estimates based upon repairing the full remediation extent specified in the Draft GAR.

TABLE 3
NORTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 2

Segment	Segment Name	Segment Length (Feet)	Erosion Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)
Erosion Catergory: B					
57	Elder Creek Unit 4b - Tehama County	4,930	2,460	$2,110,000	$4,520,000
58	Elder Creek Unit 4a - Tehama County	15,930	12,740	$10,907,000	$4,520,000
59	Elder Creek Unit 5 - Tehama County	20,360	10,180	$7,626,000	$3,955,000
65	LD 1-Glenn, Sacramento River	64,720	16,180	$17,313,000	$5,650,000
115	RD 0070 Unit 2	81,840	40,920	$73,333,000	$9,462,000
116	RD 0108 (Colusa Co, and Yolo Co)	107,480	32,240	$59,589,000	$9,757,000
137	RD 0787	23,480	14,090	$31,553,000	$11,827,000
146	RD 1500 Unit 1	174,960	87,480	$143,638,000	$8,670,000
149	RD 1660 Unit 1	15,270	4,580	$7,522,000	$8,670,000
158	Sacramento River West Side Levee District	139,270	55,710	$112,310,000	$10,644,000
287	Sacramento River West Side Levee District	28,120	14,060	$31,490,000	$11,827,000
288	Sacramento River West Side Levee District	93,200	46,600	$93,951,000	$10,644,000
294	RD 1500 Unit 2	109,500	65,700	$147,161,000	$11,827,000
380	Maintenance Area No. 01	45,880	11,470	$18,832,000	$8,670,000
	Erosion Category B	924,940	414,420	$757,334,000	$9,649,000

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TABLE 3
NORTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 2

Segment	Segment Name	Segment Length (Feet)	Erosion Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)
Erosion Catergory: C					
54	Deer Creek Unit 1b	16,320	9,800	$8,385,000	$4,520,000
55	Deer Creek Unit 2	7,640	3,820	$2,451,000	$3,390,000
56	Deer Creek Unit 1a	5,300	3,180	$1,663,000	$2,761,000
	Erosion Category C	29,260	16,790	$12,499,000	$3,930,000
Total for GAR Study Area: 2		954,200	431,210	$769,833,000	$9,426,000

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TABLE 3
NORTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 3

Segment	Segment Name	Segment Length (Feet)	Erosion Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)
Erosion Catergory: B					
101	Maintenance Area No. 03	11,600	5,800	$12,992,000	$11,827,000
135	RD 0784 Unit 3b	7,390	1,480	$2,649,000	$9,462,000
138	RD 0817 Unit 1	20,160	5,040	$6,621,000	$6,936,000
145	RD 1001 Unit 2	19,240	1,920	$2,737,000	$7,514,000
164	Sutter Bypass - East Levee - south	72,900	21,870	$48,989,000	$11,827,000
167	Wadsworth Canal Unit 1	11,600	11,600	$11,171,000	$5,085,000
168	Wadsworth Canal Unit 2	24,300	24,300	$54,432,000	$11,827,000
392	RD 0784 Unit 5b	22,180	6,650	$11,922,000	$9,462,000
	Erosion Category B	189,360	78,660	$151,513,000	$10,170,000
Erosion Catergory: C					
154	RD 2103 Unit 1b	17,950	5,380	$5,186,000	$5,085,000
246	RD 1001 Unit 3, and Unit 3a	49,630	19,850	$28,252,000	$7,514,000
247	RD 1001 Unit 4	70,220	35,110	$78,651,000	$11,827,000
283	RD 1001 Unit 3b	16,630	8,320	$18,628,000	$11,827,000
284	RD 1001 Unit 5	28,510	28,510	$63,867,000	$11,827,000
	Erosion Category C	182,950	97,180	$194,583,000	$10,572,000

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TABLE 3
NORTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 3

Segment	Segment Name	Segment Length (Feet)	Erosion Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)
Erosion Catergory: LD					
163	Sutter Bypass - East Levee - north	22,700	5,680	$12,712,000	$11,827,000
	Erosion Category LD	22,700	5,680	$12,712,000	$11,827,000
Total for GAR Study Area: 3		395,010	181,520	$358,808,000	$10,437,000

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TABLE 3
NORTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 4

Segment	Segment Name	Segment Length (Feet)	Erosion Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)
Erosion Catergory: B					
78	Middle Creek - Unit 1a	5,680	4,260	$2,228,000	$2,761,000
136	RD 0785 Unit 1	11,610	5,800	$11,703,000	$10,644,000
139	RD 0827 Unit 1	7,390	5,170	$9,270,000	$9,462,000
156.2	Sacramento Bypass Unit 1 - north bank	3,050	1,220	$2,733,000	$11,827,000
162	Service Area 6 - Yolo County	30,530	9,160	$15,041,000	$8,670,000
171	Yolo Bypass East Levee	10,560	10,560	$23,654,000	$11,827,000
172	Yolo Bypass West Levee Unit 1	13,800	4,140	$9,277,000	$11,827,000
173	Yolo Bypass West Levee Unit 2	7,960	7,960	$16,053,000	$10,644,000
174	Yolo Bypass West Levee Unit 3	7,530	7,530	$15,178,000	$10,644,000
216	Knights Landing Ridge Cut - Unit 1	35,060	17,530	$28,785,000	$8,670,000
241	RD 0827 Unit 2	14,780	14,780	$33,116,000	$11,827,000
295	RD 1600 Unit 2	22,180	22,180	$49,674,000	$11,827,000
	Erosion Category B	170,140	110,300	$216,713,000	$10,374,000

Note: Estimates are order of magnitude estimates based upon repairing the full remediation extent specified in the Draft GAR.

TABLE 3
NORTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 4

Segment	Segment Name	Segment Length (Feet)	Erosion Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)
Erosion Catergory: C					
41	Cache Creek - Yolo County Unit 1b	61,700	61,700	$94,557,000	$8,092,000
81.2	Middle Creek - Unit 1e	13,260	13,260	$14,189,000	$5,650,000
124	RD 0537 Unit 1 - northh of Sac Bypass	19,500	7,800	$15,725,000	$10,644,000
147	RD 1600 Unit 1	54,910	54,910	$98,399,000	$9,462,000
150	RD 2035 Unit 2 - Yolo Bypass	16,400	16,400	$31,226,000	$10,053,000
217	Knights Landing Ridge Cut - Unit 2	34,870	20,920	$34,352,000	$8,670,000
297	RD 2035 Unit 3 - Willow Bypass	12,920	12,920	$18,393,000	$7,514,000
393	RD 0785 Unit 2	17,420	17,420	$39,030,000	$11,827,000
	Erosion Category C	230,990	205,340	$345,871,000	$8,893,000
Total for GAR Study Area: 4		401,130	315,640	$562,583,000	$9,411,000

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TABLE 3
NORTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 5

Segment	Segment Name	Segment Length (Feet)	Erosion Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)
Erosion Catergory: B					
106	Maintenance Area No. 09	46,690	18,680	$35,559,000	$10,053,000
113.1	RD 0003 Unit 1	22,840	4,570	$9,209,000	$10,644,000
113.2	RD 0003 Unit 1	37,300	7,460	$16,710,000	$11,827,000
119	RD 0341 Unit 1	17,500	8,750	$13,410,000	$8,092,000
122	RD 0501 Unit 1	15,250	3,050	$6,830,000	$11,827,000
126	RD 0551	35,830	3,580	$7,224,000	$10,644,000
129	RD 0556 Unit 1	28,940	23,150	$35,476,000	$8,092,000
131	RD 0755	9,700	2,910	$5,541,000	$10,053,000
132	RD 0755	9,190	1,840	$3,704,000	$10,644,000
148	RD 1601	13,680	10,950	$24,520,000	$11,827,000
148	RD 1601	13,680	2,740	$4,904,000	$9,462,000
151.1	RD 2060 Unit 1	25,650	25,650	$45,961,000	$9,462,000
152	RD 2068 Unit 1	29,210	11,690	$17,908,000	$8,092,000
153.1	RD 2098 Unit 1	16,800	8,400	$18,812,000	$11,827,000
244	RD 0999 Unit 5	49,960	19,990	$38,052,000	$10,053,000
303	RD 0999 Unit 4	6,510	1,950	$3,717,000	$10,053,000
304	RD 0999 Unit 2	12,060	1,210	$2,702,000	$11,827,000
305	RD 0999 Unit 3	19,770	7,910	$15,058,000	$10,053,000

Note: Estimates are order of magnitude estimates based upon repairing the full remediation extent specified in the Draft GAR.

TABLE 3
NORTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 5

Segment	Segment Name	Segment Length (Feet)	Erosion Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)
306	RD 0150 Unit 2	41,280	12,380	$23,576,000	$10,053,000
307	RD 0349 Unit 2	22,870	4,570	$9,222,000	$10,644,000
308	RD 0501 Unit 2	18,810	5,640	$12,643,000	$11,827,000
309	RD 0501 Unit 3	40,670	20,330	$45,548,000	$11,827,000
312	RD 2098 Unit 3	10,220	5,110	$9,159,000	$9,462,000
313	RD 2098 Unit 2	9,980	2,990	$5,701,000	$10,053,000
314	RD 2060 Unit 3a	23,320	13,990	$33,855,000	$12,773,000
386	RD 0150 Unit 3	49,610	24,810	$50,009,000	$10,644,000
388	RD 0349 Unit 3	34,340	10,300	$23,080,000	$11,827,000
390	RD 0556 Unit 2	30,260	6,050	$12,200,000	$10,644,000
	Erosion Category B	691,930	270,650	$530,293,000	$10,345,000
Erosion Catergory: C					
118	RD 0307	34,590	10,380	$19,757,000	$10,053,000
130	RD 0563	64,110	64,110	$98,252,000	$8,092,000
378	Brannan-Andrus LMD Unit 2	60,900	12,180	$18,693,000	$8,104,000
387	RD 0341 Unit 2	33,120	33,120	$66,764,000	$10,644,000
	Erosion Category C	192,710	119,780	$203,466,000	$8,969,000

Note: Estimates are order of magnitude estimates based upon repairing the full remediation extent specified in the Draft GAR.

TABLE 3
NORTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 5

Segment	Segment Name	Segment Length (Feet)	Erosion Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)
Erosion Catergory: LD					
1043	North Fork Mokelumne River Right Bank	51,550	25,780	$57,736,000	$11,827,000
	Erosion Category LD	51,550	25,780	$57,736,000	$11,827,000
Total for GAR Study Area: 5		936,200	416,210	$791,494,000	$10,041,000

Note: Estimates are order of magnitude estimates based upon repairing the full remediation extent specified in the Draft GAR.

TABLE 4
NORTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment	Segment Name	FG Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	FG Repair Cost ($)
47	Chico-Mud Unit 3a	14,380	$3,020,000	$1,109,000	$26,000	$937,000	$3,983,000
48	Chico-Mud Unit 3c	9,880	$1,993,000	$1,065,000	$18,000	$619,000	$2,630,000
68	LD 3-Glenn, Sacramento River (Glenn Co)	9,480	$3,105,000	$1,729,000	$45,000	$969,000	$4,119,000
103	Maintenance Area No. 05 - Unit 1	29,440	$7,136,000	$1,280,000	$54,000	$2,212,000	$9,402,000
104	Maintenance Area No. 05 - Unit 2c	30,020	$8,108,000	$1,426,000	$74,000	$2,518,000	$10,700,000
108	Maintenance Area No. 13 - Unit 1a	18,160	$4,499,000	$1,308,000	$325,000	$1,484,000	$6,308,000
109	Maintenance Area No. 13 - Unit 2a	19,050	$4,505,000	$1,249,000	$124,000	$1,424,000	$6,054,000
160	Sacramento River East Levee Unit 1b, and Unit 1c	12,520	$3,349,000	$1,412,000	$41,000	$1,043,000	$4,434,000
161	Sacramento River East Levee Unit 1d	13,130	$2,931,000	$1,179,000	$46,000	$916,000	$3,893,000
263	Maintenance Area No. 05 - Unit 2b	20,780	$10,061,000	$2,556,000	$587,000	$3,276,000	$13,924,000
271	Maintenance Area No. 13 - Unit 2c	6,700	$1,374,000	$1,083,000	$25,000	$430,000	$1,829,000
272	Maintenance Area No. 13 - Unit 1c	25,290	$6,211,000	$1,297,000	$46,000	$1,925,000	$8,183,000
274	Maintenance Area No. 05 - Unit 2a	720	$185,000	$1,355,000	$10,000	$60,000	$255,000
290	Sacramento River East Levee Unit 4, Moulton Wei	730	$227,000	$1,639,000	$73,000	$92,000	$393,000
291	Sacramento River East Levee Unit 3, Colusa Weir	2,420	$503,000	$1,097,000	$4,000	$156,000	$664,000
292	Sacramento River East Levee Unit 2, Colusa Weir	1,730	$397,000	$1,209,000	$3,000	$123,000	$524,000
379	Chico-Mud Unit 2b	20,300	$5,003,000	$1,301,000	$384,000	$1,658,000	$7,046,000
381	Maintenance Area No. 05 - Unit 1	26,940	$8,323,000	$1,631,000	$412,000	$2,688,000	$11,422,000

Note: FG = Freeboard and Geometry LD = Levee District RD = Reclamation District
Estimates are order of magnitude estimates based upon freeboard and geometry repair lengths specified in the Draft GAR

TABLE 4
NORTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment	Segment Name	FG Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	FG Repair Cost ($)
383	Maintenance Area No. 13 - Unit 2e	8,020	$1,867,000	$1,229,000	$36,000	$585,000	$2,488,000
1027	Segment 1027	3,560	$774,000	$1,149,000	$20,000	$244,000	$1,038,000
Subtotals by Area	**GAR Study Area: 1**	273,260	$73,571,000	$1,422,000	$2,355,000	$23,362,000	$99,288,000

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TABLE 4
NORTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment	Segment Name	FG Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	FG Repair Cost ($)
54	Deer Creek Unit 1b	16,320	$3,438,000	$1,112,000	$51,000	$1,074,000	$4,562,000
55	Deer Creek Unit 2	5,500	$1,159,000	$1,113,000	$18,000	$362,000	$1,539,000
56	Deer Creek Unit 1a	3,980	$693,000	$921,000	$12,000	$217,000	$922,000
57	Elder Creek Unit 4b - Tehama County	3,990	$838,000	$1,108,000	$7,000	$260,000	$1,106,000
59	Elder Creek Unit 5 - Tehama County	14,460	$2,810,000	$1,026,000	$58,000	$882,000	$3,750,000
65	LD 1-Glenn, Sacramento River	32,360	$7,249,000	$1,183,000	$159,000	$2,279,000	$9,688,000
67	LD 2-Glenn, Sacramento River	1,300	$292,000	$1,188,000	$6,000	$91,000	$389,000
115	RD 0070 Unit 2	4,090	$989,000	$1,276,000	$37,000	$316,000	$1,342,000
116	RD 0108 (Colusa Co, and Yolo Co)	37,620	$10,525,000	$1,477,000	$69,000	$3,260,000	$13,853,000
137	RD 0787	8,450	$2,039,000	$1,274,000	$16,000	$632,000	$2,686,000
146	RD 1500 Unit 1	34,990	$8,427,000	$1,272,000	$260,000	$2,673,000	$11,361,000
149	RD 1660 Unit 1	1,530	$373,000	$1,289,000	$11,000	$118,000	$502,000
158	Sacramento River West Side Levee District	69,640	$25,707,000	$1,949,000	$418,000	$8,038,000	$34,163,000
165	Tisdale Bypass Unit 1 - north bank	16,570	$4,421,000	$1,409,000	$61,000	$1,379,000	$5,861,000
166	Tisdale Bypass Unit 2 - south bank	21,040	$5,736,000	$1,439,000	$66,000	$1,785,000	$7,587,000
248	RD 1660 Unit 2	48,160	$11,752,000	$1,288,000	$279,000	$3,702,000	$15,732,000
288	Sacramento River West Side Levee District	4,660	$1,042,000	$1,180,000	$37,000	$332,000	$1,411,000
293	RD 0070 Unit 1	22,990	$6,761,000	$1,553,000	$217,000	$2,147,000	$9,126,000

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TABLE 4
NORTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment	Segment Name	FG Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	FG Repair Cost ($)
294	RD 1500 Unit 2	109,500	$28,586,000	$1,378,000	$342,000	$8,901,000	$37,829,000
380	Maintenance Area No. 01	4,590	$1,029,000	$1,185,000	$16,000	$322,000	$1,367,000
Subtotals by Area	**GAR Study Area: 2**	461,730	$123,866,000	$1,416,000	$2,138,000	$38,771,000	$164,775,000

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TABLE 4
NORTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Segment	Segment Name	FG Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	FG Repair Cost ($)
52	Marysville Unit 3 (NE extension)	10,070	$2,874,000	$1,506,000	$117,000	$920,000	$3,912,000
62	Honcut Creek Area - Eastern	6,190	$2,876,000	$2,452,000	$11,000	$888,000	$3,775,000
114	RD 0010 Unit 1	30,300	$7,663,000	$1,335,000	$514,000	$2,516,000	$10,693,000
135	RD 0784 Unit 3b	5,770	$1,589,000	$1,455,000	$18,000	$494,000	$2,101,000
138	RD 0817 Unit 1	2,620	$407,000	$820,000	$0	$125,000	$532,000
144	RD 1001 Unit 1	2,660	$531,000	$1,053,000	$15,000	$168,000	$713,000
145	RD 1001 Unit 2	2,690	$732,000	$1,436,000	$14,000	$230,000	$976,000
154	RD 2103 Unit 1b	2,150	$297,000	$727,000	$12,000	$95,000	$403,000
163	Sutter Bypass - East Levee - north	5,680	$1,497,000	$1,393,000	$10,000	$464,000	$1,972,000
164	Sutter Bypass - East Levee - south	36,450	$9,429,000	$1,366,000	$67,000	$2,922,000	$12,418,000
167	Wadsworth Canal Unit 1	11,600	$3,047,000	$1,387,000	$21,000	$944,000	$4,013,000
168	Wadsworth Canal Unit 2	8,500	$2,458,000	$1,526,000	$27,000	$765,000	$3,249,000
246	RD 1001 Unit 3, and Unit 3a	43,180	$12,259,000	$1,499,000	$230,000	$3,843,000	$16,332,000
275	RD 0010 Unit 3	2,230	$646,000	$1,532,000	$12,000	$203,000	$861,000
283	RD 1001 Unit 3b	1,830	$524,000	$1,513,000	$10,000	$164,000	$699,000
385	RD 0010 Unit 2	15,010	$3,627,000	$1,276,000	$117,000	$1,152,000	$4,896,000
Subtotals by Area	**GAR Study Area: 3**	186,940	$50,457,000	$1,425,000	$1,195,000	$15,893,000	$67,545,000

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TABLE 4
NORTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment	Segment Name	FG Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	FG Repair Cost ($)
41	Cache Creek - Yolo County Unit 1b	39,490	$9,953,000	$1,331,000	$290,000	$3,152,000	$13,394,000
77	Middle Creek - Unit 2a	2,010	$770,000	$2,018,000	$59,000	$255,000	$1,083,000
78	Middle Creek - Unit 1a	5,680	$1,928,000	$1,792,000	$14,000	$597,000	$2,539,000
80	Middle Creek - Unit 3 - Scotts Creek	12,940	$5,261,000	$2,147,000	$44,000	$1,632,000	$6,937,000
81	Middle Creek - Unit 1e	17,080	$6,209,000	$1,919,000	$139,000	$1,953,000	$8,300,000
112	Putah Creek Unit 2 - south bank	20,920	$7,004,000	$1,767,000	$42,000	$2,168,000	$9,214,000
139	RD 0827 Unit 1	520	$144,000	$1,467,000	$5,000	$46,000	$194,000
147	RD 1600 Unit 1	10,430	$3,006,000	$1,521,000	$73,000	$947,000	$4,026,000
150	RD 2035 Unit 2 - Yolo Bypass	16,400	$3,714,000	$1,196,000	$30,000	$1,152,000	$4,897,000
162	Service Area 6 - Yolo County	9,160	$2,590,000	$1,493,000	$61,000	$816,000	$3,467,000
169	Willow Slough Bypass Unit 1 - north bank	10,660	$3,987,000	$1,975,000	$171,000	$1,279,000	$5,438,000
171	Yolo Bypass East Levee	8,980	$2,745,000	$1,615,000	$16,000	$850,000	$3,611,000
172	Yolo Bypass West Levee Unit 1	13,800	$3,864,000	$1,478,000	$25,000	$1,197,000	$5,086,000
173	Yolo Bypass West Levee Unit 2	3,980	$1,120,000	$1,485,000	$7,000	$347,000	$1,474,000
216	Knights Landing Ridge Cut - Unit 1	14,020	$3,560,000	$1,340,000	$49,000	$1,110,000	$4,719,000
217	Knights Landing Ridge Cut - Unit 2	10,460	$2,172,000	$1,096,000	$47,000	$683,000	$2,902,000
237	Middle Creek - Unit 4 Alley Creek-Channel	6,190	$2,106,000	$1,798,000	$17,000	$653,000	$2,777,000
241	RD 0827 Unit 2	14,780	$5,178,000	$1,849,000	$27,000	$1,602,000	$6,807,000

Note: FG = Freeboard and Geometry LD = Levee District RD = Reclamation District
Estimates are order of magnitude estimates based upon freeboard and geometry repair lengths specified in the Draft GAR

TABLE 4
NORTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment	Segment Name	FG Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	FG Repair Cost ($)
267	Middle Creek - Unit 5 Alley Creek-Channel	5,390	$2,100,000	$2,057,000	$10,000	$649,000	$2,760,000
268	Middle Creek - Unit 3b Scotts Creek	6,450	$1,444,000	$1,182,000	$33,000	$454,000	$1,932,000
295	RD 1600 Unit 2	22,180	$6,245,000	$1,487,000	$81,000	$1,947,000	$8,274,000
393	RD 0785 Unit 2	17,420	$5,160,000	$1,564,000	$32,000	$1,598,000	$6,789,000
1030	Segment 1030	3,750	$1,168,000	$1,645,000	$376,000	$475,000	$2,019,000
1031	Segment 1031	10,250	$4,193,000	$2,160,000	$1,735,000	$1,824,000	$7,753,000
Subtotals by Area	**GAR Study Area: 4**	282,960	$85,620,000	$1,598,000	$3,384,000	$27,386,000	$116,390,000

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Estimates are order of magnitude estimates based upon freeboard and geometry repair lengths specified in the Draft GAR

TABLE 4
NORTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment	Segment Name	FG Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	FG Repair Cost ($)
40	Brannan-Andrus LMD Unit 1	28,620	$9,481,000	$1,749,000	$399,000	$3,040,000	$12,921,000
106	Maintenance Area No. 09	11,670	$3,112,000	$1,408,000	$252,000	$1,035,000	$4,399,000
117	RD 0150 Unit 1	2,210	$492,000	$1,175,000	$12,000	$155,000	$659,000
118	RD 0307	12,110	$3,435,000	$1,498,000	$427,000	$1,188,000	$5,051,000
119	RD 0341 Unit 1	4,380	$1,301,000	$1,570,000	$55,000	$417,000	$1,772,000
120	RD 0349 Unit 1	1,660	$415,000	$1,317,000	$13,000	$132,000	$560,000
123	RD 0536 Unit 1	6,840	$1,530,000	$1,181,000	$13,000	$475,000	$2,017,000
129	RD 0556 Unit 1	20,260	$5,802,000	$1,512,000	$179,000	$1,840,000	$7,820,000
130	RD 0563	25,640	$5,949,000	$1,225,000	$198,000	$1,891,000	$8,038,000
142	RD 0999 Unit 1	77,400	$28,438,000	$1,940,000	$142,000	$8,794,000	$37,375,000
148	RD 1601	9,580	$3,097,000	$1,707,000	$42,000	$966,000	$4,105,000
152	RD 2068 Unit 1	29,210	$7,358,000	$1,330,000	$169,000	$2,316,000	$9,843,000
153	RD 2098 Unit 1	17,300	$5,014,000	$1,531,000	$188,000	$1,600,000	$6,801,000
155	RD 2104 - Hass Slough	17,400	$5,568,000	$1,689,000	$32,000	$1,723,000	$7,322,000
244	RD 0999 Unit 5	500	$113,000	$1,196,000	$1,000	$35,000	$149,000
249	RD 2098 Unit 4	13,230	$2,252,000	$899,000	$24,000	$700,000	$2,977,000
251	RD 2104 - west levee	7,420	$1,301,000	$926,000	$33,000	$411,000	$1,746,000
304	RD 0999 Unit 2	360	$107,000	$1,566,000	$20,000	$39,000	$166,000

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TABLE 4
NORTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment	Segment Name	FG Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	FG Repair Cost ($)
305	RD 0999 Unit 3	990	$246,000	$1,312,000	$4,000	$77,000	$327,000
306	RD 0150 Unit 2	10,320	$2,654,000	$1,358,000	$214,000	$882,000	$3,751,000
307	RD 0349 Unit 2	3,430	$871,000	$1,340,000	$51,000	$284,000	$1,206,000
308	RD 0501 Unit 2	15,990	$3,758,000	$1,241,000	$175,000	$1,210,000	$5,143,000
309	RD 0501 Unit 3	2,030	$475,000	$1,232,000	$19,000	$152,000	$645,000
310	RD 0501 Unit 4	600	$142,000	$1,244,000	$7,000	$46,000	$194,000
311	RD 2068 Unit 2	10,410	$2,679,000	$1,359,000	$73,000	$847,000	$3,599,000
312	RD 2098 Unit 3	1,020	$214,000	$1,107,000	$2,000	$66,000	$283,000
313	RD 2098 Unit 2	2,990	$705,000	$1,242,000	$5,000	$218,000	$928,000
314	RD 2060 Unit 3a	16,330	$4,959,000	$1,604,000	$30,000	$1,535,000	$6,525,000
315	RD 2060 Unit 2	8,580	$1,985,000	$1,222,000	$61,000	$630,000	$2,676,000
316	RD 0536 Unit 2	23,740	$5,676,000	$1,262,000	$44,000	$1,760,000	$7,479,000
386	RD 0150 Unit 3	32,250	$7,900,000	$1,294,000	$323,000	$2,530,000	$10,753,000
387	RD 0341 Unit 2	9,940	$2,818,000	$1,497,000	$57,000	$885,000	$3,760,000
388	RD 0349 Unit 3	5,150	$1,130,000	$1,158,000	$49,000	$363,000	$1,542,000
1036	Segment 1036	20,490	$12,750,000	$3,286,000	$143,000	$3,967,000	$16,861,000
1040	Segment 1040	4,740	$692,000	$770,000	$38,000	$225,000	$955,000
1041	Snodgrass Slough Right Bank Levee	15,600	$2,766,000	$936,000	$107,000	$884,000	$3,758,000

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TABLE 4
NORTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment	Segment Name	FG Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	FG Repair Cost ($)
1043	North Fork Mokelumne River Right Bank	48,970	$11,273,000	$1,215,000	$283,000	$3,556,000	$15,112,000
Subtotals by Area	**GAR Study Area: 5**	519,360	$148,458,000	$1,509,000	$3,886,000	$46,875,000	$199,219,000

Note: FG = Freeboard and Geometry LD = Levee District RD = Reclamation District
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Figures

Figure 1 Proposed Land Acquisition Approach
Figure 2 Typical Remediation Details
Figure 3 Rock Slope Protection
Figure 4 Freeboard and Geometry Repair
Figure 5 Remediation Selection Form

PLOT BY: DAVID_LARSON - Dec 22, 2010 - 10:00:27am
DRAWING: G:\DWR-8101\WorkZone\U107_RACER\Memorandum\Final Memorandum 20101217\Figures 1 to 5\CAD Drawings\Figure 1 Easement Limits 20101222.dwg

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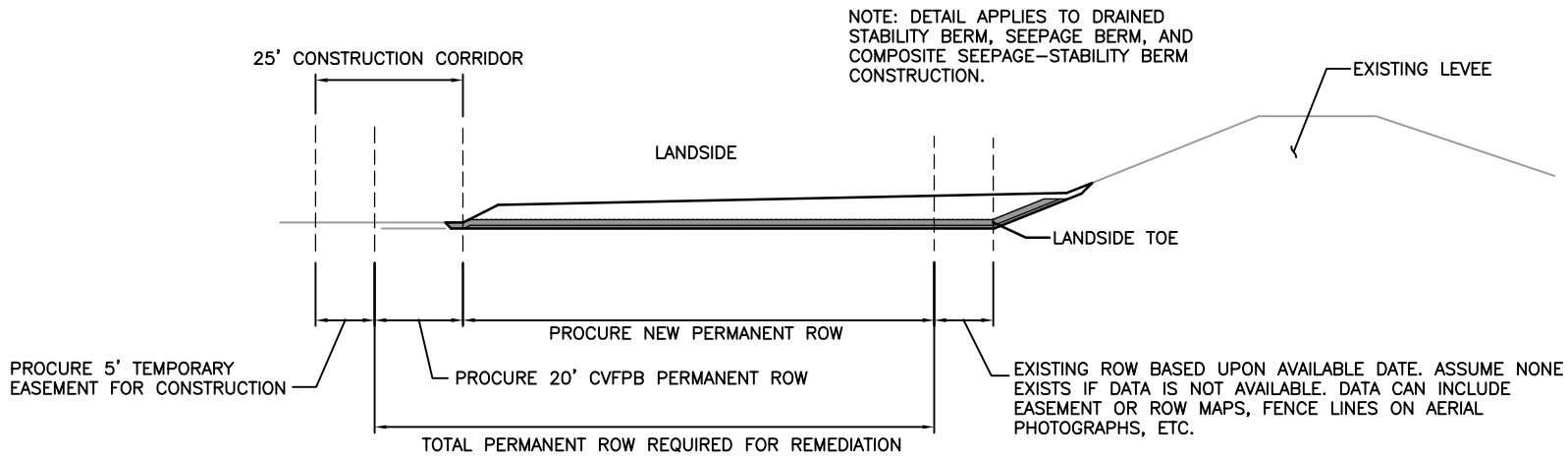
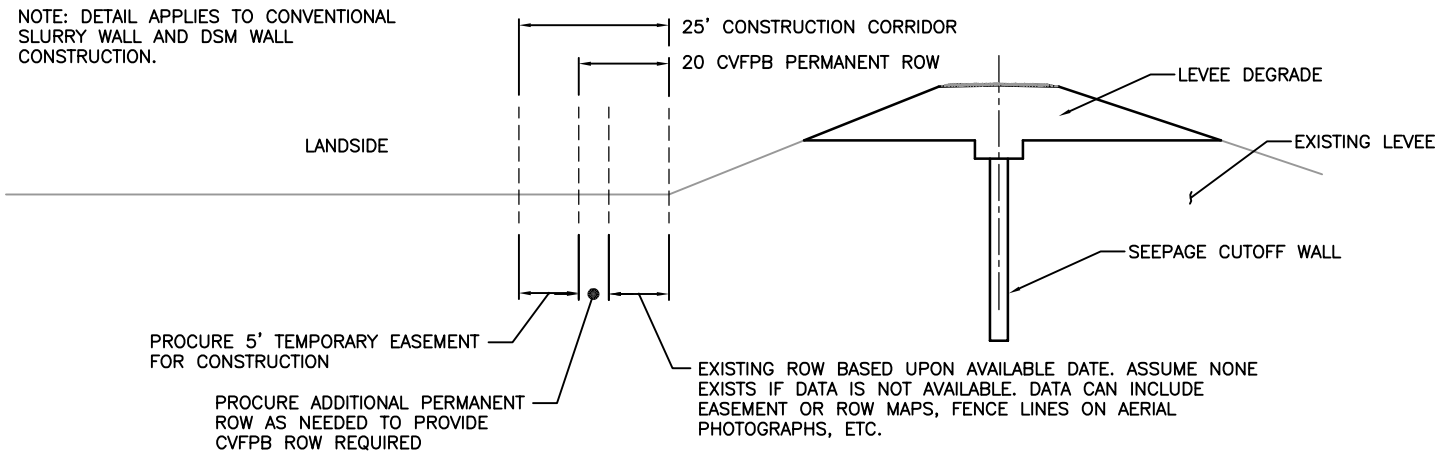
NULE - RACER

FIGURE 1
PROPOSED LAND ACQUISITION APPROACH

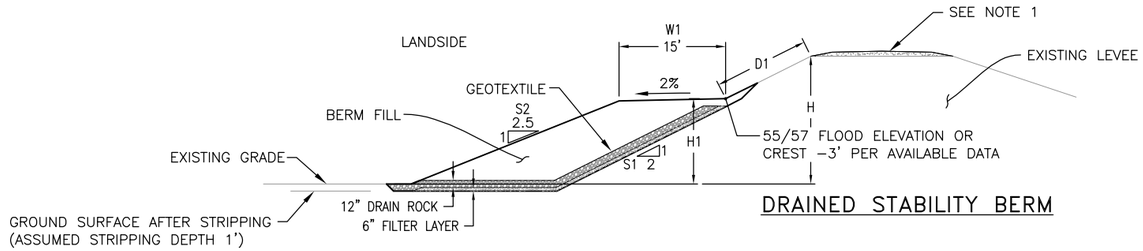


LAND ACQUISITION - BERM REMEDIATIONS

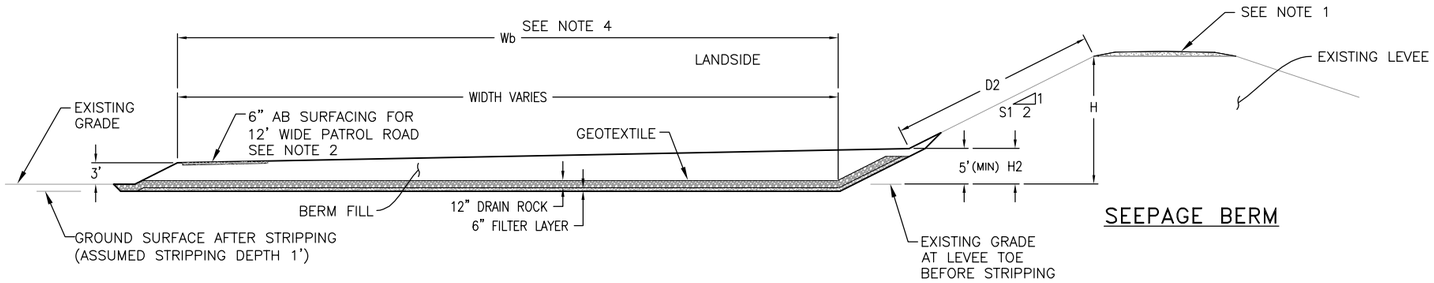


LAND ACQUISITION - SEEPAGE CUTOFF WALL REMEDIATIONS

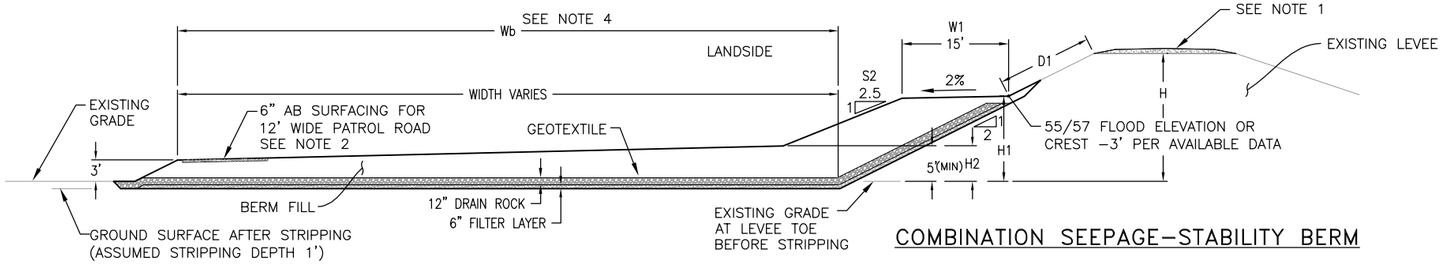
FIGURE 1



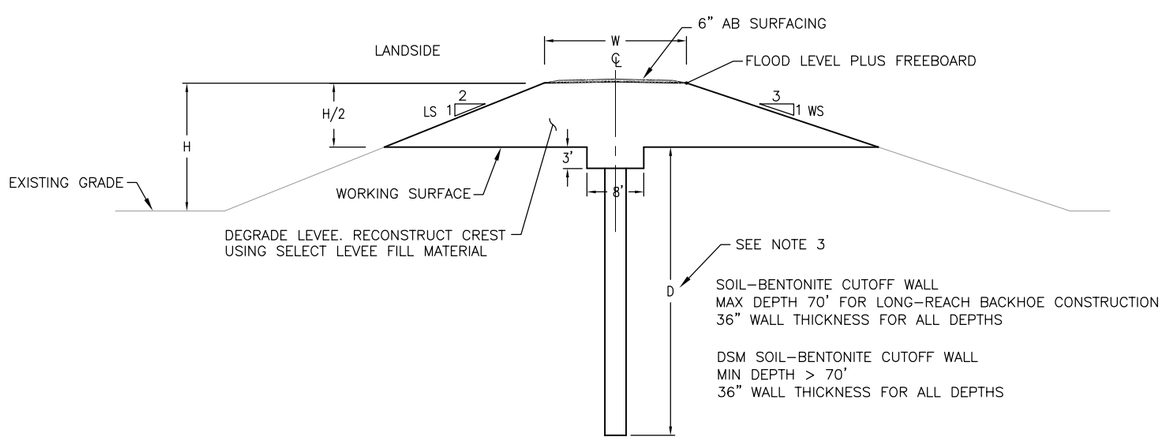
DRAINED STABILITY BERM



SEEPAGE BERM



COMBINATION SEEPAGE–STABILITY BERM



CUTOFF WALL

NOTES:

1. ASSUME THAT 4" OF AB IS ADDED TO THE CREST ROAD IN ALL LEVEE SEGMENTS OVER THE LENGTH WHERE REMEDIATIONS ARE INSTALLED TO ACCOUNT FOR DETERIORATION FROM CONSTRUCTION TRAFFIC.

2. PATROL ROAD COULD BE LOCATED IN CONSTRUCTION EASEMENT ALONG TOE OF SEEPAGE BERM.

3. SELECTION OF CUTOFF WALL DEPTH (D) IS BASED UPON LANDSIDE HEIGHT (H) OF LEVEE AND IS DETERMINED AS FOLLOWS:

   NO GEOTECHNICAL DATA AVAILABLE:
   SELECT H = LEVEE HEIGHT MEASURED FROM LANDSIDE TOE.
   DEPTH OF WALL MEASURED FROM FOUNDATION LEVEL IS 20' MINIMUM OR 3*H, WHICHEVER IS LARGER.
   ROUND RESULT TO THE NEAREST HIGHER FOOT AND ADD H/2 TO EXTEND TO DEGRADE LEVEL AND GET TOTAL WALL DEPTH FOR ESTIMATING.

   GEOTECHNICAL DATA AVAILABLE:
   SELECT H = LEVEE HEIGHT MEASURED FROM LANDSIDE TOE.
   IF AQUACLUDE >70' AND H<=23' THEN STOP WALL AT 70'
   ASSUME 70' IS MEASURED FROM DEGRADE LEVEL.
   (THIS ASSUMES GOING TO MAXIMUM WALL DEPTH FOR CONVENTIONAL WALL CONSTRUCTION)
   IF AQUACLUDE >70' AND H>23' THEN GO TO AQUACLUDE + 6' TOE–IN
   ADD H/2 TO EXTEND TO DEGRADE LEVEL AND GET TOTAL DSM WALL DEPTH FOR ESTIMATING.

4. SELECTION OF SEEPAGE BERM WIDTH (Wb) IS ALSO BASED UPON LANDSIDE HEIGHT OF LEVEE (H) AND IS DETERMINED AS FOLLOWS:

LEVEE LANDSIDE HEIGHT (FEET)	Wb (FEET)
LESS THAN 10'	4*H
10' TO 20'	5*H
GREATER THAN 20'	6*H

FIGURE 2

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main: (916) 679-2000
fax: (916) 679-2900

REVISIONS

NO.	DESCRIPTION	DATE	BY

NOT FOR CONSTRUCTION

DRAWN BY:
DESIGNED BY:
REVIEWED BY:
APPROVED BY:
SCALE:
HORIZONTAL:
VERTICAL:

SUBMITTED:
SUBMITTAL
APPROVED:

IF THIS BAR DOES NOT MEASURE 1" THEN ADJUST SCALE ACCORDINGLY

NULE – RACER

FIGURE 2
TYPICAL REMEDIATION DETAILS

PROJECT NO.

SHEET NO.

SHEET SEQUENCE
of

PLOT BY: LORENZO_ALA – Nov 03, 2010 – 2:49:24pm
DRAWING: R:\CADD_Reference\Standards\Borders\XR-BDR.dwg

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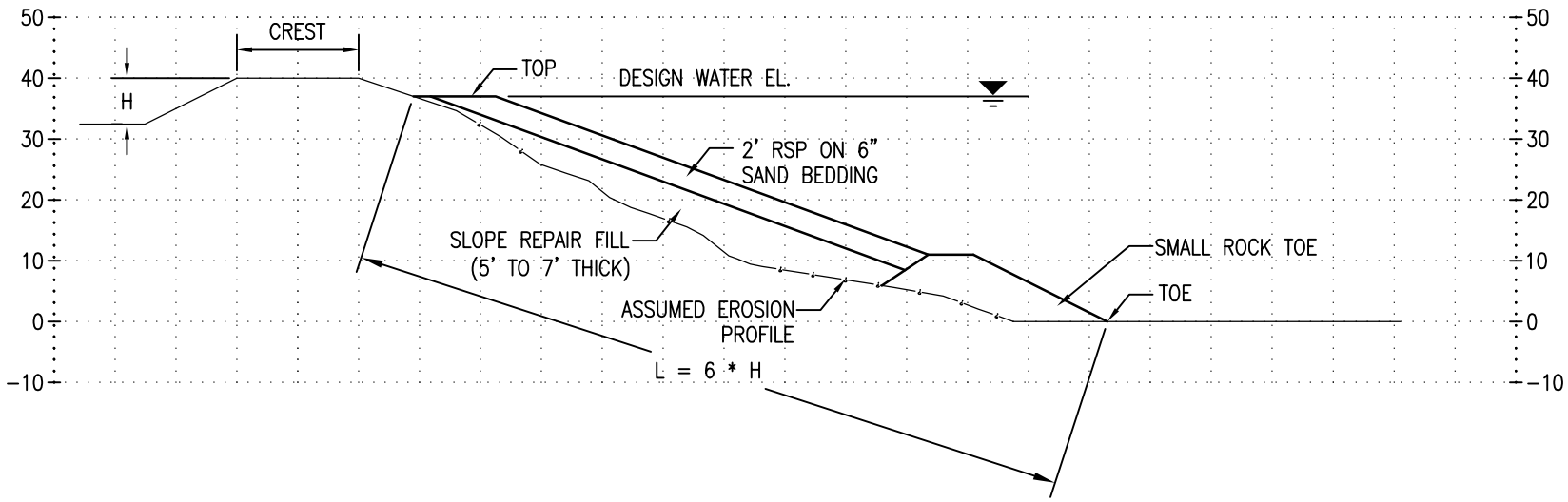
NULE – RACER

FIGURE 3
ROCK SLOPE PROTECTION



NOTES:

1. ASSUME THAT 4" OF AB IS ADDED TO THE CREST ROAD IN ALL LEVEE SEGMENTS OVER THE LENGTH WHERE REMEDIATIONS ARE INSTALLED TO ACCOUNT FOR DETERIORATION FROM CONSTRUCTION TRAFFIC.

FIGURE 3

PLOT BY: DAVID_LARSON – Dec 22, 2010 – 9:59:15am
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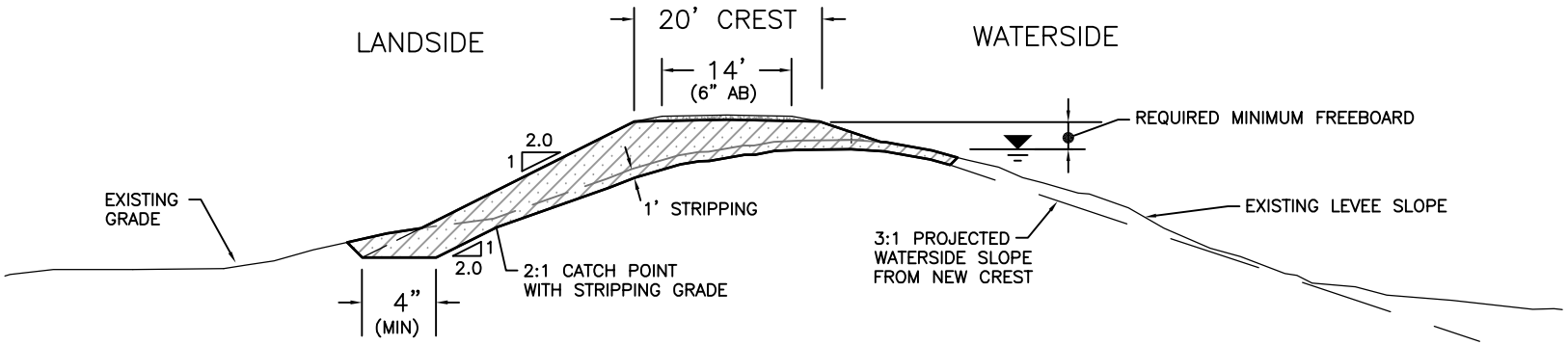

TYPICAL FREEBOARD AND GEOMETRY REPAIR FOR 20' CREST

NOTE: 12' CREST SIMILAR

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NULE – RACER

FIGURE 4
FREEBOARD AND GEOMETRY REPAIR

FIGURE 4

DWR Non Urban Levee Evaluations (NULE) Program
Selection of Remediation Alternatives for NULE RACER

Segment Identification and Location

Segment ID:
Reach No.:
Total Length: (feet)
Name:
Agency: RD
Unit: Unit
Levee Mile: LM to LM
NULE Stationing: Right Bank Sta to Sta

LAT Data Summary from Draft GAR, Dated June 2010

Potential Failure Mode	Categorization	Deficiency Extent (% of Total Length)	Comments
Underseepage			
Stability			
Through Seepage			
Erosion			

Evaluated By:
Area Lead:
Date:
Prepared By:
Date:

Select Alternative Parameters for Estimating - Seepage and Stability

Deficiency	Located Between		Length	Existing ROW	Remediation Alternatives Selected													ROW Land Use (%)				Comments
					Drained StabilityBerm		Seepage Berm		Combination Berm			Slurry Wall (Pick Only One)										
												See Note 1	Crest Width	Conventional Backhoe		DSM Wall						
	From	To	(Feet)	Width	"H"	"H1"	"H"	"W_b"	"H"	"H1"	"W_b"	"%"	"W"	"H"	"D"	"H"	"D"	"Orch"	"Agr"	"Res"	"Com"	

Note 1: Provide the estimated % of levee degrade material that could be reused for levee reconstruction for either the conventional backhoe option or the DSM wall option.

Select Alternative Parameters for Estimating - Rock Slope Protection and Geometry Repairs

Deficiency	Located Between		Length	Existing ROW	Rock Slope Protection		Geometry Repair		Replacement Levee		ROW Land Use (%)				Comments
	From	To	(Feet)	Width	Slope Length		"H"	"h1"	"Crest"	"H"	"Orch"	"Agr"	"Res"	"Com"	

FIGURE 5

ATTACHMENT 1

LIST OF KEY ESTIMATING ASSUMPTIONS

ATTACHMENT 1

KEY ASSUMPTIONS FOR ESTIMATING
NULE RACER COST MEMORANDUM

	Assumptions and Discussion
1.	Cost estimate will include project and non-project levees within the Non-Urban Levee Evaluation (NULE) project scope for which information is available in the Draft Geotechnical Assessment Report (GAR).
2.	Remediation estimates will be prepared for levee segments with composite classifications of "B," "C," or "LD." Estimates currently include levee segments with an "LD" classification that could become an "A" classification based upon additional information obtained in the future.
3.	Construction cost estimates will be escalated at 3% to October 2011 based upon information received in the Central Valley Flood Management Plan (CVFMP)-Urban Levee Evaluation (ULE)/NULE coordination meeting held on July 7, 2010. The 3% value is conservative over the near future given the current economic climate.
4.	The NULE Remedial Alternative Cost Estimate Report (RACER) cost estimate to be provided to the Department of Water Resources (DWR), will include the cost estimate spreadsheet and several pages of text describing the work approach, key assumptions, and limitations. Costs will be provided by segment and for the overall project. A summary sheet will list the cost for alternatives considered for remediation of a deficiency where alternatives are feasible. The actual format for the spreadsheet will be developed as the work progresses through the Technical Approach Team meeting process.
5.	Because of the limited information available to evaluate levees for the GAR, the cost estimate will be an order-of-magnitude cost estimate comparable to a Class 4 estimate as defined by the American Association for the Advancement of Cost Estimating, which can vary in accuracy from -30% on the low side to from +20% to +50-percent on the high side.
6.	Preparation of estimates for the CVFMP process may require the addition of other remediation measures to the cost estimating tool. These will be added at a later date in a manner mutually agreed between DWR and URS. Adding remediation alternatives should not affect the NULE RACER cost estimate.
7.	A small percentage (approximately 6%) of levee mileage was not covered in the levee assessment tool (LAT)/GAR process due to complete lack of information, lack of authorized access, etc. The cost to remediate this mileage will be estimated as a percentage of the cost to remediate similar mileage where information is available. As a starting point, the percentage will be based upon the ratio of the mileage not evaluated to the total mileage in the program.
8.	Cost estimates for remediation alternatives will include: • Direct construction costs • Contingencies (30% of construction cost) • Design, Engineering costs (15% of construction cost) • CM (15% of construction cost) • Permitting/Legal (5% of construction cost) (See Items 16 and 17 also) • Environmental mitigation (25% or 35% of construction cost) (see Item 32 also) • Escalation (3% per year)
9.	The cost estimating tool is currently limited to eight remediation types: drained stability berm; seepage berm; combination seepage-stability berm; conventional slurry wall to maximum depth of 70 feet below working surface; deep soil mixing (DSM) wall for wall more than 70 feet deep measured below the working surface; erosion repair; and levee replacement in place; and freeboard/geometry.

Assumptions and Discussion

10. The only remediation being considered for waterside erosion is the placement of rock slope protection in deficient reaches. The length of slope repair on slope will be six times the landside levee height. The following costs per foot have been prepared for four levee heights:

Levee Height	Slope Length	$ Per Foot
5 feet	30 feet	$523
10 feet	60 feet	$1,070
15 feet	90 feet	$1,642
20 feet	120 feet	$2,240

The estimating tool will interpolate the cost per foot from the above values based on the actual levee height where remediation is required.

The lengths of levee to be remediated as specified in the Draft GAR are large and may result in a significant remediation cost compared to other deficiencies. As suggested by DWR, the cost memorandum will include a cost to repair all lengths specified in the Draft GAR and a cost to repair a lesser length (20% of the length specified in the Draft GAR). The latter cost assumes that other areas requiring remediation would be repaired as part of an ongoing maintenance program.

11. For any remediation requiring additional land acquisition, existing right-of-way (ROW) would be estimated from existing readily available data (assessor's maps, owner contact, fence lines on aerials, etc.). In the absence of such data, existing ROW width will be assumed to be zero. For the cost estimates provided in the cost memorandum, all estimates assume that no existing easement exists due to the general lack of easement data (see cost memorandum Figure 1 for easement requirements for estimating).

12. For any berm-type remediation requiring land acquisition, 20 feet of addition permanent ROW will be acquired along the landside toe of the remediation to satisfy planned Central Valley Flood Protection Board (CVFPB) easement requirements (see cost memorandum Figure 1).

13. For any berm remediation requiring additional land acquisition, 5 feet of additional temporary easement will be obtained such that the 5-foot temporary easement plus the adjacent 20-foot permanent easement for CVFPB will provide a construction easement of 25 feet along the landside toe of the remediation (see cost memorandum Figure 1).

14. For slurry wall or DSM remediations, the 20-foot CVFPB permanent easement (less any existing easement) and 5-foot temporary easement will also be obtained along the landside toe of the levee (see cost memorandum Figure 1).

15. No allowance will be included in the estimate for temporary or permanent property acquisition for levee segments with an "A" classification (unless freeboard/geometry repair is needed) or for reaches within a levee segment where no remediation measures are required based upon the LAT and GAR.

16. Costs for four land use categories are covered in the estimating tool: orchard, agricultural, industrial, and residential. Where remediations are required and land acquisition is needed, the percentage of each use category will be estimated from aerial photographs or other readily available information and a composite cost for temporary/permanent land acquisition based on the percentages will be used. The basic land costs currently being used in the cost estimating tool are:

Agricultural	$10,000 per acre
Orchard	$30,000 per acre
Industrial	$150,000 per acre
Residential	$300,000 per acre

	Assumptions and Discussion
17.	The temporary/permanent property acquisition costs described above address the cost of procuring the land. In addition, a 5% allowance for legal costs for land acquisition will also be included. The percentage will be multiplied by the total direct construction cost to obtain the legal cost percentage. Legal costs could be more expensive than the land acquisition cost depending upon the amount of land acquired.
18.	Wherever available, the United States Army Corps of Engineers (USACE) 55/57 water surface profiles are the design water surfaces for levee remediation evaluations. Where 55/57 water surface information is not available, the design water surface is set at the existing crest level less 3 feet, or at the 100-year water surface elevation, where appropriate.
19.	Remediation of levee geometry deficiencies is based upon the levee configuration described in the 1953 Memorandum of Understanding between the USACE (USA) and State of California. In summary these configurations are: 3:1 waterside slopes for all levees, 20-foot- or 12-foot-wide crest depending upon location, 2.5:1 landside slopes for bypass levees, and 2:1 landside slopes for other levees.
20.	Selection of remediation alternatives and extent of remediation required will be based upon information in the LAT and GAR wherever possible. Simplifying assumptions would be made where information is not available (see seepage berm and slurry wall items below as an example). Where specific lengths for required remediation alternatives are not provided in the LAT and GAR documentation, or cannot be readily determined, the percentage of total segment length requiring remediation as noted in the GAR will be used.
21.	The estimate assumes the use of hydroseeding to revegetate new slopes or restore other areas disturbed during construction. The cost for plantings, irrigation systems, fencing, etc., installed as part of the emergency levee repair program will not be reflected in the NULE RACER estimate.
22.	For estimating purposes, all slurry walls and DSM walls are assumed to be 36 inches wide regardless of depth.
23.	Levee degrade for slurry wall and DSM wall construction is assumed to be 50% of the height of the levee measured on the landside, and the 50% degrade is assumed to provide suitable working width for equipment. For low height levees (generally 5 feet high or less) that require a cutoff wall, the levee section would be removed to existing grade measured on the landside.
24.	Imported or on-site material used to reconstruct levees within the levee prism or to construct drained stability berms is assumed to meet current USACE criteria for select levee fill. Material used to construct seepage berms (other than drain layers) can be any suitable material.
25.	NULE south will use different borrow rates from NULE north because suitable sandy material for berm construction may be more readily available close to project sites. Unit rates for borrow for both areas will be included in the cost estimating tool.

	Assumptions and Discussion
26.	There may be areas where the length of seepage berm or depth of slurry wall cannot be determined based upon available information. In this case, an approximation method is used to select wall depths and seepage berm widths that would provide comparable levels of protection. Selections of wall depth and berm width are based upon landside height of levee and are as follows: <u>No Geotechnical Data Available:</u> Select H = Levee height measured from landside toe Depth of wall measured from foundation level is 20 feet minimum or 3*H, whichever is larger. Round result to the nearest higher foot and add H/2 to extend to degrade level and get total wall depth for estimating. <u>Geotechnical Data Available:</u> Select H = Levee height measured from landside toe If aquaclude >70 feet and H<= 23 feet then stop wall at 70 feet Assume 70 feet is measured from degrade level. (This assumes going to the maximum wall depth for conventional wall construction) If aquaclude >70 feet and H>23 feet then go to aquaclude + 6 feet toe-in Add H/2 to extend to degrade level and get total DSM wall depth for estimating
27.	The cost estimate will not include any allowance for ongoing operation and maintenance costs of facilities after remediations are constructed.
28.	The cost to make animal burrow repairs will not be included in the cost estimate. However, the documentation for the cost memorandum will include an estimate of the average cost per mile to repair such damage based upon DWR experience. DWR will provide the cost to URS for incorporation in the report. Areas where heavy rodent damage was noted are documented in the LAT and GAR.
29.	For estimating purposes, seepage berms and combined seepage-stability berms include acquiring a 20-foot-wide strip of land along the full length of the landside toe of berm for a CVFPB easement. An additional 5-foot-wide strip of land will be acquired as a temporary easement so that the temporary and CVFPB easements together provide a 25-foot-wide easement for construction.
30.	For estimating purposes, all levee sections degraded to construct slurry walls will include a new crest road with 6 inches of aggregate base (AB). AB section will be placed above the levee crest elevation required for freeboard. Where paved public roads are known to exist on the crest of a levee, an allowance will be included for repaving.
31.	For estimating purposes, levee sections where landside berms are constructed or erosion protection is placed will have up to 4 inches of AB added to the crest to supplement existing surfacing to address possible deterioration of the existing crest road due to construction activities.
32.	A low environmental mitigation cost factor and a high environmental mitigation cost factor will be used. The low factor will be 25% and the high factor will be 35 percent. These factors will be multiplied by the direct construction cost for a remediation to estimate the environmental mitigation cost. All cost estimates will begin at 25 percent. A biologist will review available data for a levee region (such as state environmental databases, County General Plans, etc.) and determine those requiring the higher percentage based upon the possible presence of wetlands, wetland indicator species, or threatened or endangered species. Any main stem levee requiring waterside erosion remediation will also be assigned the higher environmental mitigation percentage.

ATTACHMENT 2

ESTIMATE BACKUP BY GAR STUDY AREA, CATEGORIZATION, AND REACH

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment/Reach: 45.1 Chico-Mud Unit 1a — **Total Segment/Reach Length (Feet): 23,769**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: E

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 30		$4,577,909
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$4,577,909**
Total Remediation Cost for Estimate		**a**	**$4,577,909**

Total Remediation Cost Estimated for Segment/Reach 45.1 $4,577,909

Segment/Reach: 45.2 Chico-Mud Unit 1a — **Total Segment/Reach Length (Feet): 13,755**

Overall Reach Categorization: LD (A or B)

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$20,844,726
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$20,844,726**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**a**	**$20,844,726**

Total Remediation Cost Estimated for Segment/Reach 45.2 $20,844,726

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment/Reach: 47 Chico-Mud Unit 3a **Total Segment/Reach Length (Feet): 11,414**

Overall Reach Categorization: LD (A or B)

Estimate Run: a

Deficiencies Being Remediated: U+FG

Remediated Length (%): 35

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$3,766,822
Combo Berm Cost:	$0
Slurry Wall Cost:	$5,515,121
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,766,822**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 73	$2,266,129
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,266,129**
Total Remediation Cost for Estimate a		**$6,032,951**

Overall Reach Categorization: LD (A or B)

Estimate Run: b

Deficiencies Being Remediated: U+FG

Remediated Length (%): 13

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$1,136,980
Combo Berm Cost:	$0
Slurry Wall Cost:	$1,468,517
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,136,980**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 27	$849,853
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$849,853**
Total Remediation Cost for Estimate b		**$1,986,832**

Overall Reach Categorization: LD (A or B)

Estimate Run: c

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 11	$375,932
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$375,932**
Total Remediation Cost for Estimate c		**$375,932**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Overall Reach Categorization: LD (A or B)

Estimate Run: d

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 15		$491,584
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$491,584**
Total Remediation Cost for Estimate	**d**		**$491,584**

Total Remediation Cost Estimated for Segment/Reach 47 $8,887,299

Segment/Reach: 48.1 Chico-Mud Unit 3c **Total Segment/Reach Length (Feet): 4,563**

Overall Reach Categorization: LD (A or B)

Estimate Run: a

Deficiencies Being Remediated: U+FG

Remediated Length (%): 15

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$466,324
Combo Berm Cost:	$0
Slurry Wall Cost:	$606,677
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$466,324**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 100		$1,214,008
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,214,008**
Total Remediation Cost for Estimate	**a**		**$1,680,332**

Total Remediation Cost Estimated for Segment/Reach 48.1 $1,680,332

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment/Reach: 48.2 Chico-Mud Unit 3c — **Total Segment/Reach Length (Feet): 5,321**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 49

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$1,970,728
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,454,207
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,970,728**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 100	$3,985,429
Freeboard/Geometry Cost:	Length (%): 100	$1,415,678
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$5,401,107**
Total Remediation Cost for Estimate a		**$7,371,835**

Total Remediation Cost Estimated for Segment/Reach 48.2 $7,371,835

Segment/Reach: 68 LD 3-Glenn, Sacramento River (Glenn Co) — **Total Segment/Reach Length (Feet): 63,231**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+E+FG

Remediated Length (%): 35

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$32,977,640
Slurry Wall Cost:	$63,522,459
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$32,977,640**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 20	$17,304,217
Freeboard/Geometry Cost:	Length (%): 15	$4,119,359
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$21,423,576**
Total Remediation Cost for Estimate a		**$54,401,215**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 15

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$19,267,581
Slurry Wall Cost:	$27,714,077
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$19,267,581**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$19,267,581**

Total Remediation Cost Estimated for Segment/Reach 68 $73,668,796

Segment/Reach: 103 Maintenance Area No. 05 - Unit 1 **Total Segment/Reach Length (Feet): 42,050**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+Ss+E+FG

Remediated Length (%): 20

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$12,365,211
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$23,674,600
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$12,365,211**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 20		$11,967,991
Freeboard/Geometry Cost:	Length (%): 26		$3,918,470
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$15,886,461**
Total Remediation Cost for Estimate		**a**	**$28,251,672**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: U+FG

Remediated Length (%): 5

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$2,979,406
Combo Berm Cost:	$0
Slurry Wall Cost:	$4,265,667
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,979,406**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 44		$5,483,946
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$5,483,946**
Total Remediation Cost for Estimate		**b**	**$8,463,352**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: U

Remediated Length (%): 5

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$1,814,938
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,481,081
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,814,938**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$1,814,938**

Total Remediation Cost Estimated for Segment/Reach 103 $38,529,962

Segment/Reach: 104 Maintenance Area No. 05 - Unit 2c **Total Segment/Reach Length (Feet): 42,275**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 15

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$8,341,445
Combo Berm Cost:	$0
Slurry Wall Cost:	$11,004,506
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,341,445**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 50	$22,617,125
Freeboard/Geometry Cost:	Length (%): 35	$5,314,237
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$27,931,362**
Total Remediation Cost for Estimate a		**$36,272,807**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: U+FG

Remediated Length (%): 15

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$5,755,341
Combo Berm Cost:	$0
Slurry Wall Cost:	$7,518,225
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,755,341**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 36	$5,386,226
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$5,386,226**
Total Remediation Cost for Estimate b		**$11,141,567**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: Ss

Remediated Length (%): 15

Alternative Remediation Costs	
Drained Stability Berm Cost:	$4,702,595
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,702,595**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$4,702,595**

Overall Reach Categorization: B

Estimate Run: d

Deficiencies Being Remediated: Ss

Remediated Length (%): 15

Alternative Remediation Costs	
Drained Stability Berm Cost:	$3,849,128
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,849,128**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate d		**$3,849,128**

Total Remediation Cost Estimated for Segment/Reach 104 $55,966,098

Segment/Reach: 108 Maintenance Area No. 13 - Unit 1a **Total Segment/Reach Length (Feet): 18,163**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 50

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$8,703,234
Slurry Wall Cost:	$11,745,443
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,703,234**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$8,703,234**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Overall Reach Categorization: LD

Estimate Run: b

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 100		$6,308,415
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$6,308,415**
Total Remediation Cost for Estimate		**b**	**$6,308,415**

Total Remediation Cost Estimated for Segment/Reach 108 $15,011,649

Segment/Reach: 109 Maintenance Area No. 13 - Unit 2a

Total Segment/Reach Length (Feet): 19,047

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$8,413,518
Combo Berm Cost:	$0
Slurry Wall Cost:	$11,102,605
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,413,518**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**a**	**$8,413,518**

Overall Reach Categorization: LD

Estimate Run: b

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 100		$6,053,624
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$6,053,624**
Total Remediation Cost for Estimate		**b**	**$6,053,624**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Total Remediation Cost Estimated for Segment/Reach 109 $14,467,141

Segment/Reach: 159 Sacramento River East Levee Unit 1a — **Total Segment/Reach Length (Feet): 17,749**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 51

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$15,567,596
Slurry Wall Cost:	$22,899,740
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$15,567,596**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$15,567,596**

Total Remediation Cost Estimated for Segment/Reach 159 $15,567,596

Segment/Reach: 160 Sacramento River East Levee Unit 1b, and Unit 1c — **Total Segment/Reach Length (Feet): 50,080**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$13,612,484
Combo Berm Cost:	$0
Slurry Wall Cost:	$18,681,056
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,612,484**

Other Required Remediation Costs		
Erosion Repair Cost: Category C	Length (%): 50	$32,892,544
Freeboard/Geometry Cost:	Length (%): 25	$4,433,660
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$37,326,204**
Total Remediation Cost for Estimate a		**$50,938,688**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$11,472,274
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$11,472,274**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$11,472,274**

Total Remediation Cost Estimated for Segment/Reach 160 $62,410,962

Segment/Reach: 161 Sacramento River East Levee Unit 1d

Total Segment/Reach Length (Feet): 37,511

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 20

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$11,604,398
Slurry Wall Cost:	$15,539,669
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$11,604,398**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 25		$13,345,163
Freeboard/Geometry Cost:	Length (%): 35		$3,892,578
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$17,237,742**
Total Remediation Cost for Estimate		**a**	**$28,842,139**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 5

Alternative Remediation Costs

Drained Stability Berm Cost:	$1,522,184
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,522,184**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$1,522,184**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Total Remediation Cost Estimated for Segment/Reach 161 $30,364,323

Segment/Reach: 263.1 Maintenance Area No. 05 - Unit 2b **Total Segment/Reach Length (Feet): 12,225**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$9,865,882
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$9,865,882**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 25	$7,380,790
Freeboard/Geometry Cost:	Length (%): 75	$7,040,498
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$14,421,288**
Total Remediation Cost for Estimate a		**$24,287,171**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 80

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$27,553,865
Slurry Wall Cost:	$32,268,636
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$27,553,865**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$27,553,865**

Total Remediation Cost Estimated for Segment/Reach 263.1 $51,841,036

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment/Reach: 263.2 Maintenance Area No. 05 - Unit 2b **Total Segment/Reach Length (Feet): 12,225**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 75

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$13,652,626
Slurry Wall Cost:	$16,420,127
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,652,626**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 95	$6,883,564
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$6,883,564**
Total Remediation Cost for Estimate a		**$20,536,190**

Overall Reach Categorization: LD

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 25

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$6,415,184
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,415,184**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$6,415,184**

Total Remediation Cost Estimated for Segment/Reach 263.2 $26,951,373

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment/Reach: 269 Chico-Mud Unit 2a — **Total Segment/Reach Length (Feet): 6,239**

Overall Reach Categorization: LD (A or B)

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 75

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$3,551,974
Combo Berm Cost:	$0
Slurry Wall Cost:	$4,719,279
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,551,974**

Other Required Remediation Costs

Erosion Repair Cost:	Category A	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**

Total Remediation Cost for Estimate a **$3,551,974**

Total Remediation Cost Estimated for Segment/Reach 269 **$3,551,974**

Segment/Reach: 271 Maintenance Area No. 13 - Unit 2c — **Total Segment/Reach Length (Feet): 6,700**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$1,945,962
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,925,866
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,945,962**

Other Required Remediation Costs

Erosion Repair Cost:	Category A	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**

Total Remediation Cost for Estimate a **$1,945,962**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Overall Reach Categorization: LD

Estimate Run: b

Deficiencies Being Remediated: U

Remediated Length (%): 70

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$3,268,447
Combo Berm Cost:	$0
Slurry Wall Cost:	$4,839,326
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,268,447**

Other Required Remediation Costs

Erosion Repair Cost:	Category A	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$3,268,447**

Overall Reach Categorization: LD

Estimate Run: c

Deficiencies Being Remediated: FG

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost:	Category A	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 30	$614,445
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$614,445**
Total Remediation Cost for Estimate c			**$614,445**

Overall Reach Categorization: LD

Estimate Run: d

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost:	Category A	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 70	$1,214,491
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,214,491**
Total Remediation Cost for Estimate d			**$1,214,491**

Total Remediation Cost Estimated for Segment/Reach 271 $7,043,344

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment/Reach: 272 **Maintenance Area No. 13 - Unit 1c** **Total Segment/Reach Length (Feet): 28,098**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: Sn

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$5,134,368
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,134,368**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$5,134,368**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 90	$8,182,591
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$8,182,591**
Total Remediation Cost for Estimate b		**$8,182,591**

Total Remediation Cost Estimated for Segment/Reach 272 $13,316,959

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment/Reach: 274.1 Maintenance Area No. 05 - Unit 2a — **Total Segment/Reach Length (Feet): 4,500**

Overall Reach Categorization: A

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 16		$254,521
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$254,521**
Total Remediation Cost for Estimate		**a**	**$254,521**

Total Remediation Cost Estimated for Segment/Reach 274.1 $254,521

Segment/Reach: 290 Sacramento River East Levee Unit 4, Moulton Weir — **Total Segment/Reach Length (Feet): 1,465**

Overall Reach Categorization: A

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 50		$393,068
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$393,068**
Total Remediation Cost for Estimate		**a**	**$393,068**

Total Remediation Cost Estimated for Segment/Reach 290 $393,068

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment/Reach: 291 Sacramento River East Levee Unit 3, Colusa Weir — **Total Segment/Reach Length (Feet): 12,108**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$8,908,488
Combo Berm Cost:	$0
Slurry Wall Cost:	$13,624,913
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,908,488**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 50		$9,940,668
Freeboard/Geometry Cost:	Length (%): 20		$663,535
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$10,604,203**
Total Remediation Cost for Estimate a			**$19,512,691**

Total Remediation Cost Estimated for Segment/Reach 291 $19,512,691

Segment/Reach: 292 Sacramento River East Levee Unit 2, Colusa Weir — **Total Segment/Reach Length (Feet): 11,565**

Overall Reach Categorization: A

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 15		$523,602
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$523,602**
Total Remediation Cost for Estimate a			**$523,602**

Total Remediation Cost Estimated for Segment/Reach 292 $523,602

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment/Reach: 379 Chico-Mud Unit 2b — **Total Segment/Reach Length (Feet): 21,148**

Overall Reach Categorization: A

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 90	$6,654,013
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$6,654,013**
Total Remediation Cost for Estimate a		**$6,654,013**

Overall Reach Categorization: A

Estimate Run: b

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 6	$391,606
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$391,606**
Total Remediation Cost for Estimate b		**$391,606**

Total Remediation Cost Estimated for Segment/Reach 379 $7,045,619

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment/Reach: 381.1 Maintenance Area No. 05 - Unit 1 **Total Segment/Reach Length (Feet): 25,150**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 80

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$41,208,802
Slurry Wall Cost:	$43,691,737
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$41,208,802**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 100	$38,543,213
Freeboard/Geometry Cost:	Length (%): 60	$5,073,503
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$43,616,716**
Total Remediation Cost for Estimate a		**$84,825,519**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: U+FG

Remediated Length (%): 10

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$4,008,792
Combo Berm Cost:	$0
Slurry Wall Cost:	$5,386,688
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,008,792**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 10	$1,214,906
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,214,906**
Total Remediation Cost for Estimate b		**$5,223,699**

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: U

Remediated Length (%): 10

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$6,224,327
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,224,327**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$6,224,327**

Total Remediation Cost Estimated for Segment/Reach 381.1 $96,273,544

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment/Reach: 381.2 Maintenance Area No. 05 - Unit 1 — **Total Segment/Reach Length (Feet): 12,450**

Overall Reach Categorization: A

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 75	$5,133,904
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$5,133,904**
Total Remediation Cost for Estimate a		**$5,133,904**

Total Remediation Cost Estimated for Segment/Reach 381.2 $5,133,904

Segment/Reach: 383.2 Maintenance Area No. 13 - Unit 2e — **Total Segment/Reach Length (Feet): 22,920**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: Sn

Remediated Length (%): 66

Alternative Remediation Costs

Drained Stability Berm Cost:	$8,865,779
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,865,779**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$8,865,779**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: Sn

Remediated Length (%): 34

Alternative Remediation Costs	
Drained Stability Berm Cost:	$5,922,361
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,922,361**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$5,922,361**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: E

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 10	$2,738,560
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,738,560**
Total Remediation Cost for Estimate c		**$2,738,560**

Overall Reach Categorization: C

Estimate Run: d

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 35	$2,488,250
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,488,250**
Total Remediation Cost for Estimate d		**$2,488,250**

Total Remediation Cost Estimated for Segment/Reach 383.2 $20,014,950

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment/Reach: 1027 Segment 1027 — **Total Segment/Reach Length (Feet): 3,950**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,164,138
Slurry Wall Cost:	$4,239,922
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,164,138**

Other Required Remediation Costs			
Erosion Repair Cost:	Category A	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$3,164,138**

Overall Reach Categorization: LD

Estimate Run: b

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs			
Erosion Repair Cost:	Category A	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 90	$1,037,563
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,037,563**
Total Remediation Cost for Estimate b			**$1,037,563**

Total Remediation Cost Estimated for Segment/Reach 1027 $4,201,701

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 54 Deer Creek Unit 1b — **Total Segment/Reach Length (Feet): 16,325**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 60

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$8,096,515
Slurry Wall Cost:	$11,102,511
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,096,515**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 60		$8,384,520
Freeboard/Geometry Cost:	Length (%): 100		$4,562,498
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$12,947,018**
Total Remediation Cost for Estimate a			**$21,043,532**

Total Remediation Cost Estimated for Segment/Reach 54 $21,043,532

Segment/Reach: 55 Deer Creek Unit 2 — **Total Segment/Reach Length (Feet): 7,636**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 47

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$2,466,351
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,404,471
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,466,351**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 50		$2,451,156
Freeboard/Geometry Cost:	Length (%): 72		$1,539,497
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$3,990,653**
Total Remediation Cost for Estimate a			**$6,457,004**

Total Remediation Cost Estimated for Segment/Reach 55 $6,457,004

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 56 Deer Creek Unit 1a — **Total Segment/Reach Length (Feet): 5,300**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: E+FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category C	Length (%): 60	$1,663,140
Freeboard/Geometry Cost:	Length (%): 75	$922,157
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,585,297**
Total Remediation Cost for Estimate a		**$2,585,297**

Total Remediation Cost Estimated for Segment/Reach 56 $2,585,297

Segment/Reach: 57 Elder Creek Unit 4b - Tehama County — **Total Segment/Reach Length (Feet): 4,930**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 41

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$1,600,494
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,478,737
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,600,494**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 50	$2,110,040
Freeboard/Geometry Cost:	Length (%): 81	$1,105,870
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,215,910**
Total Remediation Cost for Estimate a		**$4,816,405**

Total Remediation Cost Estimated for Segment/Reach 57 $4,816,405

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 58 **Elder Creek Unit 4a - Tehama County** **Total Segment/Reach Length (Feet): 15,928**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+E

Remediated Length (%): 39

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,878,998
Slurry Wall Cost:	$5,529,802
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,878,998**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 80		$10,907,494
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$10,907,494**
Total Remediation Cost for Estimate		**a**	**$14,786,493**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 11

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$2,960,535
Slurry Wall Cost:	$3,105,220
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,960,535**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$2,960,535**

Total Remediation Cost Estimated for Segment/Reach 58 $17,747,028

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 59 **Elder Creek Unit 5 - Tehama County** **Total Segment/Reach Length (Feet): 20,363**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 31

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$4,003,837
Slurry Wall Cost:	$5,810,408
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,003,837**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 50	$7,625,944
Freeboard/Geometry Cost:	Length (%): 36	$1,728,251
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$9,354,195**
Total Remediation Cost for Estimate a		**$13,358,032**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$5,180,210
Slurry Wall Cost:	$7,185,265
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,180,210**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 35	$2,021,530
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,021,530**
Total Remediation Cost for Estimate b		**$7,201,740**

Total Remediation Cost Estimated for Segment/Reach 59 $20,559,772

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 65 LD 1-Glenn, Sacramento River **Total Segment/Reach Length (Feet): 64,720**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 5

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$3,664,489
Combo Berm Cost:	$0
Slurry Wall Cost:	$8,216,793
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,664,489**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 25	$17,312,600
Freeboard/Geometry Cost:	Length (%): 50	$9,687,597
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$27,000,197**
Total Remediation Cost for Estimate a		**$30,664,686**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 25

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$20,173,912
Slurry Wall Cost:	$43,826,441
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$20,173,912**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$20,173,912**

Total Remediation Cost Estimated for Segment/Reach 65 $50,838,598

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 67 LD 2-Glenn, Sacramento River **Total Segment/Reach Length (Feet): 25,915**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+FG

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$12,840,181
Combo Berm Cost:	$0
Slurry Wall Cost:	$23,087,108
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$12,840,181**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 5	$388,746
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$388,746**

Total Remediation Cost for Estimate a **$13,228,927**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 20

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$9,292,268
Slurry Wall Cost:	$15,591,354
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$9,292,268**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**

Total Remediation Cost for Estimate b **$9,292,268**

Total Remediation Cost Estimated for Segment/Reach 67 **$22,521,195**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 100 Maintenance Area No. 01 **Total Segment/Reach Length (Feet): 13,400**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 25

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$8,248,148
Slurry Wall Cost:	$6,962,405
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,962,405**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 25		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**a**	**$6,962,405**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 25

Alternative Remediation Costs

Drained Stability Berm Cost:	$2,954,147
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,954,147**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$2,954,147**

Total Remediation Cost Estimated for Segment/Reach 100 $9,916,552

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 107 **Maintenance Area No. 12** **Total Segment/Reach Length (Feet): 60,005**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: Ss

Remediated Length (%): 90

Alternative Remediation Costs

Drained Stability Berm Cost:	$43,923,724
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$43,923,724**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$43,923,724**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: U+Ss

Remediated Length (%): 10

Alternative Remediation Costs

Drained Stability Berm Cost:	$4,880,305
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$9,932,524
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,880,305**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$4,880,305**

Total Remediation Cost Estimated for Segment/Reach 107 $48,804,029

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 115 RD 0070 Unit 2 — **Total Segment/Reach Length (Feet): 81,845**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$34,313,361
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$64,472,762
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$34,313,361**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$34,313,361**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 40

Alternative Remediation Costs	
Drained Stability Berm Cost:	$34,109,007
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$34,109,007**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$34,109,007**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: Sn

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$25,581,755
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$25,581,755**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$25,581,755**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Overall Reach Categorization: C

Estimate Run: d

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 4		$1,061,524
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,061,524**
Total Remediation Cost for Estimate		**d**	**$1,061,524**

Overall Reach Categorization: C

Estimate Run: e

Deficiencies Being Remediated:
FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 1		$280,015
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$280,015**
Total Remediation Cost for Estimate		**e**	**$280,015**

Overall Reach Categorization: C

Estimate Run: f

Deficiencies Being Remediated:
E

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 50		$73,333,120
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$73,333,120**
Total Remediation Cost for Estimate		**f**	**$73,333,120**

Total Remediation Cost Estimated for Segment/Reach **115** **$168,678,782**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 116 RD 0108 (Colusa Co, and Yolo Co) **Total Segment/Reach Length (Feet): 107,483**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: Sn+E+FG

Remediated Length (%): 59

Alternative Remediation Costs	
Drained Stability Berm Cost:	$61,195,365
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$61,195,365**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 30	$59,588,575
Freeboard/Geometry Cost:	Length (%): 21	$8,179,198
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$67,767,773**
Total Remediation Cost for Estimate a		**$128,963,138**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: Sn

Remediated Length (%): 50

Alternative Remediation Costs	
Drained Stability Berm Cost:	$38,566,395
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$38,566,395**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 14	$5,674,036
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$5,674,036**
Total Remediation Cost for Estimate b		**$44,240,432**

Total Remediation Cost Estimated for Segment/Reach 116 $173,203,570

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 137 RD 0787 — **Total Segment/Reach Length (Feet): 23,477**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: Sn+E+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$27,607,209
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$27,607,209**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 60		$31,553,088
Freeboard/Geometry Cost:	Length (%): 36		$2,686,438
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$34,239,526**
Total Remediation Cost for Estimate a			**$61,846,735**

Total Remediation Cost Estimated for Segment/Reach 137 $61,846,735

Segment/Reach: 146 RD 1500 Unit 1 — **Total Segment/Reach Length (Feet): 174,955**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$334,227,275
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$719,274,718
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$334,227,275**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$334,227,275**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 15	$8,403,202
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$8,403,202**
Total Remediation Cost for Estimate b		**$8,403,202**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 5	$2,957,474
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,957,474**
Total Remediation Cost for Estimate c		**$2,957,474**

Overall Reach Categorization: C

Estimate Run: d

Deficiencies Being Remediated: E

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 50	$143,638,055
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$143,638,055**
Total Remediation Cost for Estimate d		**$143,638,055**

Total Remediation Cost Estimated for Segment/Reach 146 $489,226,007

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 149 RD 1660 Unit 1 **Total Segment/Reach Length (Feet): 15,270**

Overall Reach Categorization: LD (B or C)

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$8,696,335
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$16,282,906
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,696,335**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**

Total Remediation Cost for Estimate a **$8,696,335**

Overall Reach Categorization: LD (B or C)

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 60

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$17,392,670
Slurry Wall Cost:	$24,068,617
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$17,392,670**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**

Total Remediation Cost for Estimate b **$17,392,670**

Overall Reach Categorization: LD (B or C)

Estimate Run: c

Deficiencies Being Remediated: E

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 30	$7,522,002
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$7,522,002**

Total Remediation Cost for Estimate c **$7,522,002**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Overall Reach Categorization: LD (B or C)

Estimate Run: d

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 5		$243,750
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$243,750**
Total Remediation Cost for Estimate	**d**		**$243,750**

Overall Reach Categorization: LD (B or C)

Estimate Run: e

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 5		$258,127
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$258,127**
Total Remediation Cost for Estimate	**e**		**$258,127**

Total Remediation Cost Estimated for Segment/Reach 149 $34,112,883

Segment/Reach: 158 Sacramento River West Side Levee District

Total Segment/Reach Length (Feet): 139,273

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$152,313,553
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$200,467,499
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$152,313,553**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 40		$112,309,747
Freeboard/Geometry Cost:	Length (%): 50		$34,162,806
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$146,472,553**
Total Remediation Cost for Estimate	**a**		**$298,786,106**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Total Remediation Cost Estimated for Segment/Reach 158 $298,786,106

Segment/Reach: 165 Tisdale Bypass Unit 1 - north bank **Total Segment/Reach Length (Feet): 23,674**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$11,871,130
Combo Berm Cost:	$0
Slurry Wall Cost:	$17,534,725
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$11,871,130**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$11,871,130**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 60

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$24,235,746
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$46,442,920
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$24,235,746**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$24,235,746**

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 70	$5,861,045
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$5,861,045**
Total Remediation Cost for Estimate c		**$5,861,045**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Total Remediation Cost Estimated for Segment/Reach 165 $41,967,921

Segment/Reach: 166 Tisdale Bypass Unit 2 - south bank **Total Segment/Reach Length (Feet): 23,380**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 60

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$36,645,795
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$63,585,842
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$36,645,795**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$36,645,795**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 40

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$17,349,675
Slurry Wall Cost:	$27,766,715
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$17,349,675**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$17,349,675**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 90	$7,586,663
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$7,586,663**
Total Remediation Cost for Estimate c		**$7,586,663**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Total Remediation Cost Estimated for Segment/Reach 166 $61,582,133

Segment/Reach: 248 RD 1660 Unit 2 — **Total Segment/Reach Length (Feet): 48,163**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 40

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$50,776,335
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$83,453,784
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$50,776,335**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$50,776,335**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+Sn

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$10,588,083
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,588,083**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$10,588,083**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: T+U

Remediated Length (%): 40

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$53,055,183
Slurry Wall Cost:	$61,787,899
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$53,055,183**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$53,055,183**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Overall Reach Categorization: C

Estimate Run: d

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 60	$9,646,149
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$9,646,149**
Total Remediation Cost for Estimate d		**$9,646,149**

Overall Reach Categorization: C

Estimate Run: e

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 40	$6,086,311
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$6,086,311**
Total Remediation Cost for Estimate e		**$6,086,311**

Total Remediation Cost Estimated for Segment/Reach 248 $130,152,061

Segment/Reach: 286 Maintenance Area No. 01 **Total Segment/Reach Length (Feet): 29,425**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 50

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$27,770,569
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$27,770,569**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$27,770,569**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Total Remediation Cost Estimated for Segment/Reach 286 $27,770,569

Segment/Reach: 287 Sacramento River West Side Levee District **Total Segment/Reach Length (Feet): 28,116**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+E

Remediated Length (%): 75

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$53,511,234
Slurry Wall Cost:	$72,903,995
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$53,511,234**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 50	$31,489,920
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$31,489,920**
Total Remediation Cost for Estimate a		**$85,001,154**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 25

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$17,739,227
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$31,633,640
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$17,739,227**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$17,739,227**

Total Remediation Cost Estimated for Segment/Reach 287 $102,740,381

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 288 Sacramento River West Side Levee District **Total Segment/Reach Length (Feet): 93,205**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+E+FG

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$41,877,837
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$71,819,018
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$41,877,837**

Other Required Remediation Costs			
Erosion Repair Cost:	Category B	Length (%): 50	$93,950,640
Freeboard/Geometry Cost:		Length (%): 5	$1,410,536
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$95,361,176**
Total Remediation Cost for Estimate a			**$137,239,013**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: U

Remediated Length (%): 15

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$28,943,221
Combo Berm Cost:	$0
Slurry Wall Cost:	$38,936,958
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$28,943,221**

Other Required Remediation Costs			
Erosion Repair Cost:	Category B	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$28,943,221**

Total Remediation Cost Estimated for Segment/Reach 288 $166,182,235

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 293 RD 0070 Unit 1 — **Total Segment/Reach Length (Feet): 41,799**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 25

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$26,139,467
Combo Berm Cost:	$0
Slurry Wall Cost:	$34,736,021
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$26,139,467**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$26,139,467**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 75

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$92,769,167
Slurry Wall Cost:	$114,020,424
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$92,769,167**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$92,769,167**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 55	$9,125,804
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$9,125,804**
Total Remediation Cost for Estimate c		**$9,125,804**

Total Remediation Cost Estimated for Segment/Reach 293 $128,034,438

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment/Reach: 294 RD 1500 Unit 2 — **Total Segment/Reach Length (Feet): 109,495**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$171,061,723
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$276,775,235
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$171,061,723**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$171,061,723**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$171,061,723
Slurry Wall Cost:	$207,729,111
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$171,061,723**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$171,061,723**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 40		$17,054,612
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$17,054,612**
Total Remediation Cost for Estimate c			**$17,054,612**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Overall Reach Categorization: C

Estimate Run: d

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 60		$20,774,096
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$20,774,096**
Total Remediation Cost for Estimate		**d**	**$20,774,096**

Overall Reach Categorization: C

Estimate Run: e

Deficiencies Being Remediated: E

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 60		$147,161,280
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$147,161,280**
Total Remediation Cost for Estimate		**e**	**$147,161,280**

Total Remediation Cost Estimated for Segment/Reach 294 $527,113,434

Segment/Reach: 380 Maintenance Area No. 01 **Total Segment/Reach Length (Feet): 45,875**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 35

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$27,836,494
Slurry Wall Cost:	$47,183,260
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$27,836,494**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 25		$18,831,688
Freeboard/Geometry Cost:	Length (%): 10		$1,366,829
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$20,198,517**
Total Remediation Cost for Estimate		**a**	**$48,035,011**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: U

Remediated Length (%): 40

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$30,092,865
Combo Berm Cost:	$0
Slurry Wall Cost:	$54,113,897
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$30,092,865**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$30,092,865**

Total Remediation Cost Estimated for Segment/Reach **380** **$78,127,876**

Segment/Reach: 52.1 Marysville Unit 3 (NE extension) **Total Segment/Reach Length (Feet): 20,147**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 15

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$10,380,972
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$14,920,505
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,380,972**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**a**	**$10,380,972**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 35

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$13,895,320
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$26,938,100
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,895,320**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$13,895,320**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 10

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,970,091
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$7,696,600
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,970,091**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$3,970,091**

Overall Reach Categorization: B

Estimate Run: d

Deficiencies Being Remediated: U

Remediated Length (%): 10

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$3,052,302
Combo Berm Cost:	$0
Slurry Wall Cost:	$4,562,119
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,052,302**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate d		**$3,052,302**

Overall Reach Categorization: B

Estimate Run: e

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 40	$3,262,251
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,262,251**
Total Remediation Cost for Estimate e		**$3,262,251**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Overall Reach Categorization: B

Estimate Run: f

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 10	$649,429
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$649,429**
Total Remediation Cost for Estimate f		**$649,429**

Total Remediation Cost Estimated for Segment/Reach 52.1 $35,210,366

Segment/Reach: 62 Honcut Creek Area - Eastern **Total Segment/Reach Length (Feet): 7,741**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$1,962,737
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,670,394
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,962,737**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$1,962,737**

Overall Reach Categorization: LD

Estimate Run: b

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 80	$3,775,426
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,775,426**
Total Remediation Cost for Estimate b		**$3,775,426**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Total Remediation Cost Estimated for Segment/Reach 62 $5,738,163

Segment/Reach: 101 Maintenance Area No. 03 — **Total Segment/Reach Length (Feet): 11,600**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+E

Remediated Length (%): 50

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$18,599,572
Slurry Wall Cost:	$21,219,681
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$18,599,572**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 50	$12,992,000
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$12,992,000**
Total Remediation Cost for Estimate a		**$31,591,572**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 50

Alternative Remediation Costs	
Drained Stability Berm Cost:	$3,605,745
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$13,848,302
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,605,745**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$3,605,745**

Total Remediation Cost Estimated for Segment/Reach 101 $35,197,317

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Segment/Reach: 114 RD 0010 Unit 1 — **Total Segment/Reach Length (Feet): 40,406**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 15

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$24,598,520
Slurry Wall Cost:	$20,178,076
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$20,178,076**

Other Required Remediation Costs			
Erosion Repair Cost:	Category A	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate a			**$20,178,076**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 15

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$18,712,160
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$27,237,114
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$18,712,160**

Other Required Remediation Costs			
Erosion Repair Cost:	Category A	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$18,712,160**

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: T+Sn

Remediated Length (%): 35

Alternative Remediation Costs	
Drained Stability Berm Cost:	$18,393,073
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$18,393,073**

Other Required Remediation Costs			
Erosion Repair Cost:	Category A	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate c			**$18,393,073**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Overall Reach Categorization: B

Estimate Run: d

Deficiencies Being Remediated: T

Remediated Length (%): 15

Alternative Remediation Costs	
Drained Stability Berm Cost:	$4,401,882
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,401,882**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate d		**$4,401,882**

Overall Reach Categorization: B

Estimate Run: e

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 35	$5,428,847
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$5,428,847**
Total Remediation Cost for Estimate e		**$5,428,847**

Overall Reach Categorization: B

Estimate Run: f

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 40	$5,264,153
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$5,264,153**
Total Remediation Cost for Estimate f		**$5,264,153**

Total Remediation Cost Estimated for Segment/Reach 114 $72,378,192

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Segment/Reach: 135 RD 0784 Unit 3b — **Total Segment/Reach Length (Feet): 7,392**

Overall Reach Categorization: LD (B or C)

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 80

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$10,945,492
Slurry Wall Cost:	$14,613,621
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,945,492**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 20	$2,649,293
Freeboard/Geometry Cost:	Length (%): 78	$2,101,460
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$4,750,753**
Total Remediation Cost for Estimate a		**$15,696,245**

Overall Reach Categorization: LD (B or C)

Estimate Run: b

Deficiencies Being Remediated: U

Remediated Length (%): 20

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$2,540,820
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,439,490
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,439,490**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$2,439,490**

Total Remediation Cost Estimated for Segment/Reach 135 $18,135,734

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Segment/Reach: 138 RD 0817 Unit 1 — **Total Segment/Reach Length (Feet): 20,160**

Overall Reach Categorization: LD (B or C)

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 42

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$15,000,061
Slurry Wall Cost:	$19,526,980
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$15,000,061**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 25	$6,620,544
Freeboard/Geometry Cost:	Length (%): 13	$532,489
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$7,153,033**

Total Remediation Cost for Estimate a **$22,153,094**

Overall Reach Categorization: LD (B or C)

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 42

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$5,564,399
Slurry Wall Cost:	$7,424,301
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,564,399**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**

Total Remediation Cost for Estimate b **$5,564,399**

Total Remediation Cost Estimated for Segment/Reach 138 **$27,717,493**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Segment/Reach: 144 RD 1001 Unit 1 — **Total Segment/Reach Length (Feet): 22,176**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 52

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$11,941,657
Slurry Wall Cost:	$15,471,469
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$11,941,657**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 2	$153,594
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$153,594**

Total Remediation Cost for Estimate a **$12,095,251**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 48

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$20,384,068
Slurry Wall Cost:	$18,540,079
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$18,540,079**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 5	$307,187
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$307,187**

Total Remediation Cost for Estimate b **$18,847,265**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 5	$252,052
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$252,052**

Total Remediation Cost for Estimate c **$252,052**

Total Remediation Cost Estimated for Segment/Reach 144 **$31,194,568**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Segment/Reach: 145 RD 1001 Unit 2 — **Total Segment/Reach Length (Feet): 19,235**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$14,489,269
Slurry Wall Cost:	$18,921,113
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$14,489,269**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 10	$2,737,269
Freeboard/Geometry Cost:	Length (%): 14	$976,200
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,713,468**

Total Remediation Cost for Estimate a **$18,202,738**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: U

Remediated Length (%): 10

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$2,957,182
Combo Berm Cost:	$0
Slurry Wall Cost:	$3,962,916
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,957,182**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**

Total Remediation Cost for Estimate b **$2,957,182**

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: U+Ss

Remediated Length (%): 10

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,128,311
Slurry Wall Cost:	$4,135,868
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,128,311**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**

Total Remediation Cost for Estimate c **$3,128,311**

Total Remediation Cost Estimated for Segment/Reach 145 **$24,288,231**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Segment/Reach: 154 RD 2103 Unit 1b — **Total Segment/Reach Length (Feet): 17,950**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$18,598,421
Slurry Wall Cost:	$24,814,949
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$18,598,421**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 30	$5,185,755
Freeboard/Geometry Cost:	Length (%): 12	$403,005
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$5,588,760**

Total Remediation Cost for Estimate a **$24,187,181**

Total Remediation Cost Estimated for Segment/Reach 154 **$24,187,181**

Segment/Reach: 163 Sutter Bypass - East Levee - north — **Total Segment/Reach Length (Feet): 22,700**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 75

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$42,618,540
Combo Berm Cost:	$0
Slurry Wall Cost:	$51,415,694
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$42,618,540**

Other Required Remediation Costs

Erosion Repair Cost: Category LD	Length (%): 25	$12,712,000
Freeboard/Geometry Cost:	Length (%): 25	$1,971,899
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$14,683,899**

Total Remediation Cost for Estimate a **$57,302,439**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: Sn

Remediated Length (%): 25

Alternative Remediation Costs

Drained Stability Berm Cost:	$6,396,991
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,396,991**

Other Required Remediation Costs

Erosion Repair Cost:	Category LD	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**

Total Remediation Cost for Estimate b **$6,396,991**

Total Remediation Cost Estimated for Segment/Reach 163 **$63,699,430**

Segment/Reach: 164 Sutter Bypass - East Levee - south **Total Segment/Reach Length (Feet): 72,900**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 25

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$42,247,559
Combo Berm Cost:	$0
Slurry Wall Cost:	$60,898,446
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$42,247,559**

Other Required Remediation Costs

Erosion Repair Cost:	Category B	Length (%): 30	$48,988,800
Freeboard/Geometry Cost:		Length (%): 50	$12,417,689
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$61,406,489**

Total Remediation Cost for Estimate a **$103,654,049**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: Sn

Remediated Length (%): 25

Alternative Remediation Costs

Drained Stability Berm Cost:	$18,514,109
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$18,514,109**

Other Required Remediation Costs

Erosion Repair Cost:	Category B	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**

Total Remediation Cost for Estimate b **$18,514,109**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: T+U

Remediated Length (%): 25

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$45,383,867
Slurry Wall Cost:	$60,898,446
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$45,383,867**

Other Required Remediation Costs			
Erosion Repair Cost:	Category B	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate c			**$45,383,867**

Overall Reach Categorization: C

Estimate Run: d

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 25

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$45,383,867
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$79,717,240
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$45,383,867**

Other Required Remediation Costs			
Erosion Repair Cost:	Category B	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate d			**$45,383,867**

Total Remediation Cost Estimated for Segment/Reach 164 $212,935,891

Segment/Reach: 167 Wadsworth Canal Unit 1

Total Segment/Reach Length (Feet): 11,600

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$2,193,851
Combo Berm Cost:	$0
Slurry Wall Cost:	$6,071,056
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,193,851**

Other Required Remediation Costs			
Erosion Repair Cost:	Category B	Length (%): 100	$11,170,800
Freeboard/Geometry Cost:		Length (%): 100	$4,013,008
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$15,183,808**
Total Remediation Cost for Estimate a			**$17,377,659**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Total Remediation Cost Estimated for Segment/Reach 167 $17,377,659

Segment/Reach: 168 Wadsworth Canal Unit 2 — **Total Segment/Reach Length (Feet): 24,300**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 52

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$27,033,756
Combo Berm Cost:	$0
Slurry Wall Cost:	$38,109,621
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$27,033,756**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 100	$54,432,000
Freeboard/Geometry Cost:	Length (%): 35	$3,249,155
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$57,681,155**
Total Remediation Cost for Estimate a		**$84,714,910**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 25

Alternative Remediation Costs	
Drained Stability Berm Cost:	$6,359,540
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$10,311,546
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,359,540**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$6,359,540**

Total Remediation Cost Estimated for Segment/Reach 168 $91,074,451

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Segment/Reach: 246 RD 1001 Unit 3, and Unit 3a **Total Segment/Reach Length (Feet): 49,632**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 47

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$29,392,104
Slurry Wall Cost:	$37,933,925
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$29,392,104**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 40	$28,251,858
Freeboard/Geometry Cost:	Length (%): 47	$8,753,076
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$37,004,934**
Total Remediation Cost for Estimate a		**$66,397,038**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 28

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$23,887,569
Slurry Wall Cost:	$32,164,712
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$23,887,569**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 40	$7,578,751
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$7,578,751**
Total Remediation Cost for Estimate b		**$31,466,320**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 12

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$10,363,058
Slurry Wall Cost:	$13,953,901
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,363,058**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$10,363,058**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Overall Reach Categorization: C

Estimate Run: d

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 13

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$13,667,009
Slurry Wall Cost:	$19,547,351
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,667,009**

Other Required Remediation Costs			
Erosion Repair Cost:	Category C	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate d			**$13,667,009**

Total Remediation Cost Estimated for Segment/Reach 246 $121,893,425

Segment/Reach: 247 RD 1001 Unit 4 **Total Segment/Reach Length (Feet): 70,224**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+E+FG

Remediated Length (%): 94

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$220,406,035
Slurry Wall Cost:	$248,127,676
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$1,870,407
Minimum Alternative Remediation Cost:	**$1,870,407**

Other Required Remediation Costs			
Erosion Repair Cost:	Category C	Length (%): 50	$78,650,880
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$78,650,880**
Total Remediation Cost for Estimate a			**$80,521,287**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss+FG

Remediated Length (%): 6

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$19,240,163
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$35,525,524
Replace Levee Cost:	$4,948,260
Minimum Alternative Remediation Cost:	**$4,948,260**

Other Required Remediation Costs			
Erosion Repair Cost:	Category C	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$4,948,260**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: T+U+Ss+FG

Remediated Length (%): 1

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$3,740,814
Minimum Alternative Remediation Cost:	**$3,740,814**

Other Required Remediation Costs		
Erosion Repair Cost: Category C	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$3,740,814**

Overall Reach Categorization: C

Estimate Run: d

Deficiencies Being Remediated: T+U+Ss+FG

Remediated Length (%): 2

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$5,160,853
Minimum Alternative Remediation Cost:	**$5,160,853**

Other Required Remediation Costs		
Erosion Repair Cost: Category C	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate d		**$5,160,853**

Total Remediation Cost Estimated for Segment/Reach 247 $94,371,213

Segment/Reach: 275 RD 0010 Unit 3

Total Segment/Reach Length (Feet): 14,848

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T

Remediated Length (%): 15

Alternative Remediation Costs	
Drained Stability Berm Cost:	$1,317,635
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,317,635**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$1,317,635**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 5

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$690,821
Slurry Wall Cost:	$2,044,700
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$690,821**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$690,821**

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: T

Remediated Length (%): 55

Alternative Remediation Costs	
Drained Stability Berm Cost:	$5,693,543
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,693,543**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$5,693,543**

Overall Reach Categorization: B

Estimate Run: d

Deficiencies Being Remediated: T+U

Remediated Length (%): 25

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,937,665
Slurry Wall Cost:	$10,223,502
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,937,665**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate d		**$3,937,665**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Overall Reach Categorization: B

Estimate Run: e

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 15		$861,319
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$861,319**
Total Remediation Cost for Estimate		**e**	**$861,319**

Total Remediation Cost Estimated for Segment/Reach 275 $12,500,983

Segment/Reach: 281 RD 0784 Unit 6

Total Segment/Reach Length (Feet): 7,920

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$6,341,191
Slurry Wall Cost:	$8,549,304
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,341,191**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**a**	**$6,341,191**

Total Remediation Cost Estimated for Segment/Reach 281 $6,341,191

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Segment/Reach: 283 RD 1001 Unit 3b — **Total Segment/Reach Length (Feet): 16,632**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+E+FG

Remediated Length (%): 11

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,792,010
Slurry Wall Cost:	$5,398,301
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,792,010**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 50	$18,627,840
Freeboard/Geometry Cost:	Length (%): 11	$698,799
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$19,326,639**

Total Remediation Cost for Estimate a **$23,118,648**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 9

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$5,161,079
Slurry Wall Cost:	$5,928,074
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,161,079**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**

Total Remediation Cost for Estimate b **$5,161,079**

Total Remediation Cost Estimated for Segment/Reach 283 **$28,279,728**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Segment/Reach: 284 RD 1001 Unit 5 — **Total Segment/Reach Length (Feet): 28,512**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: U+E

Remediated Length (%): 25

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$16,391,504
Combo Berm Cost:	$0
Slurry Wall Cost:	$23,342,382
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$16,391,504**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 100	$63,866,880
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$63,866,880**

Total Remediation Cost for Estimate a **$80,258,384**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 25

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$17,858,772
Slurry Wall Cost:	$23,342,382
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$17,858,772**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**

Total Remediation Cost for Estimate b **$17,858,772**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: Sn

Remediated Length (%): 25

Alternative Remediation Costs

Drained Stability Berm Cost:	$7,902,200
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,902,200**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**

Total Remediation Cost for Estimate c **$7,902,200**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

GAR Study Area: 3

Overall Reach Categorization: C

Estimate Run: d

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 25

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$17,858,772
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$31,207,754
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$17,858,772**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**d**	**$17,858,772**

Total Remediation Cost Estimated for Segment/Reach 284 $123,878,128

Segment/Reach: 285 RD 1001 Unit 6

Total Segment/Reach Length (Feet): 24,816

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 25

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$8,649,689
Combo Berm Cost:	$0
Slurry Wall Cost:	$11,682,417
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,649,689**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**a**	**$8,649,689**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: Sn

Remediated Length (%): 25

Alternative Remediation Costs

Drained Stability Berm Cost:	$4,853,130
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,853,130**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$4,853,130**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Total Remediation Cost Estimated for Segment/Reach 285 $13,502,820

Segment/Reach: 385 RD 0010 Unit 2 — **Total Segment/Reach Length (Feet): 60,039**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U

Remediated Length (%): 45

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$57,942,344
Slurry Wall Cost:	$89,865,528
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$57,942,344**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$57,942,344**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 25

Alternative Remediation Costs	
Drained Stability Berm Cost:	$15,349,628
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$15,349,628**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$15,349,628**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: U

Remediated Length (%): 15

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$12,682,492
Combo Berm Cost:	$0
Slurry Wall Cost:	$26,365,295
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$12,682,492**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$12,682,492**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Overall Reach Categorization: C

Estimate Run: d

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 7	$1,424,875
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,424,875**
Total Remediation Cost for Estimate d		**$1,424,875**

Overall Reach Categorization: C

Estimate Run: e

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 18	$3,470,738
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,470,738**
Total Remediation Cost for Estimate e		**$3,470,738**

Total Remediation Cost Estimated for Segment/Reach 385 $90,870,077

Segment/Reach: 392 RD 0784 Unit 5b **Total Segment/Reach Length (Feet): 22,176**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+E

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$12,610,927
Slurry Wall Cost:	$17,104,061
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$12,610,927**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 30	$11,921,818
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$11,921,818**
Total Remediation Cost for Estimate a		**$24,532,745**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Total Remediation Cost Estimated for Segment/Reach 392 $24,532,745

Segment/Reach: 41 Cache Creek - Yolo County Unit 1b — **Total Segment/Reach Length (Feet): 61,700**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 51

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$60,923,820
Slurry Wall Cost:	$68,122,743
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$60,923,820**

Other Required Remediation Costs		
Erosion Repair Cost: Category C	Length (%): 100	$94,557,307
Freeboard/Geometry Cost:	Length (%): 51	$11,939,943
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$106,497,250**
Total Remediation Cost for Estimate a		**$167,421,070**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 49

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$41,343,293
Slurry Wall Cost:	$54,674,387
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$41,343,293**

Other Required Remediation Costs		
Erosion Repair Cost: Category C	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 13	$1,453,936
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,453,936**
Total Remediation Cost for Estimate b		**$42,797,229**

Total Remediation Cost Estimated for Segment/Reach 41 $210,218,299

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment/Reach: 77 Middle Creek - Unit 2a — **Total Segment/Reach Length (Feet): 3,302**

Overall Reach Categorization: A

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 61		$1,083,479
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,083,479**
Total Remediation Cost for Estimate a			**$1,083,479**

Total Remediation Cost Estimated for Segment/Reach 77 $1,083,479

Segment/Reach: 78 Middle Creek - Unit 1a — **Total Segment/Reach Length (Feet): 5,680**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+E+FG

Remediated Length (%): 60

Alternative Remediation Costs

Drained Stability Berm Cost:	$1,438,151
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,438,151**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 75		$2,227,980
Freeboard/Geometry Cost:	Length (%): 100		$2,538,787
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$4,766,767**
Total Remediation Cost for Estimate a			**$6,204,918**

Total Remediation Cost Estimated for Segment/Reach 78 $6,204,918

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment/Reach: 80 **Middle Creek - Unit 3 - Scotts Creek** **Total Segment/Reach Length (Feet): 13,072**

Overall Reach Categorization: LD (A or B)

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+FG

Remediated Length (%): 38

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$3,749,590
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$7,606,571
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,749,590**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 38	$2,559,036
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,559,036**
Total Remediation Cost for Estimate a		**$6,308,625**

Overall Reach Categorization: LD (A or B)

Estimate Run: b

Deficiencies Being Remediated: T+FG

Remediated Length (%): 15

Alternative Remediation Costs	
Drained Stability Berm Cost:	$1,135,134
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,135,134**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 15	$1,023,614
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,023,614**
Total Remediation Cost for Estimate b		**$2,158,748**

Overall Reach Categorization: LD (A or B)

Estimate Run: c

Deficiencies Being Remediated: T+Ss+FG

Remediated Length (%): 31

Alternative Remediation Costs	
Drained Stability Berm Cost:	$2,281,928
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,281,928**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 46	$3,354,661
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,354,661**
Total Remediation Cost for Estimate c		**$5,636,589**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Overall Reach Categorization: LD (A or B)

Estimate Run: d

Deficiencies Being Remediated: T

Remediated Length (%): 15

Alternative Remediation Costs

Drained Stability Berm Cost:	$1,140,964
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,140,964**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**d**	**$1,140,964**

Total Remediation Cost Estimated for Segment/Reach 80 $15,244,926

Segment/Reach: 81.1 Middle Creek - Unit 1e

Total Segment/Reach Length (Feet): 3,820

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: U+Ss+FG

Remediated Length (%): 20

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$1,151,462
Slurry Wall Cost:	$1,154,879
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,151,462**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 100		$1,917,242
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,917,242**
Total Remediation Cost for Estimate		**a**	**$3,068,704**

Overall Reach Categorization: LD

Estimate Run: b

Deficiencies Being Remediated: Ss

Remediated Length (%): 80

Alternative Remediation Costs

Drained Stability Berm Cost:	$2,932,941
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,932,941**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$2,932,941**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Total Remediation Cost Estimated for Segment/Reach 81.1 $6,001,645

Segment/Reach: 81.2 Middle Creek - Unit 1e — **Total Segment/Reach Length (Feet): 13,261**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+E+FG

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$15,725,105
Slurry Wall Cost:	$19,044,812
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$15,725,105**

Other Required Remediation Costs		
Erosion Repair Cost: Category C	Length (%): 100	$14,189,270
Freeboard/Geometry Cost:	Length (%): 100	$6,382,957
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$20,572,227**
Total Remediation Cost for Estimate a		**$36,297,332**

Total Remediation Cost Estimated for Segment/Reach 81.2 $36,297,332

Segment/Reach: 112 Putah Creek Unit 2 - south bank — **Total Segment/Reach Length (Feet): 41,850**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$18,871,481
Combo Berm Cost:	$0
Slurry Wall Cost:	$30,475,385
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$18,871,481**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 50	$9,213,921
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$9,213,921**
Total Remediation Cost for Estimate a		**$28,085,402**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Overall Reach Categorization: LD

Estimate Run: b

Deficiencies Being Remediated: U

Remediated Length (%): 40

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$25,287,494
Combo Berm Cost:	$0
Slurry Wall Cost:	$40,836,546
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$25,287,494**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$25,287,494**

Total Remediation Cost Estimated for Segment/Reach 112 $53,372,895

Segment/Reach: 124 RD 0537 Unit 1 - northh of Sac Bypass

Total Segment/Reach Length (Feet): 19,500

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+E

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$47,488,761
Slurry Wall Cost:	$61,145,136
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$47,488,761**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 40		$15,724,800
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$15,724,800**
Total Remediation Cost for Estimate		**a**	**$63,213,561**

Total Remediation Cost Estimated for Segment/Reach 124 $63,213,561

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment/Reach: 136 RD 0785 Unit 1 — **Total Segment/Reach Length (Feet): 11,610**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$29,083,111
Combo Berm Cost:	$0
Slurry Wall Cost:	$36,951,122
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$29,083,111**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 50		$11,702,880
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$11,702,880**
Total Remediation Cost for Estimate a			**$40,785,991**

Total Remediation Cost Estimated for Segment/Reach 136 $40,785,991

Segment/Reach: 139 RD 0827 Unit 1 — **Total Segment/Reach Length (Feet): 7,390**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$17,315,018
Slurry Wall Cost:	$23,941,805
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$17,315,018**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 70		$9,270,016
Freeboard/Geometry Cost:	Length (%): 7		$194,330
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$9,464,346**
Total Remediation Cost for Estimate a			**$26,779,364**

Total Remediation Cost Estimated for Segment/Reach 139 $26,779,364

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment/Reach: 147 RD 1600 Unit 1 — **Total Segment/Reach Length (Feet): 54,910**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+E+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$108,539,695
Slurry Wall Cost:	$149,785,855
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$108,539,695**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 100	$98,398,720
Freeboard/Geometry Cost:	Length (%): 19	$4,025,574
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$102,424,294**
Total Remediation Cost for Estimate a		**$210,963,989**

Total Remediation Cost Estimated for Segment/Reach 147 $210,963,989

Segment/Reach: 150 RD 2035 Unit 2 - Yolo Bypass — **Total Segment/Reach Length (Feet): 16,400**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+E+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$30,625,234
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$60,194,484
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$30,625,234**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 100	$31,225,600
Freeboard/Geometry Cost:	Length (%): 100	$4,896,789
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$36,122,389**
Total Remediation Cost for Estimate a		**$66,747,623**

Total Remediation Cost Estimated for Segment/Reach 150 $66,747,623

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment/Reach: 156.1 Sacramento Bypass Unit 1 - north bank — **Total Segment/Reach Length (Feet): 6,330**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$15,854,992
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$52,707,497
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$15,854,992**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**a**	**$15,854,992**

Total Remediation Cost Estimated for Segment/Reach 156.1 $15,854,992

Segment/Reach: 156.2 Sacramento Bypass Unit 1 - north bank — **Total Segment/Reach Length (Feet): 3,050**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: Sn+E

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$3,380,326
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,380,326**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 40		$2,732,800
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,732,800**
Total Remediation Cost for Estimate		**a**	**$6,113,126**

Total Remediation Cost Estimated for Segment/Reach 156.2 $6,113,126

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment/Reach: 162 **Service Area 6 - Yolo County** **Total Segment/Reach Length (Feet): 30,533**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+E+FG

Remediated Length (%): 80

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$45,390,922
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$81,687,872
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$45,390,922**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 30	$15,040,556
Freeboard/Geometry Cost:	Length (%): 30	$3,466,801
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$18,507,357**
Total Remediation Cost for Estimate a		**$63,898,279**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T+Sn

Remediated Length (%): 9

Alternative Remediation Costs

Drained Stability Berm Cost:	$2,865,766
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,865,766**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$2,865,766**

Total Remediation Cost Estimated for Segment/Reach 162 $66,764,045

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment/Reach: 169 Willow Slough Bypass Unit 1 - north bank — **Total Segment/Reach Length (Feet): 26,650**

Overall Reach Categorization: A

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 40		$5,437,516
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$5,437,516**
Total Remediation Cost for Estimate		**a**	**$5,437,516**

Total Remediation Cost Estimated for Segment/Reach 169 $5,437,516

Segment/Reach: 171 Yolo Bypass East Levee — **Total Segment/Reach Length (Feet): 10,560**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: Sn+E+FG

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$6,399,284
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,399,284**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 100		$23,654,400
Freeboard/Geometry Cost:	Length (%): 85		$3,610,764
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$27,265,164**
Total Remediation Cost for Estimate		**a**	**$33,664,449**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$14,189,962
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$24,027,978
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$14,189,962**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$14,189,962**

Total Remediation Cost Estimated for Segment/Reach 171 $47,854,411

Segment/Reach: 172 Yolo Bypass West Levee Unit 1 **Total Segment/Reach Length (Feet): 13,805**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+E+FG

Remediated Length (%): 70

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$20,907,594
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$40,900,002
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$20,907,594**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 30		$9,276,960
Freeboard/Geometry Cost:	Length (%): 100		$5,086,314
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$14,363,274**
Total Remediation Cost for Estimate		**a**	**$35,270,868**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: Sn

Remediated Length (%): 10

Alternative Remediation Costs

Drained Stability Berm Cost:	$1,435,748
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,435,748**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$1,435,748**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Total Remediation Cost Estimated for Segment/Reach 172 $36,706,615

Segment/Reach: 173 Yolo Bypass West Levee Unit 2 — **Total Segment/Reach Length (Feet): 7,963**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: Sn+E+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$7,481,170
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,481,170**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 100	$16,053,408
Freeboard/Geometry Cost:	Length (%): 50	$1,473,750
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$17,527,158**
Total Remediation Cost for Estimate a		**$25,008,329**

Total Remediation Cost Estimated for Segment/Reach 173 $25,008,329

Segment/Reach: 174 Yolo Bypass West Levee Unit 3 — **Total Segment/Reach Length (Feet): 7,529**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: Sn+E

Remediated Length (%): 40

Alternative Remediation Costs

Drained Stability Berm Cost:	$2,818,479
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,818,479**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 100	$15,178,464
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$15,178,464**
Total Remediation Cost for Estimate a		**$17,996,943**

Total Remediation Cost Estimated for Segment/Reach 174 $17,996,943

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment/Reach: 216 Knights Landing Ridge Cut - Unit 1 **Total Segment/Reach Length (Feet): 35,061**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+Sn+E+FG

Remediated Length (%): 90

Alternative Remediation Costs	
Drained Stability Berm Cost:	$26,151,795
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$26,151,795**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 50	$28,785,081
Freeboard/Geometry Cost:	Length (%): 40	$4,719,005
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$33,504,086**
Total Remediation Cost for Estimate a		**$59,655,882**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: Sn

Remediated Length (%): 10

Alternative Remediation Costs	
Drained Stability Berm Cost:	$2,905,884
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,905,884**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$2,905,884**

Total Remediation Cost Estimated for Segment/Reach 216 $62,561,766

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment/Reach: 217 Knights Landing Ridge Cut - Unit 2 **Total Segment/Reach Length (Feet): 34,868**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: Sn+E+FG

Remediated Length (%): 89

Alternative Remediation Costs

Drained Stability Berm Cost:	$27,838,258
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$27,838,258**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 60	$34,351,954
Freeboard/Geometry Cost:	Length (%): 30	$2,902,133
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$37,254,087**
Total Remediation Cost for Estimate a		**$65,092,345**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: Sn

Remediated Length (%): 11

Alternative Remediation Costs

Drained Stability Berm Cost:	$5,798,204
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$9,151,712
Minimum Alternative Remediation Cost:	**$5,798,204**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$5,798,204**

Total Remediation Cost Estimated for Segment/Reach 217 $70,890,549

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment/Reach: 237 Middle Creek - Unit 4 Alley Creek-Channel **Total Segment/Reach Length (Feet): 6,874**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$1,509,844
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$2,618,752
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,509,844**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 90	$2,776,548
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,776,548**
Total Remediation Cost for Estimate a		**$4,286,392**

Overall Reach Categorization: LD

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 40

Alternative Remediation Costs	
Drained Stability Berm Cost:	$1,699,570
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,699,570**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$1,699,570**

Total Remediation Cost Estimated for Segment/Reach 237 $5,985,963

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment/Reach: 241 RD 0827 Unit 2 — **Total Segment/Reach Length (Feet): 14,784**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: Sn+E+FG

Remediated Length (%): 70

Alternative Remediation Costs	
Drained Stability Berm Cost:	$13,585,135
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,585,135**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 100	$33,116,160
Freeboard/Geometry Cost:	Length (%): 100	$6,806,568
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$39,922,728**
Total Remediation Cost for Estimate a		**$53,507,863**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$5,821,341
Seepage Berm Cost:	$0
Combo Berm Cost:	$13,020,461
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$30,780,847
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,821,341**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$5,821,341**

Total Remediation Cost Estimated for Segment/Reach 241 $59,329,204

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment/Reach: 267 Middle Creek - Unit 5 Alley Creek-Channel — **Total Segment/Reach Length (Feet): 5,392**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$4,336,967
Slurry Wall Cost:	$6,252,406
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,336,967**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 100		$2,759,642
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,759,642**
Total Remediation Cost for Estimate a			**$7,096,609**

Total Remediation Cost Estimated for Segment/Reach 267 $7,096,609

Segment/Reach: 268 Middle Creek - Unit 3b Scotts Creek — **Total Segment/Reach Length (Feet): 7,164**

Overall Reach Categorization: LD (A or B)

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 10

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$825,804
Slurry Wall Cost:	$940,031
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$825,804**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 90		$1,931,525
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,931,525**
Total Remediation Cost for Estimate a			**$2,757,328**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Overall Reach Categorization: LD (A or B)

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 90

Alternative Remediation Costs

Drained Stability Berm Cost:	$4,159,995
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,159,995**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$4,159,995**

Total Remediation Cost Estimated for Segment/Reach 268 $6,917,323

Segment/Reach: 295 RD 1600 Unit 2 **Total Segment/Reach Length (Feet): 22,176**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: Sn+E+FG

Remediated Length (%): 40

Alternative Remediation Costs

Drained Stability Berm Cost:	$10,976,958
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,976,958**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 100		$49,674,240
Freeboard/Geometry Cost:	Length (%): 100		$8,273,575
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$57,947,815**
Total Remediation Cost for Estimate		**a**	**$68,924,773**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 60

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$36,931,625
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$60,981,002
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$36,931,625**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$36,931,625**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Total Remediation Cost Estimated for Segment/Reach 295 $105,856,398

Segment/Reach: 297 RD 2035 Unit 3 - Willow Bypass — **Total Segment/Reach Length (Feet): 12,925**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+E

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$18,971,684
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$35,424,898
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$18,971,684**

Other Required Remediation Costs		
Erosion Repair Cost: Category C	Length (%): 100	$18,393,137
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$18,393,137**
Total Remediation Cost for Estimate a		**$37,364,821**

Total Remediation Cost Estimated for Segment/Reach 297 $37,364,821

Segment/Reach: 393 RD 0785 Unit 2 — **Total Segment/Reach Length (Feet): 17,424**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: Sn+E+FG

Remediated Length (%): 100

Alternative Remediation Costs	
Drained Stability Berm Cost:	$20,361,015
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$20,361,015**

Other Required Remediation Costs		
Erosion Repair Cost: Category C	Length (%): 100	$39,029,760
Freeboard/Geometry Cost:	Length (%): 100	$6,789,414
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$45,819,174**
Total Remediation Cost for Estimate a		**$66,180,189**

Total Remediation Cost Estimated for Segment/Reach 393 $66,180,189

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 4

Segment/Reach: 1030 Segment 1030 — **Total Segment/Reach Length (Feet): 6,250**

Overall Reach Categorization: A

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs			
Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 60		$2,019,202
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,019,202**
Total Remediation Cost for Estimate	**a**		**$2,019,202**

Total Remediation Cost Estimated for Segment/Reach 1030 $2,019,202

Segment/Reach: 1031 Segment 1031 — **Total Segment/Reach Length (Feet): 20,500**

Overall Reach Categorization: A

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs			
Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 50		$7,752,789
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$7,752,789**
Total Remediation Cost for Estimate	**a**		**$7,752,789**

Total Remediation Cost Estimated for Segment/Reach 1031 $7,752,789

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 40 Brannan-Andrus LMD Unit 1 **Total Segment/Reach Length (Feet): 31,798**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 10

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$8,775,814
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,775,814**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 90	$12,921,146
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$12,921,146**
Total Remediation Cost for Estimate a		**$21,696,961**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$8,769,760
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$17,551,628
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,769,760**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$8,769,760**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: T+U

Remediated Length (%): 55

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$27,660,820
Slurry Wall Cost:	$43,451,779
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$27,660,820**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$27,660,820**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: C

Estimate Run: d

Deficiencies Being Remediated: U

Remediated Length (%): 5

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$2,514,620
Slurry Wall Cost:	$3,950,162
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,514,620**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**d**	**$2,514,620**

Total Remediation Cost Estimated for Segment/Reach 40 $60,642,161

Segment/Reach: 106 Maintenance Area No. 09 **Total Segment/Reach Length (Feet): 46,690**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Ss+E+FG

Remediated Length (%): 10

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$34,398,162
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$34,398,162**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 40		$35,559,104
Freeboard/Geometry Cost:	Length (%): 25		$4,399,486
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$39,958,590**
Total Remediation Cost for Estimate		**a**	**$74,356,752**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U+Ss

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$33,336,303
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$99,769,171
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$33,336,303**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$33,336,303**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: U

Remediated Length (%): 40

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$42,126,675
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$133,025,562
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$42,126,675**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**c**	**$42,126,675**

Overall Reach Categorization: C

Estimate Run: d

Deficiencies Being Remediated: T+Ss

Remediated Length (%): 20

Alternative Remediation Costs

Drained Stability Berm Cost:	$10,083,640
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,083,640**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**d**	**$10,083,640**

Total Remediation Cost Estimated for Segment/Reach 106 $159,903,371

Segment/Reach: 113.1 RD 0003 Unit 1

Total Segment/Reach Length (Feet): 22,840

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+E

Remediated Length (%): 20

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$10,906,934
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$20,265,956
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,906,934**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 20		$9,209,088
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$9,209,088**
Total Remediation Cost for Estimate		**a**	**$20,116,022**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 20

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$10,906,934
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$20,265,956
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,906,934**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$10,906,934**

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: T+Sn

Remediated Length (%): 10

Alternative Remediation Costs

Drained Stability Berm Cost:	$2,426,962
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,426,962**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**c**	**$2,426,962**

Overall Reach Categorization: B

Estimate Run: d

Deficiencies Being Remediated: T

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$12,134,808
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$12,134,808**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**d**	**$12,134,808**

Total Remediation Cost Estimated for Segment/Reach 113.1 $45,584,726

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 113.2 RD 0003 Unit 1 — **Total Segment/Reach Length (Feet): 37,300**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+E

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$36,630,357
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$58,021,838
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$36,630,357**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 20	$16,710,400
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$16,710,400**
Total Remediation Cost for Estimate a		**$53,340,757**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$24,420,238
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$38,213,994
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$24,420,238**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$24,420,238**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: T

Remediated Length (%): 50

Alternative Remediation Costs	
Drained Stability Berm Cost:	$23,115,018
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$43,472,771
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$23,115,018**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$23,115,018**

Total Remediation Cost Estimated for Segment/Reach 113.2 $100,876,012

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 117 RD 0150 Unit 1 — **Total Segment/Reach Length (Feet): 2,762**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$4,339,678
Slurry Wall Cost:	$7,341,733
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,339,678**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 80	$658,920
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$658,920**

Total Remediation Cost for Estimate a **$4,998,598**

Total Remediation Cost Estimated for Segment/Reach 117 **$4,998,598**

Segment/Reach: 118 RD 0307 — **Total Segment/Reach Length (Feet): 34,588**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 40

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$101,518,634
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$101,518,634**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 30	$19,756,666
Freeboard/Geometry Cost:	Length (%): 35	$5,050,588
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$24,807,254**

Total Remediation Cost for Estimate a **$126,325,888**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$22,447,998
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$22,447,998**

Other Required Remediation Costs			
Erosion Repair Cost:	Category C	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$22,447,998**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: U

Remediated Length (%): 10

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$7,348,319
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$24,706,614
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,348,319**

Other Required Remediation Costs			
Erosion Repair Cost:	Category C	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate c			**$7,348,319**

Overall Reach Categorization: C

Estimate Run: d

Deficiencies Being Remediated: T

Remediated Length (%): 10

Alternative Remediation Costs	
Drained Stability Berm Cost:	$3,487,175
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,487,175**

Other Required Remediation Costs			
Erosion Repair Cost:	Category C	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate d			**$3,487,175**

Total Remediation Cost Estimated for Segment/Reach 118 $159,609,380

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 119 RD 0341 Unit 1 — **Total Segment/Reach Length (Feet): 17,501**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+E+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$33,405,978
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$69,745,830
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$33,405,978**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 50		$13,410,433
Freeboard/Geometry Cost:	Length (%): 25		$1,772,243
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$15,182,676**
Total Remediation Cost for Estimate a			**$48,588,655**

Total Remediation Cost Estimated for Segment/Reach 119 $48,588,655

Segment/Reach: 120 RD 0349 Unit 1 — **Total Segment/Reach Length (Feet): 8,324**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: T+U+FG

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$7,824,145
Slurry Wall Cost:	$11,901,089
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,824,145**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 20		$560,013
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$560,013**
Total Remediation Cost for Estimate a			**$8,384,157**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: LD

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 50

Alternative Remediation Costs	
Drained Stability Berm Cost:	$3,562,528
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,562,528**

Other Required Remediation Costs			
Erosion Repair Cost:	Category A	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$3,562,528**

Total Remediation Cost Estimated for Segment/Reach 120 $11,946,685

Segment/Reach: 122 RD 0501 Unit 1 **Total Segment/Reach Length (Feet): 15,246**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+E

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$13,428,116
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$17,402,510
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,428,116**

Other Required Remediation Costs			
Erosion Repair Cost:	Category B	Length (%): 20	$6,830,208
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$6,830,208**
Total Remediation Cost for Estimate a			**$20,258,324**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$13,428,116
Slurry Wall Cost:	$17,255,916
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,428,116**

Other Required Remediation Costs			
Erosion Repair Cost:	Category B	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$13,428,116**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: U

Remediated Length (%): 40

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$17,009,315
Combo Berm Cost:	$0
Slurry Wall Cost:	$23,007,888
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$17,009,315**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**c**	**$17,009,315**

Total Remediation Cost Estimated for Segment/Reach 122 $50,695,756

Segment/Reach: 123.2 RD 0536 Unit 1

Total Segment/Reach Length (Feet): 22,800

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+FG

Remediated Length (%): 5

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$2,461,411
Slurry Wall Cost:	$3,587,233
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,461,411**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 30		$2,016,679
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,016,679**
Total Remediation Cost for Estimate		**a**	**$4,478,091**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 45

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$22,152,700
Slurry Wall Cost:	$32,285,101
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$22,152,700**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$22,152,700**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: Sn

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$6,872,632
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,872,632**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$6,872,632**

Total Remediation Cost Estimated for Segment/Reach 123.2 $33,503,422

Segment/Reach: 126 RD 0551 **Total Segment/Reach Length (Feet): 35,833**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+E

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$25,760,887
Combo Berm Cost:	$0
Slurry Wall Cost:	$38,938,891
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$25,760,887**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 10	$7,223,933
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$7,223,933**
Total Remediation Cost for Estimate a		**$32,984,820**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: U

Remediated Length (%): 10

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$13,835,088
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,835,088**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$13,835,088**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Total Remediation Cost Estimated for Segment/Reach 126 $46,819,908

Segment/Reach: 129 RD 0556 Unit 1 — **Total Segment/Reach Length (Feet): 28,936**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 15

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$7,392,241
Combo Berm Cost:	$0
Slurry Wall Cost:	$10,349,783
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,392,241**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 80	$35,476,308
Freeboard/Geometry Cost:	Length (%): 70	$7,820,496
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$43,296,804**
Total Remediation Cost for Estimate a		**$50,689,045**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 25

Alternative Remediation Costs	
Drained Stability Berm Cost:	$6,648,890
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,648,890**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$6,648,890**

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: Sn

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$7,978,668
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,978,668**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$7,978,668**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Total Remediation Cost Estimated for Segment/Reach 129 $65,316,604

Segment/Reach: 130 RD 0563 — **Total Segment/Reach Length (Feet): 64,111**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+E+FG

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$17,974,783
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$17,974,783**

Other Required Remediation Costs		
Erosion Repair Cost: Category C	Length (%): 100	$98,252,245
Freeboard/Geometry Cost:	Length (%): 40	$8,038,359
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$106,290,604**
Total Remediation Cost for Estimate a		**$124,265,387**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 50

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$57,351,233
Slurry Wall Cost:	$76,213,637
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$57,351,233**

Other Required Remediation Costs		
Erosion Repair Cost: Category C	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$57,351,233**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: T+Sn

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$11,983,189
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$11,983,189**

Other Required Remediation Costs		
Erosion Repair Cost: Category C	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$11,983,189**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Total Remediation Cost Estimated for Segment/Reach 130 $193,599,809

Segment/Reach: 131 RD 0755 — **Total Segment/Reach Length (Feet): 9,700**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+E

Remediated Length (%): 80

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$17,319,297
Slurry Wall Cost:	$26,337,341
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$17,319,297**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 30	$5,540,640
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$5,540,640**
Total Remediation Cost for Estimate a		**$22,859,937**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 10

Alternative Remediation Costs	
Drained Stability Berm Cost:	$980,211
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$980,211**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$980,211**

Total Remediation Cost Estimated for Segment/Reach 131 $23,840,148

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 132 RD 0755 — **Total Segment/Reach Length (Feet): 9,187**

Overall Reach Categorization: LD (B or C)

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 40

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$8,683,609
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$25,813,331
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,683,609**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 20		$3,704,198
Freeboard/Geometry Cost:	Length (%): 20		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$3,704,198**
Total Remediation Cost for Estimate	**a**		**$12,387,807**

Total Remediation Cost Estimated for Segment/Reach 132 $12,387,807

Segment/Reach: 142 RD 0999 Unit 1 — **Total Segment/Reach Length (Feet): 81,471**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 60

Alternative Remediation Costs

Drained Stability Berm Cost:	$60,132,043
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$60,132,043**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 95		$37,374,609
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$37,374,609**
Total Remediation Cost for Estimate	**a**		**$97,506,652**

Total Remediation Cost Estimated for Segment/Reach 142 $97,506,652

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 148 RD 1601 — **Total Segment/Reach Length (Feet): 13,683**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 80

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$29,206,006
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$47,587,925
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$29,206,006**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 80	$24,519,936
Freeboard/Geometry Cost:	Length (%): 50	$3,040,834
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$27,560,770**
Total Remediation Cost for Estimate a		**$56,766,776**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U+Sn+E+FG

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$4,798,076
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$9,023,334
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,798,076**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 20	$4,903,987
Freeboard/Geometry Cost:	Length (%): 20	$1,063,828
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$5,967,815**
Total Remediation Cost for Estimate b		**$10,765,891**

Total Remediation Cost Estimated for Segment/Reach 148 $67,532,667

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 151.1 RD 2060 Unit 1 — **Total Segment/Reach Length (Feet): 25,648**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: Sn

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$7,381,780
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,381,780**

Other Required Remediation Costs			
Erosion Repair Cost:	Category B	Length (%): 100	$45,961,216
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$45,961,216**
Total Remediation Cost for Estimate a			**$53,342,996**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 70

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$35,868,089
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$66,101,556
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$35,868,089**

Other Required Remediation Costs			
Erosion Repair Cost:	Category B	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate b			**$35,868,089**

Total Remediation Cost Estimated for Segment/Reach 151.1 $89,211,085

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 151.2 RD 2060 Unit 1 — **Total Segment/Reach Length (Feet): 11,041**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 10

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$1,654,939
Combo Berm Cost:	$0
Slurry Wall Cost:	$2,356,734
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,654,939**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate a		**$1,654,939**

Total Remediation Cost Estimated for Segment/Reach 151.2 $1,654,939

Segment/Reach: 152 RD 2068 Unit 1 — **Total Segment/Reach Length (Feet): 29,213**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: Sn+E+FG

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$7,291,309
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,291,309**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 40	$17,907,959
Freeboard/Geometry Cost:	Length (%): 100	$9,843,232
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$27,751,190**
Total Remediation Cost for Estimate a		**$35,042,500**

Total Remediation Cost Estimated for Segment/Reach 152 $35,042,500

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 153.1 RD 2098 Unit 1 — **Total Segment/Reach Length (Feet): 16,796**

Overall Reach Categorization: LD (B or C)

Estimate Run: a

Deficiencies Being Remediated: Sn+E+FG

Remediated Length (%): 40

Alternative Remediation Costs

Drained Stability Berm Cost:	$7,717,834
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,717,834**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 50	$18,811,520
Freeboard/Geometry Cost:	Length (%): 100	$6,582,467
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$25,393,987**
Total Remediation Cost for Estimate a		**$33,111,821**

Total Remediation Cost Estimated for Segment/Reach 153.1 $33,111,821

Segment/Reach: 153.2 RD 2098 Unit 1 — **Total Segment/Reach Length (Feet): 500**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$1,326,522
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$1,973,322
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,326,522**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$218,955
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$218,955**
Total Remediation Cost for Estimate a		**$1,545,477**

Total Remediation Cost Estimated for Segment/Reach 153.2 $1,545,477

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 155 RD 2104 - Hass Slough — **Total Segment/Reach Length (Feet): 17,400**

Overall Reach Categorization: LD (A or B)

Estimate Run: a

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$6,893,085
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,893,085**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 100	$7,322,468
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$7,322,468**

Total Remediation Cost for Estimate a **$14,215,552**

Total Remediation Cost Estimated for Segment/Reach 155 **$14,215,552**

Segment/Reach: 244 RD 0999 Unit 5 — **Total Segment/Reach Length (Feet): 49,963**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$37,822,340
Slurry Wall Cost:	$40,228,369
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$37,822,340**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 40	$38,051,821
Freeboard/Geometry Cost:	Length (%): 1	$149,182
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$38,201,003**

Total Remediation Cost for Estimate a **$76,023,342**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 40

Alternative Remediation Costs

Drained Stability Berm Cost:	$21,570,979
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$33,142,630
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$21,570,979**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$21,570,979**

Total Remediation Cost Estimated for Segment/Reach 244 $97,594,321

Segment/Reach: 249 RD 2098 Unit 4

Total Segment/Reach Length (Feet): 15,569

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$2,838,314
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,838,314**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 85		$2,977,016
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$2,977,016**
Total Remediation Cost for Estimate		**a**	**$5,815,330**

Total Remediation Cost Estimated for Segment/Reach 249 $5,815,330

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 251 RD 2104 - west levee — **Total Segment/Reach Length (Feet): 18,552**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$7,661,963
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,661,963**

Other Required Remediation Costs

Erosion Repair Cost:	Category A	Length (%): 0	$0
Freeboard/Geometry Cost:		Length (%): 40	$1,745,567
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$1,745,567**
Total Remediation Cost for Estimate a			**$9,407,530**

Total Remediation Cost Estimated for Segment/Reach 251 $9,407,530

Segment/Reach: 303 RD 0999 Unit 4 — **Total Segment/Reach Length (Feet): 6,508**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+E

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$14,472,434
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$14,472,434**

Other Required Remediation Costs

Erosion Repair Cost:	Category B	Length (%): 30	$3,717,370
Freeboard/Geometry Cost:		Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$3,717,370**
Total Remediation Cost for Estimate a			**$18,189,803**

Total Remediation Cost Estimated for Segment/Reach 303 $18,189,803

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 304 RD 0999 Unit 2 — **Total Segment/Reach Length (Feet): 12,062**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+Sn+E+FG

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$7,046,302
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$10,209,140
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,046,302**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 10	$2,701,888
Freeboard/Geometry Cost:	Length (%): 3	$166,444
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,868,332**
Total Remediation Cost for Estimate a		**$9,914,634**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: Sn

Remediated Length (%): 50

Alternative Remediation Costs	
Drained Stability Berm Cost:	$6,698,930
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,698,930**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$6,698,930**

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: U

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$9,788,636
Combo Berm Cost:	$0
Slurry Wall Cost:	$11,039,676
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$9,788,636**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$9,788,636**

Total Remediation Cost Estimated for Segment/Reach 304 $26,402,199

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 305 RD 0999 Unit 3 — **Total Segment/Reach Length (Feet): 19,772**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+E+FG

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$11,690,511
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$25,837,911
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$11,690,511**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 40	$15,058,355
Freeboard/Geometry Cost:	Length (%): 5	$327,085
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$15,385,440**
Total Remediation Cost for Estimate a		**$27,075,951**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 60

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$22,758,912
Slurry Wall Cost:	$34,676,639
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$22,758,912**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$22,758,912**

Total Remediation Cost Estimated for Segment/Reach 305 $49,834,863

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 306 RD 0150 Unit 2 — **Total Segment/Reach Length (Feet): 41,275**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$45,984,737
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$145,019,865
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$45,984,737**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 30	$23,576,280
Freeboard/Geometry Cost:	Length (%): 25	$3,750,563
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$27,326,843**
Total Remediation Cost for Estimate a		**$73,311,579**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 40

Alternative Remediation Costs

Drained Stability Berm Cost:	$16,852,970
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$16,852,970**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$16,852,970**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: U

Remediated Length (%): 10

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$30,092,357
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$30,092,357**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$30,092,357**

Total Remediation Cost Estimated for Segment/Reach 306 $120,256,906

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 307 RD 0349 Unit 2 — **Total Segment/Reach Length (Feet): 22,873**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+E+FG

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$22,441,796
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$34,915,231
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$22,441,796**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 20	$9,222,394
Freeboard/Geometry Cost:	Length (%): 15	$1,205,765
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$10,428,159**
Total Remediation Cost for Estimate a		**$32,869,955**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 10

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$5,521,311
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$9,728,636
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,521,311**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$5,521,311**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: T

Remediated Length (%): 60

Alternative Remediation Costs	
Drained Stability Berm Cost:	$13,267,209
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,267,209**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$13,267,209**

Total Remediation Cost Estimated for Segment/Reach 307 $51,658,475

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 308 RD 0501 Unit 2 — **Total Segment/Reach Length (Feet): 18,814**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+E+FG

Remediated Length (%): 40

Alternative Remediation Costs	
Drained Stability Berm Cost:	$10,460,553
Seepage Berm Cost:	$0
Combo Berm Cost:	$26,762,539
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$55,771,575
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,460,553**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 30	$12,643,008
Freeboard/Geometry Cost:	Length (%): 85	$5,142,785
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$17,785,793**
Total Remediation Cost for Estimate a		**$28,246,346**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$5,230,277
Seepage Berm Cost:	$0
Combo Berm Cost:	$13,381,269
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$27,885,787
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,230,277**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$5,230,277**

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: T

Remediated Length (%): 40

Alternative Remediation Costs	
Drained Stability Berm Cost:	$10,072,997
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$16,389,423
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$10,072,997**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$10,072,997**

Total Remediation Cost Estimated for Segment/Reach 308 $43,549,619

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 309 RD 0501 Unit 3 — **Total Segment/Reach Length (Feet): 40,668**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+E+FG

Remediated Length (%): 60

Alternative Remediation Costs	
Drained Stability Berm Cost:	$32,510,739
Seepage Berm Cost:	$0
Combo Berm Cost:	$83,924,115
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$183,711,666
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$32,510,739**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 50	$45,548,160
Freeboard/Geometry Cost:	Length (%): 5	$644,938
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$46,193,098**
Total Remediation Cost for Estimate a		**$78,703,837**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 10

Alternative Remediation Costs	
Drained Stability Berm Cost:	$5,418,457
Seepage Berm Cost:	$0
Combo Berm Cost:	$13,987,353
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$29,448,298
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,418,457**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$5,418,457**

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: U

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$26,022,666
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$58,896,597
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$26,022,666**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$26,022,666**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: B

Estimate Run: d

Deficiencies Being Remediated: T

Remediated Length (%): 10

Alternative Remediation Costs	
Drained Stability Berm Cost:	$5,418,457
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$9,575,623
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,418,457**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate d		**$5,418,457**

Total Remediation Cost Estimated for Segment/Reach 309 $115,563,417

Segment/Reach: 310 RD 0501 Unit 4 **Total Segment/Reach Length (Feet): 12,039**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 60

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$15,934,026
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$27,605,727
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$15,934,026**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 5	$194,449
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$194,449**
Total Remediation Cost for Estimate a		**$16,128,475**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: U

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$7,552,006
Combo Berm Cost:	$0
Slurry Wall Cost:	$10,237,889
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,552,006**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$7,552,006**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: Sn

Remediated Length (%): 10

Alternative Remediation Costs

Drained Stability Berm Cost:	$1,223,563
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$1,223,563**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**c**	**$1,223,563**

Total Remediation Cost Estimated for Segment/Reach 310 $24,904,044

Segment/Reach: 311 RD 2068 Unit 2

Total Segment/Reach Length (Feet): 17,350

Overall Reach Categorization: A

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 60		$3,598,735
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$3,598,735**
Total Remediation Cost for Estimate		**a**	**$3,598,735**

Total Remediation Cost Estimated for Segment/Reach 311 $3,598,735

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 312 RD 2098 Unit 3 — **Total Segment/Reach Length (Feet): 10,222**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: Sn+E+FG

Remediated Length (%): 60

Alternative Remediation Costs	
Drained Stability Berm Cost:	$5,079,952
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,079,952**

Other Required Remediation Costs			
Erosion Repair Cost:	Category B	Length (%): 50	$9,158,912
Freeboard/Geometry Cost:		Length (%): 10	$282,605
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$9,441,517**
Total Remediation Cost for Estimate a			**$14,521,469**

Total Remediation Cost Estimated for Segment/Reach 312 $14,521,469

Segment/Reach: 313 RD 2098 Unit 2 — **Total Segment/Reach Length (Feet): 9,981**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: U+Sn+E+FG

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$2,277,565
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$7,143,828
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$2,277,565**

Other Required Remediation Costs			
Erosion Repair Cost:	Category B	Length (%): 30	$5,701,147
Freeboard/Geometry Cost:		Length (%): 30	$928,496
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$6,629,643**
Total Remediation Cost for Estimate a			**$8,907,208**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: Sn

Remediated Length (%): 80

Alternative Remediation Costs	
Drained Stability Berm Cost:	$7,357,685
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,357,685**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$7,357,685**

Total Remediation Cost Estimated for Segment/Reach 313 $16,264,893

Segment/Reach: 314 RD 2060 Unit 3a **Total Segment/Reach Length (Feet): 23,324**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: Sn+E+FG

Remediated Length (%): 35

Alternative Remediation Costs	
Drained Stability Berm Cost:	$6,615,118
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,615,118**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 60	$33,855,252
Freeboard/Geometry Cost:	Length (%): 15	$2,694,300
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$36,549,552**
Total Remediation Cost for Estimate a		**$43,164,670**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 55	$3,830,304
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,830,304**
Total Remediation Cost for Estimate b		**$3,830,304**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Total Remediation Cost Estimated for Segment/Reach 314 $46,994,974

Segment/Reach: 315 RD 2060 Unit 2 — **Total Segment/Reach Length (Feet): 19,059**

Overall Reach Categorization: LD

Estimate Run: a

Deficiencies Being Remediated: Sn+FG

Remediated Length (%): 30

Alternative Remediation Costs	
Drained Stability Berm Cost:	$5,288,147
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$5,288,147**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 45	$2,676,404
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$2,676,404**
Total Remediation Cost for Estimate a		**$7,964,551**

Total Remediation Cost Estimated for Segment/Reach 315 $7,964,551

Segment/Reach: 316.1 RD 0536 Unit 2 — **Total Segment/Reach Length (Feet): 18,041**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+FG

Remediated Length (%): 10

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$4,522,822
Combo Berm Cost:	$0
Slurry Wall Cost:	$6,094,801
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,522,822**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 95	$5,582,457
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$5,582,457**
Total Remediation Cost for Estimate a		**$10,105,279**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 40

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$19,434,320
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$32,440,788
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$19,434,320**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$19,434,320**

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: Sn

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$4,049,429
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,049,429**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$4,049,429**

Total Remediation Cost Estimated for Segment/Reach 316.1 $33,589,028

Segment/Reach: 316.2 RD 0536 Unit 2 **Total Segment/Reach Length (Feet): 8,250**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+Sn+FG

Remediated Length (%): 50

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$7,032,321
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$13,139,063
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,032,321**

Other Required Remediation Costs		
Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 80	$1,896,439
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$1,896,439**
Total Remediation Cost for Estimate a		**$8,928,759**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: T+U

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$4,219,392
Slurry Wall Cost:	$5,726,878
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$4,219,392**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$4,219,392**

Total Remediation Cost Estimated for Segment/Reach **316.2** **$13,148,152**

Segment/Reach: 378 Brannan-Andrus LMD Unit 2 **Total Segment/Reach Length (Feet): 60,897**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: Sn+E

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$13,086,417
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$13,086,417**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 20		$18,692,922
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$18,692,922**
Total Remediation Cost for Estimate		**a**	**$31,779,339**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T

Remediated Length (%): 20

Alternative Remediation Costs

Drained Stability Berm Cost:	$8,724,278
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$8,724,278**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$8,724,278**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: C

Estimate Run: c

Deficiencies Being Remediated: T

Remediated Length (%): 10

Alternative Remediation Costs

Drained Stability Berm Cost:	$7,933,871
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$10,734,118
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$7,933,871**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**c**	**$7,933,871**

Total Remediation Cost Estimated for Segment/Reach 378 $48,437,488

Segment/Reach: 384.1 RD 0003 Unit 2

Total Segment/Reach Length (Feet): 6,000

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+Ss

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$6,060,130
Seepage Berm Cost:	$0
Combo Berm Cost:	$14,343,243
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$42,730,317
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,060,130**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**a**	**$6,060,130**

Total Remediation Cost Estimated for Segment/Reach 384.1 $6,060,130

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 384.2 Sacramento River Right Bank Levee — **Total Segment/Reach Length (Feet): 85,620**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U

Remediated Length (%): 16

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$31,696,018
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$94,455,066
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$31,696,018**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**

Total Remediation Cost for Estimate a **$31,696,018**

Total Remediation Cost Estimated for Segment/Reach 384.2 **$31,696,018**

Segment/Reach: 386 RD 0150 Unit 3 — **Total Segment/Reach Length (Feet): 49,612**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+E+FG

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$43,759,249
Slurry Wall Cost:	$45,135,546
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$43,759,249**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 50	$50,008,896
Freeboard/Geometry Cost:	Length (%): 65	$10,753,000
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$60,761,896**

Total Remediation Cost for Estimate a **$104,521,145**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated:
T

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$14,336,551
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$23,165,721
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$14,336,551**

Other Required Remediation Costs

Erosion Repair Cost: Category B	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$14,336,551**

Total Remediation Cost Estimated for Segment/Reach 386 $118,857,696

Segment/Reach: 387 RD 0341 Unit 2

Total Segment/Reach Length (Feet): 33,117

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated:
T+U+Sn+E+FG

Remediated Length (%): 100

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$71,836,397
Slurry Wall Cost:	$109,655,540
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$71,836,397**

Other Required Remediation Costs

Erosion Repair Cost: Category C	Length (%): 100		$66,763,872
Freeboard/Geometry Cost:	Length (%): 30		$3,759,748
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$70,523,620**
Total Remediation Cost for Estimate		**a**	**$142,360,017**

Total Remediation Cost Estimated for Segment/Reach 387 $142,360,017

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 388 RD 0349 Unit 3 — **Total Segment/Reach Length (Feet): 34,345**

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: U+Sn+E+FG

Remediated Length (%): 50

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$51,128,694
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$68,763,385
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$51,128,694**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 30	$23,079,840
Freeboard/Geometry Cost:	Length (%): 15	$1,542,489
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$24,622,329**
Total Remediation Cost for Estimate a		**$75,751,023**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: U

Remediated Length (%): 10

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$6,814,947
Combo Berm Cost:	$0
Slurry Wall Cost:	$8,742,090
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$6,814,947**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$6,814,947**

Total Remediation Cost Estimated for Segment/Reach 388 $82,565,971

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 390 RD 0556 Unit 2 — **Total Segment/Reach Length (Feet): 30,259**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: T+U+E

Remediated Length (%): 20

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$14,394,143
Slurry Wall Cost:	$20,347,795
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$14,394,143**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 20	$12,200,429
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$12,200,429**
Total Remediation Cost for Estimate a		**$26,594,571**

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: U

Remediated Length (%): 40

Alternative Remediation Costs	
Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$27,535,492
Combo Berm Cost:	$0
Slurry Wall Cost:	$40,695,590
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$27,535,492**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$27,535,492**

Overall Reach Categorization: B

Estimate Run: c

Deficiencies Being Remediated: T

Remediated Length (%): 40

Alternative Remediation Costs	
Drained Stability Berm Cost:	$12,632,037
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$12,632,037**

Other Required Remediation Costs		
Erosion Repair Cost: Category B	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate c		**$12,632,037**

Total Remediation Cost Estimated for Segment/Reach 390 $66,762,100

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Segment/Reach: 1036 Segment 1036 — **Total Segment/Reach Length (Feet): 34,150**

Overall Reach Categorization: A

Estimate Run: a

Deficiencies Being Remediated: FG

Remediated Length (%): 0

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$0
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$0**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 60		$16,861,169
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$16,861,169**
Total Remediation Cost for Estimate		**a**	**$16,861,169**

Total Remediation Cost Estimated for Segment/Reach 1036 $16,861,169

Segment/Reach: 1040 Segment 1040 — **Total Segment/Reach Length (Feet): 7,300**

Overall Reach Categorization: B

Estimate Run: a

Deficiencies Being Remediated: U+FG

Remediated Length (%): 40

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$9,097,688
Combo Berm Cost:	$0
Slurry Wall Cost:	$9,950,852
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$9,097,688**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 65		$954,931
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$954,931**
Total Remediation Cost for Estimate		**a**	**$10,052,619**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: B

Estimate Run: b

Deficiencies Being Remediated: U+Sn

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$3,070,782
Seepage Berm Cost:	$0
Combo Berm Cost:	$6,919,954
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$15,757,973
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$3,070,782**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$3,070,782**

Total Remediation Cost Estimated for Segment/Reach 1040 $13,123,401

Segment/Reach: 1041 Snodgrass Slough Right Bank Levee **Total Segment/Reach Length (Feet): 31,200**

Overall Reach Categorization: LD (B or C)

Estimate Run: a

Deficiencies Being Remediated: U+FG

Remediated Length (%): 20

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$16,880,868
Combo Berm Cost:	$0
Slurry Wall Cost:	$19,116,008
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$16,880,868**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 50	$3,757,869
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$3,757,869**
Total Remediation Cost for Estimate a		**$20,638,737**

Overall Reach Categorization: LD (B or C)

Estimate Run: b

Deficiencies Being Remediated: U+Sn+FG

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$35,480,753
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$46,438,695
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$35,480,753**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0	$0
Freeboard/Geometry Cost:	Length (%): 0	$0
Miscellaneous Hazardous Conditions Cost:		$0
Subtotal Other Required Remediation Costs:		**$0**
Total Remediation Cost for Estimate b		**$35,480,753**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Overall Reach Categorization: LD (B or C)

Estimate Run: c

Deficiencies Being Remediated: U

Remediated Length (%): 30

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$25,452,421
Combo Berm Cost:	$0
Slurry Wall Cost:	$23,641,840
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$23,641,840**

Other Required Remediation Costs

Erosion Repair Cost: Category A	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**c**	**$23,641,840**

Total Remediation Cost Estimated for Segment/Reach 1041 $79,761,330

Segment/Reach: 1043 North Fork Mokelumne River Right Bank

Total Segment/Reach Length (Feet): 51,550

Overall Reach Categorization: C

Estimate Run: a

Deficiencies Being Remediated: U+E+FG

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$66,534,793
Combo Berm Cost:	$0
Slurry Wall Cost:	$91,566,161
Seepage Berm and Slurry Wall:	$0
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$66,534,793**

Other Required Remediation Costs

Erosion Repair Cost: Category LD	Length (%): 50		$57,736,000
Freeboard/Geometry Cost:	Length (%): 95		$15,111,714
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$72,847,714**
Total Remediation Cost for Estimate		**a**	**$139,382,508**

Overall Reach Categorization: C

Estimate Run: b

Deficiencies Being Remediated: T+U+Sn

Remediated Length (%): 50

Alternative Remediation Costs

Drained Stability Berm Cost:	$0
Seepage Berm Cost:	$0
Combo Berm Cost:	$73,067,759
Slurry Wall Cost:	$0
Seepage Berm and Slurry Wall:	$123,673,399
DSM Wall Cost:	$0
Replace Levee Cost:	$0
Minimum Alternative Remediation Cost:	**$73,067,759**

Other Required Remediation Costs

Erosion Repair Cost: Category LD	Length (%): 0		$0
Freeboard/Geometry Cost:	Length (%): 0		$0
Miscellaneous Hazardous Conditions Cost:			$0
Subtotal Other Required Remediation Costs:			**$0**
Total Remediation Cost for Estimate		**b**	**$73,067,759**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

ATTACHMENT 2
NORTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 5

Total Remediation Cost Estimated for Segment/Reach	**1043**	**$212,450,267**

Note: Estimates are order of magnitude estimates based upon deficiencies and remediation extents specified in the Dreaft GAR.

KLEINFELDER

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Stockton, California
95206

Memorandum

SOUTH NON-URBAN LEVEE EVALUATIONS (NULE) PROJECT
REMEDIATION ALTERNATIVES AND COST ESTIMATE REPORT (RACER)

Date:	December 23, 2010
To:	Hamid Bonakdar, Chief, Non-Urban Levee Evaluations Branch, DWR Vincent Rodriguez, Task Order Manager, DWR
From:	Ron Heinzen, Kleinfelder Fran Bean, Kleinfelder
Reviewed By:	Pat Dell, Neil O. Anderson and Associates
Contract:	4600008102, Task Order K107
Subject:	Preliminary Estimate of Levee Remediation Costs for South NULE Levees

1.0 BACKGROUND AND SCOPE

DWR is undertaking a program to determine the approximate cost to repair non-urban Project and Non-Project levees in the Sacramento (North NULE Study Area) and San Joaquin (South NULE Study Area) river systems. Under separate agreements with DWR, URS is responsible for preparing cost estimates for the North NULE Study Area and Kleinfelder is responsible for preparing estimates for the South NULE Study Area. This memorandum includes estimated costs for repair in the South NULE Study Area.

Task Order K107 includes providing geotechnical, civil engineering, and cost estimating support services for DWR. These services also entail preparing a Remediation Alternatives and Cost Estimate Report (RACER) for the South NULE Study Area. Task Order K107 is comprised of five tasks; this memorandum documents and transmits work completed under the first two tasks:

- Task K107-1 (1a and 1b): Identification of Remediation Alternatives and Development of Unit Costs for Project and Non-Project Levees
- Task K107-2 (2a and 2b): Selection of Remediation Alternatives and Development of Cost Estimates for Project and Non-Project Levee Sections

As part of Task K107-1, Kleinfelder supported URS in updating the Draft Parametric Cost Estimating Tool (Estimating Tool) originally developed by URS in 2008. This update created a consistent methodology for generating levee repair alternative cost estimates.

Under Task K107-2, Kleinfelder selected levee remediation alternatives for levee segments in the South NULE Study Area. These remediation alternatives addressed hazards and/or deficiencies identified in the May 2010 Draft Phase 1 Geotechnical Assessment Report (GAR), and determined likely conceptual, planning-level remediation costs using the Estimating Tool. The Draft GAR identified through seepage, underseepage, stability, and erosion hazards, and freeboard/geometry deficiencies that could exist along levee segments for the assessed water level. As discussed in the Draft GAR, the assessments were based on limited, existing surface and subsurface levee data and past performance history. The work performed under both Tasks K107-1 and K107-2, including cost estimating results, is summarized in this memorandum.

This memorandum serves as an interim report. The final RACER will be completed approximately one month after the final GAR is complete, as identified on the NULE Project's current deliverables schedule.

Cost estimates for the remediation of levees in the South NULE Study Area presented in this memorandum provide a base case for future flood mitigation planning by DWR. These estimates reflect costs to remediate hazards and freeboard/geometry deficiencies identified in the South NULE Draft GAR. Parameters applied to remediation of freeboard/geometry deficiencies are based on applicable geometric and freeboard requirements as described in available design data (See Project Memorandum, Data Available for Design Criteria for Use in the South NULE Study Area, Kleinfelder, September 25, 2009). Parameters applied to remediation of hazards identified in the GAR are based on the assessed water surface elevations described in the Draft GAR.

2.0 TECHNICAL APPROACH TEAM MEETINGS

A series of 13 Technical Approach Team (TAT) meetings were conducted between June and October 2010 to address and resolve administrative and technical questions identified during the execution of the remediation selection and cost estimating work. The TAT, led by URS, was composed of DWR, URS, and Kleinfelder representatives to ensure North NULE Study Area and South NULE Study Area work was being performed consistently, that both study area teams received the same direction from DWR, and that both interim and final cost estimating work products would be similar in format and content. Each TAT meeting was documented with an agenda, meeting notes, and a list of action items assigned during the meetings.

3.0 TASK K107-1, IDENTIFICATION OF REMEDIATION ALTERNATIVES AND DEVELOPMENT OF UNIT COSTS FOR PROJECT AND NON-PROJECT LEVEES

3.1 Key Estimating Assumptions

Based upon issues, questions discussed, and recommendations made during the first few TAT meetings, URS developed a draft list of key estimating assumptions applicable to the work (see Attachment 1 for complete list). Some key assumptions are discussed below.

3.1.1 Environmental Mitigation

The original Estimating Tool included a rigorous consideration of potential biological impacts and site conditions along a levee segment or reach to estimate an environmental impact cost expressed as a percentage of the direct construction cost. Due to lack of site-specific information, and lack of time to develop specific data, the current Estimating Tool was modified to include only two mitigation percentages: 25 and 35 percent. The higher percentage was applied to locations where endangered or threatened species (or their critical habitats) have been documented, where wetland conditions are anticipated, or where erosion repairs recommended on main river system levees have the potential to impact fish populations. The lower percentage was used for all other segments. The categorizations were based on readily-available information, such as County General Plans, and were reviewed by a Kleinfelder biologist. This method and its application were agreed upon in a meeting with a DWR biologist and by TAT participants.

3.1.2 Land Acquisition

The estimate includes allowances for temporary and permanent easement acquisitions required for each remediation. Figure 1 shows basic land acquisition requirements for the various seepage/stability berm and seepage cutoff wall remediations. Allowances include land required for the remediation, for a 20-foot wide permanent Central Valley Flood Protection Board easement along the landside toe, and for a 5-foot additional temporary easement. Because of the lack of available easement data for many rural levee segments in the NULE Project area, estimates for this Memorandum assume that no easements currently exist.

The TAT identified four categories of land use:

- Agricultural
- Orchard
- Commercial
- Residential

Included in Attachment 1 are the input cost parameters for each of these land uses. When assigning remediations to a levee segment, an estimate of the percentage of each land category potentially impacted by the remediation was determined. These percentages are input parameters to the Estimating Tool. The tool calculates a composite real estate rate per acre based on the input percentages, and uses this rate to estimate real estate costs for the remediation alternative's required area.

3.1.3 *Rock Slope Protection for Erosion Remediation*

As agreed upon by TAT participants, only rock slope protection was considered for waterside erosion remediation. Rock slope protection costs were estimated assuming the full lengths of erosion hazards specified in the Draft GAR. Since this cost is significant, the cost for limiting rock slope protection to approximately 20 percent of the length specified in the Draft GAR is also presented in this memorandum. This 20 percent factor conservatively represents the length requiring immediate attention based on a review of the current approach being used by local levee Reclamation and Maintenance Districts to address critical repair sites. Remediation in other areas (beyond the 20 percent factor) would be assumed completed as ongoing maintenance activities. Unit rates for rock and rock installation typical for non-state or federal projects were used to estimate costs, rather than using higher rates often associated with emergency levee repairs conducted by DWR.

3.1.4 *Revegetation*

For estimates presented in this memorandum, revegetation of disturbed areas and new construction areas (other than rock slope protection areas) was limited to hydroseeding, consistent with recent levee remediation projects. The cost for special plantings, irrigation systems, and ongoing maintenance, included as part of the emergency levee repair program, is not reflected in the estimates presented in this memorandum.

3.1.5 *Escalation*

Cost estimates include escalation for one year, from October 2010 to October 2011, as requested by the Central Valley Flood Protection Planning Group. Escalation is assumed at 3 percent per year.

3.1.6 *Other Direct and Indirect Costs*

In addition to escalation, estimates provided with this memorandum include appropriate allowances for engineering and design, engineering support during construction, construction management, and owner legal costs. The respective factors for these costs are presented in Attachment 1.

3.1.7 *Levee Segments Not Covered by the Draft GAR*

Based on current segment counts, there are 9 levee segments totaling approximately 28 miles in the South NULE Study Area that are not included in the Draft GAR due to lack of access or other programmatic reasons. These segments have an average length of approximately 3 miles, representing about 5 percent of the total levee length in the South NULE study area. No cost allowance to cover the additional segments is currently included in the estimates presented in the tables in this Memorandum. However, an estimated cost for the remediation of the additional segments is included in Section 5.2.

These segments are currently being evaluated and specific remediation cost estimates will be included for these segments as part of the final RACER.

3.1.8 *Burrowing Animal Infestation*

Numerous levee segments are identified in the Draft GAR as having significant burrowing animal infestation. As agreed upon by TAT participants, such infestations were not taken as a cause for remediation by themselves. No costs to treat burrowing animal infestations are included in the attached estimated remediation costs.

DWR provided approximate maintenance costs associated with treating burrowing animal infestations based on the evaluation of historical data associated with a 23-mile levee reach. The results of that evaluation indicate that the material, equipment, and labor costs for one treatment cycle can range from $2,000 to $3,000 per mile. The need for additional treatment cycles for non-urban levees, especially where adjacent to orchards, is likely.

3.1.9 *Guidance for Defining Dimensions For Slurry Walls and Seepage Berms for Estimating*

There are locations in the South NULE Study Area where the width of seepage berm or depth of slurry wall cannot be determined based on available information. In such cases, an approximation method was used to select default wall depths and seepage berm widths that would provide comparable levels of protection. Selections of wall depth and berm width were based on landside height of levee and were agreed upon by TAT participants. Width and depth selection criteria are discussed further in the Key Estimating Assumptions (Attachment 1).

The assumptions described above and those documented in Attachment 1 were reviewed and agreed upon by TAT participants as appropriate for a conceptual planning effort considering the limited physical and geotechnical data and a lack of specific remediation designs. Because of these limitations, Kleinfelder recommends the estimates presented in this memorandum are solely used as a tool for levee remediation program planning. **These cost estimates should not be used for actual construction budget planning for specific segments.**

3.2 Estimating Tool Background And Update

In 2008, URS developed a draft version of the Estimating Tool to prepare conceptual-level cost estimates to remediate seepage, stability, and erosion deficiencies. The Estimating Tool included 20 alternative remediations for seepage, six remediations for stability, and six remediations for erosion. In addition to the direct civil construction costs for major work items, the Estimating Tool also included estimates for significant indirect cost items, such as engineering and design, construction management, site restoration, environmental mitigation, temporary and permanent real estate acquisitions, permitting/legal costs, escalation, and contingency.

The 2008 Estimating Tool was the starting point for developing and refining a simplified version used to prepare the estimates described in this memorandum. Simplification entailed reducing the number of remediation options available as described in Section 3.4 and simplifying the routine to estimate environmental impact costs and rock slope protection costs for erosion remediation. The amount of input data required to prepare an estimate was also reduced by incorporating more capability into the programming. New programming maximized the internal calculation of quantities for standardized alternative templates using readily-available average levee dimensions along a segment or reach. Simplifications to the Estimating Tool are warranted and commensurate with the limited information available to prepare the Draft GAR. The Estimating Tool was discussed at several TAT meetings; a version was provided to DWR for review and comment before production estimating began.

The original Estimating Tool did not include alternatives to remediate freeboard and geometry deficiencies. A standardized freeboard and geometry template was added to the Estimating Tool to prepare freeboard and geometry estimates presented in this memorandum.

3.3 Unit Rates for Estimating

Unit rates used in the Estimating Tool are generally the same rates used in the 2008 version. Rates were updated in several instances to reflect recent bid results and other estimating experience on levee remediation projects in northern California. Caution was used to avoid adopting any highly competitive lower rates common during the recent economic downturn.

3.4 Identifying Remediation Alternatives

From TAT discussions, and as noted previously, it was determined that only eight alternative remediations would be included in the Estimating Tool. These remediations could be used individually, or in combinations, to address the hazards and/or deficiencies identified in the Draft GAR. The eight alternative remediations are:

Alternative	Type of Deficiency Remediated
Drained stability berm	Through seepage and stability
Seepage berm	Underseepage
Combination drained stability and seepage berm	Through seepage, underseepage, and stability
Conventional soil-bentonite slurry wall (up to 70' remediation depth)	Through seepage and underseepage
Deep Soil Mixing (DSM) wall (greater than 70' remediation depth)	Through seepage and underseepage
Rock slope protection	Waterside erosion
Replacement levee	Through seepage and stability
Freeboard/geometry remediation	Freeboard and/or geometry

Typical remediation details for berms and seepage cutoff walls are shown on Figure 2. Lettered dimensions on Figure 2 are those typically used as input for the Estimating Tool. Figures 3 and 4 illustrate typical details for erosion and freeboard/geometry remediation. Different remediation combinations could be used to provide alternative remediation sets for comparison and selection of the minimum cost. For example, a slurry wall and stability berm combination could be compared against a combination berm where underseepage, through seepage, and stability deficiencies exist.

3.5 Miscellaneous Remediations

Additional remediation costs associated with the anomalous hazards identified in the Draft GAR are also included in cost estimate summaries. These costs have been differentiated from overall remediation costs as miscellaneous costs when they require a distinct remediation alternative. Other potential miscellaneous costs, such as sheet piling around a pump station or relocation of penetrations or ditches, were reviewed and generally incorporated into the unallocated cost rating in the Estimating Tool. Also considered in this category are major cost items not included in the basic Estimating Tool, such as reconstruction of paved roads on levees where road removal and replacement is required for slurry wall construction. However, in general, the impact of such potential costs was considered during the remediation alternative selection process.

3.6 Levee Segments Evaluated

Currently, there are 113 levee segments in the South NULE study area. Of these, 104 segments were included in the Draft GAR, encompassing approximately 530 miles of levee. The remaining nine segments (28 miles) are not included due to lack of entry for inspections or other programmatic reasons.

Of the 104 levee segments assessed, 20 were assigned to Hazard Category A (no failure modes requiring remediation). The remaining 84 segments were assigned to Hazard Categories B, C, or LD for one or more potential failure modes. Of the 20 segments assigned to Hazard Category A, eight were found to have geometry or freeboard deficiencies. Remediation alternatives were selected and cost estimates were prepared for each of the hazards and/or deficiencies identified in the Draft GAR.

4.0 TASK K107-2, SELECTION OF REMEDIATION ALTERNATIVES AND DEVELOPMENT OF COST ESTIMATES FOR PROJECT AND NON-PROJECT LEVEE SECTIONS

4.1 Selecting Remediation Alternatives

Geotechnical data obtained for the Draft GAR were reviewed and organized for use during remediation alternative selection. The Draft GAR results and applicable data were reviewed by Kleinfelder's Senior Review Team, comprised of the Senior Geotechnical Engineers that reviewed the conclusions presented in the GAR. The Senior Review team selected appropriate remediation alternatives and specific parameters (e.g., slurry wall depth). Representatives of DWR and URS also attended several of the South NULE Remediation Alternative Selection sessions to ensure consistency with the NULE programmatic needs and North NULE remediation cost estimating.

The results of the review sessions were documented on a standardized Remediation Selection Form (Figure 5), identifying the selected remediation, including an alternative where possible, and associated parameters required for the estimate (e.g., length, depth, width of the remediation, etc.).

Hazards and/or deficiencies identified in the Draft GAR were assumed to require remediation.

4.2 Preparing Cost Estimates

Geotechnical data gathered during the geotechnical assessments and specific parameters determined by the Senior Review team were entered into the Estimating Tool to prepare estimates for the selected remediation alternatives.

4.3 Compiling Estimate Data For Presentation

Because of the large volume of estimating data generated, a Microsoft Access database was used to compile the results. The database was then used to tabulate the results in a series of summary tables that are discussed further in Section 5.0. The content and format of the summary tables were discussed at TAT meetings and the table formats were approved before the tables were finalized. The database evaluated the cost of alternatives to remediate hazards and/or deficiencies and selected the minimum cost remediation, which was then carried forward to the various tables described in Section 5.0.

5.0 OPINION OF PROBABLE COST

5.1 Remediation Costs for Levee Segments

Estimating results are presented in four tables presented at the end of this Memorandum. As discussed during the TAT meetings, costs are segregated based upon the type of remediation required as follows:

- Structural Remediations (addressing through seepage, underseepage, and stability hazards)
- Waterside Erosion Remediations
- Freeboard and Geometry Remediations

For each type of remediation, costs are typically sorted and grouped first by GAR Study Area (i.e., 1, 2, and 3), then by overall Hazard Categorization (i.e., A, B, C, or LD), then by segment number and name (e.g., Segment 189, RD 544 Unit 1).

Table 1 provides an overall summary of costs by GAR study area, Hazard Level Categorization, and remediation type. Table 1 also includes miscellaneous costs associated with anomalous hazards identified in the Draft GAR.

Table 2 provides the summary of costs specifically for the structural remediations to address through seepage, underseepage, and stability deficiencies.

Table 3 provides the summary of costs specifically for erosion remediations. As noted previously, these costs were developed assuming the erosion hazard lengths identified in the Draft GAR were repaired. This represents an upper bound estimate of the erosion remediation cost. A lower bound cost estimate was also estimated by assuming that only about 20-percent of the erosion hazard length specified in the Draft GAR is remediated immediately, and the remainder is remediated on an on-going basis using maintenance budgets. This would result in reducing the costs provided in Table 3 by 80 percent. Another approach to remediating erosion might be to remediate only Hazard Category C segments, leaving Categories B and LD to be remediated as an on-going maintenance activity. These costing approaches are summarized as follows:

Possible Waterside Erosion Remediation Strategies	Estimated Cost
1. Remediate All Deficient Lengths in Draft GAR (B, C, LD)	$ 759,000,000
2. Remediate Only Category C Deficient Lengths in Draft GAR	$ 338,000,000
3. Remediate 20-Percent of All Deficient Length in Draft GAR	$ 152,000,000
4. Remediate 20-Percent of Only Category C Deficient Length in Draft GAR	$ 68,000,000

Table 4 provides the summary of costs to remediate freeboard and geometry deficiencies.

Detailed backup information for segment specific estimates is provided in Attachment 2. Tables 1 through 4 were developed by extracting select information from the database compiled from data included in the Draft GAR Levee Assessment Tools (LATs) and the Estimating Tools.

5.2 Remediation Costs for Levee Segments Not Included in the Draft GAR

As previously noted, 9 levee segments representing approximately 5 percent of the total levee length in the South NULE Study Area were not included in the Draft GAR. The TAT agreed that some cost for assumed remediation of the additional segments should be included in the cost estimates provided with this memorandum. Based on 5 percent of the total remediation cost estimated for the assessed segments included in the attached summary, the additional total costs for remediation of the remaining segments in the South NULE Study Area is estimated to be approximately $150,000,000. Specific remediation cost estimates for the additional segments will be included in the Final RACER.

6.0 ESTIMATE LIMITATIONS AND FUTURE UPDATES

The estimates provided in this memorandum are order-of-magnitude estimates based on limited data provided in the Draft GAR. Simplifying assumptions were agreed upon by the TAT to facilitate estimating costs that are reasonable and appropriate considering the limited physical and geotechnical data and lack of specific remediation designs. The estimated extent, depth, and cost of selected remediation alternatives used to address hazards and/or deficiencies identified in the Draft GAR are based on engineering judgment without detailed analysis, which is beyond the scope of work authorized by the task order. Cost estimate results presented in this memorandum should only be used by DWR as a tool for levee remediation program planning and not for actual construction budget planning for specific segments.

Estimates provided here are for hazards and deficiencies described in the current Draft GAR. The Draft GAR is being updated. Upon completion, the associated remediation cost estimates will be revised.

TABLES

Table 1 Remediation Costs Grouped By GAR Study Area and Assigned Category

Table 2 Through seepage, Underseepage and Stability Remediation Costs Grouped by Study Area and Assigned Category

Table 3 Erosion Remediation Costs Grouped by Study Area and Assigned Category

Table 4 Freeboard and Geometry Costs Grouped by GAR Study Area

TABLE 1
NORTH NULE RACER
REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

Overall Summary

Segment Details		Structural Remediations		Erosion Remediations		Freeboard/Geometry Remediations		Miscellaneous Remediations
GAR Categorization	Length (Feet)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Total Cost ($)
Hazard Level A	75,896	0	$0	0	$0	39,300	$8,988,000	$0
Hazard Level B	385,417	211,340	$193,121,000	33,880	$23,695,000	51,220	$8,388,000	$485,000
Hazard Level C	1,913,029	1,295,010	$1,508,216,000	397,280	$658,080,000	317,850	$89,894,000	$27,391,000
Hazard Level LD (A/B)	244,363	160,490	$213,829,000	50,390	$71,837,000	18,650	$3,073,000	$0
Hazard Level LD (B/C)	63,472	17,450	$28,350,000	5,750	$5,355,000	5,750	$1,485,000	$0
Grand Total:	**2,682,177**	**1,684,290**	**$1,943,516,000**	**487,300**	**$758,967,000**	**432,770**	**$111,828,000**	**$27,876,000**

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Note: Estimates are order of magnitude estimates.
Structural remediations refer to underseepage, through seepage, or stability remediations.

DRAFT TABLE 1
SOUTH NULE RACER
REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 1

Segment Details		Structural Remediations		Erosion Remediations		Freeboard/Geometry Remediations		Miscellaneous Remediations
GAR Categorization	Length (Feet)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Total Cost ($)
Hazard Level A	8,820	0	$0	0	$0	880	$228,000	$0
Hazard Level B	117,835	48,310	$47,739,000	33,880	$23,695,000	3,110	$1,116,000	$0
Hazard Level C	473,548	339,220	$512,701,000	168,070	$305,479,000	35,380	$13,877,000	$0
Hazard Level LD (A/B)	62,270	19,780	$36,792,000	50,390	$71,837,000	1,190	$524,000	$0
Hazard Level LD (B/C)	5,950	5,950	$11,836,000	0	$0	0	$0	$0
Subtotal:	**668,423**	**413,260**	**$609,068,000**	**252,340**	**$401,011,000**	**40,560**	**$15,745,000**	**$0**

GAR Study Area: 2

Segment Details		Structural Remediations		Erosion Remediations		Freeboard/Geometry Remediations		Miscellaneous Remediations
GAR Categorization	Length (Feet)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Total Cost ($)
Hazard Level B	9,476	9,480	$8,408,000	0	$0	0	$0	$0
Hazard Level C	319,322	253,610	$319,789,000	60,040	$106,203,000	44,880	$36,111,000	$1,256,000
Subtotal:	**328,798**	**263,090**	**$328,197,000**	**60,040**	**$106,203,000**	**44,880**	**$36,111,000**	**$1,256,000**

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Note: Estimates are order of magnitude estimates.
Structural remediations refer to underseepage, through seepage, or stability remediations.

DRAFT TABLE 1
SOUTH NULE RACER
REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 3

Segment Details		Structural Remediations		Erosion Remediations		Freeboard/Geometry Remediations		Miscellaneous Remediations
GAR Categorization	Length (Feet)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Length (Feet)	Total Cost ($)	Total Cost ($)
Hazard Level A	67,076	0	$0	0	$0	38,420	$8,760,000	$0
Hazard Level B	258,106	153,550	$136,974,000	0	$0	48,110	$7,272,000	$485,000
Hazard Level C	1,120,159	702,180	$675,726,000	169,170	$246,398,000	237,590	$39,906,000	$26,135,000
Hazard Level LD (A/B)	182,093	140,710	$177,037,000	0	$0	17,460	$2,549,000	$0
Hazard Level LD (B/C)	57,522	11,500	$16,514,000	5,750	$5,355,000	5,750	$1,485,000	$0
Subtotal:	**1,684,956**	**1,007,940**	**$1,006,251,000**	**174,920**	**$251,753,000**	**347,330**	**$59,972,000**	**$26,620,000**

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Note: Estimates are order of magnitude estimates.
Structural remediations refer to underseepage, through seepage, or stability remediations.

DRAFT TABLE 2
SOUTH NULE RACER
THROUGH SEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 1

Segment		Segment Length (Feet)	Remediated Deficiencies	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
	Hazard Level B					
201	RD 2094, Unit 1	14,679	U+T	14,680	$17,915,000	$6,444,000
203	RD 2096, Unit 1	871	U+T	870	$2,176,000	$13,194,000
259	RD 2107, Unit 2	9,599	U+Sn+T	9,600	$10,771,000	$5,925,000
336	RD 2062, Unit 2	29,319	U	20,520	$13,007,000	$3,346,000
5013	RD 2089, Grant Line Canal	4,400	U	2,640	$3,870,000	$7,740,000
	Hazard Level B Subtotal	**58,868**		**48,310**	**$47,739,000**	**$5,217,000**
	Hazard Level C					
185	RD 1, Unit 1	5,904	U+Sn+T	5,900	$9,932,000	$8,882,000
188	RD 524, Unit 1	32,733	U+T	16,370	$33,325,000	$10,751,000
189	RD 544, Unit 1	31,833	U+T	25,470	$33,824,000	$7,013,000
192	RD 2058, Unit 1	40,412	U+T	32,330	$27,229,000	$4,447,000
195	RD 2064, Unit 1	29,314	U+T	29,310	$39,697,000	$7,150,000
196	RD 2075, Unit 1	39,202	U+T	39,200	$53,317,000	$7,181,000
197	RD 2085, Unit 1	27,893	U+T	27,890	$49,493,000	$9,369,000
198	RD 2089, Unit 1	8,139	U+Sn+T	7,330	$11,799,000	$8,505,000
202	RD 2095, Unit 1	7,297	U+T	7,300	$8,900,000	$6,440,000
208	RD 2107, Unit 1	12,299	U+Sn+T	12,300	$19,069,000	$8,187,000
256	RD 2062, Unit 3	29,105	U+Sn+T	23,280	$31,406,000	$7,122,000

U = Underseepage
T = Through Seepage
Sn = Non-seepage Related Stability

Note: Estimates are order of magnitude estimates.

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12/23/2010

DRAFT TABLE 2
SOUTH NULE RACER
THROUGH SEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION
COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

257	RD 2064, Unit 2	32,550	U+T	19,530	$25,699,000	$6,948,000
258	RD 2095, Unit 2	18,172	U+T	29,080	$66,020,000	$11,989,000
334	RD 544, Unit 2	22,071	U+T	4,410	$5,740,000	$6,865,000
335	RD 2089, Unit 2	6,854	U+T	4,800	$6,103,000	$6,716,000
5008	RD 544, Middle River	25,550	U+T	17,880	$26,929,000	$7,950,000
5010	RD 1, Middle River	53,320	U+T	26,660	$45,031,000	$8,918,000
5019	RD 348, Mokelumne River	50,900	U+T	10,180	$19,188,000	$9,952,000
	Hazard Level C Subtotal	**473,548**		**339,220**	**$512,701,000**	**$7,980,000**
	Hazard Level LD					
5009	RD 524, Middle River	11,880	U+T	7,130	$13,807,000	$10,227,000
5012	RD 2089, Dryland levee	5,950	U+Sn+T	5,950	$11,836,000	$10,503,000
5015	RD 1007, Sugar Cut	6,350	U	640	$1,235,000	$10,267,000
5018	RD 1007, Old River	40,040	U	12,010	$21,750,000	$9,560,000
	Hazard Level LD Subtotal	**64,220**		**25,730**	**$48,628,000**	**$9,980,000**
	Area 1 Subtotal	**596,636**		**413,260**	**$609,068,000**	**$7,782,000**

U = Underseepage
T = Through Seepage
Sn = Non-seepage Related Stability

Note: Estimates are order of magnitude estimates.

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DRAFT TABLE 2
SOUTH NULE RACER
THROUGH SEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 2

Segment		Segment Length (Feet)	Remediated Deficiencies	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
	Hazard Level B					
207	RD 2102, Unit 1	9,476	U+Sn+T	9,480	$8,408,000	$4,685,000
	Hazard Level B Subtotal	**9,476**		**9,480**	**$8,408,000**	**$4,685,000**
	Hazard Level C					
190	RD 1602, Unit 1	32,866	U+T	29,580	$30,411,000	$5,428,000
191	RD 2031, Unit 1	37,242	U+T	14,900	$15,046,000	$5,333,000
194	RD 2063, Unit 1	55,066	U+T	49,560	$60,077,000	$6,400,000
199	RD 2091, Unit 1	39,679	U+T	27,780	$37,462,000	$7,121,000
200	RD 2092, Unit 1	19,544	U+T	15,640	$20,104,000	$6,789,000
204	RD 2099, Unit 1	12,630	U+Sn+T	11,370	$15,331,000	$7,121,000
205	RD 2100, Unit 1	13,952	U+Sn+T	12,560	$14,444,000	$6,073,000
206	RD 2101, Unit 1	16,550	U+T	14,900	$20,090,000	$7,121,000
341	RD 2031, Unit 2	31,509	U+T	22,060	$29,380,000	$7,033,000
5001	Tuolumne River, Right Bank	36,539	U+T	36,540	$54,914,000	$7,935,000
5002	Tuolumne River, Left Bank	16,745	U+T	11,720	$13,834,000	$6,232,000
5003	San Joaquin River, Left Bank	7,000	U+T	7,000	$8,696,000	$6,559,000
	Hazard Level C Subtotal	**319,322**		**253,610**	**$319,789,000**	**$6,659,000**
	Area 2 Subtotal	**328,798**		**263,090**	**$328,197,000**	**$6,587,000**

U = Underseepage
T = Through Seepage
Sn = Non-seepage Related Stability

Note: Estimates are order of magnitude estimates.

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12/23/2010

DRAFT TABLE 2
SOUTH NULE RACER
THROUGH SEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 3

Segment		Segment Length (Feet)	Remediated Deficiencies	Remediated Length (Feet)	Total Remediation Cost ($)	Cost Per Remediated Mile ($)
	Hazard Level B					
12	Madera County FCWCA, Unit 4	11,711	U+T	4,680	$3,473,000	$3,915,000
176	Lower San Joaquin River Levee District, Unit	59,855	U+T	35,910	$23,229,000	$3,415,000
179	Lower San Joaquin Levee District, Unit 5	22,382	T	13,430	$8,116,000	$3,191,000
180	Lower San Joaquin Levee District, Unit 5	6,439	T	6,440	$3,536,000	$2,900,000
184	Lower San Joaquin Levee District, Unit 5	15,830	U+T	15,830	$12,015,000	$4,007,000
218	Lower San Joaquin Levee District, Unit 5	14,973	U+T	14,970	$12,415,000	$4,378,000
254	Lower San Joaquin Levee District, Unit 15	10,631	U+T	9,570	$8,490,000	$4,685,000
345	Lower San Joaquin Levee District, Unit 7	18,269	U	3,650	$2,962,000	$4,280,000
346	Lower San Joaquin Levee District, Unit 8	20,734	U+T	2,070	$1,844,000	$4,696,000
353	Lower San Joaquin Levee District, Unit 25	13,100	U	6,550	$5,779,000	$4,658,000
356	Lower San Joaquin Levee District, Unit 13	7,079	U+T	5,660	$4,376,000	$4,080,000
358	Lower San Joaquin Levee District, Unit 14	7,059	U+T	5,650	$4,263,000	$3,986,000
359	Lower San Joaquin Levee District, Unit 16	10,304	U+T	9,270	$6,983,000	$3,976,000
5033	San Joaquin River, Reach 2B	39,740	U+T	19,870	$39,493,000	$10,494,000
	Hazard Level B Subtotal	**258,106**		**153,550**	**$136,974,000**	**$4,709,000**
	Hazard Level C					
177	Lower San Joaquin Levee District, Unit 2	72,510	U+T	36,260	$28,889,000	$4,207,000
178	Lower San Joaquin Levee District, Unit 1	41,806	U+T	37,630	$30,349,000	$4,259,000

U = Underseepage
T = Through Seepage
Sn = Non-seepage Related Stability

Note: Estimates are order of magnitude estimates.

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12/23/2010

DRAFT TABLE 2
SOUTH NULE RACER
THROUGH SEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

181	Lower San Joaquin Levee District, Unit 1	17,550	U+T	12,280	$10,249,000	$4,405,000
182	Lower San Joaquin Levee District, Unit 5	104,000	U+T	104,000	$113,499,000	$5,762,000
183	Lower San Joaquin Levee District, Unit 3,	11,054	U+T	11,050	$7,587,000	$3,624,000
219	Lower San Joaquin Levee District, Unit 23	54,042	U+T	16,210	$13,947,000	$4,542,000
220	Lower San Joaquin Levee District, Unit 24	44,251	U+T	22,130	$17,058,000	$4,071,000
252	Lower San Joaquin Levee District, Unit 6	50,709	U+T	50,710	$69,190,000	$7,204,000
253	Lower San Joaquin Levee District, Unit 6	86,704	U+T	34,680	$41,673,000	$6,344,000
261	Lower San Joaquin levee District, Unit 17	85,013	U+T	76,510	$80,741,000	$5,572,000
27	Madera County FCWCA, Unit 5	47,744	U+T	42,970	$33,833,000	$4,157,000
28	Madera County FCWCA, Unit 6	47,492	U+T	23,750	$17,954,000	$3,992,000
351	Lower San Joaquin Levee District, Unit 6	50,271	U+T	50,270	$33,040,000	$3,470,000
352	Lower San Joaquin Levee District, Unit 11	17,470	U	10,480	$10,148,000	$5,112,000
354	Lower San Joaquin Levee District, Unit 12	17,958	U	8,980	$8,895,000	$5,231,000
357	Lower San Joaquin Levee District, Unit 18	84,351	U+T	59,050	$63,847,000	$5,709,000
5023	Madera County FCWCA, Berenda Slough	38,960	U+T	19,480	$14,013,000	$3,798,000
5024	Madera FCWCA, Berenda Slough	31,300	U+T	28,170	$19,610,000	$3,676,000
5025	Madera County FCWCA, Fresno River	27,700	U+T	11,080	$8,330,000	$3,970,000
5026	Madera County FCWCA, Fresno River	27,500	U+T	8,250	$6,785,000	$4,342,000
5031	San Joaquin River, Reach 4A	102,904	U+T	20,580	$23,310,000	$5,980,000
5032	San Joaquin River Reach 2B	43,710	U+T	13,110	$17,490,000	$7,042,000
5034	Fresno Slough	15,160	U+T	4,550	$5,289,000	$6,140,000
	Hazard Level C Subtotal	**1,120,159**		**702,180**	**$675,726,000**	**$5,081,000**

U = Underseepage
T = Through Seepage
Sn = Non-seepage Related Stability

Note: Estimates are order of magnitude estimates.

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12/23/2010

DRAFT TABLE 2
SOUTH NULE RACER
THROUGH SEEPAGE, UNDERSEEPAGE, AND STABILITY REMEDIATION
COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

	Hazard Level LD					
355	Lower San Joaquin Levee District, Unit 4	7,425	U	7,420	$1,389,000	$988,000
5028	San Joaquin River, Reach 4A	63,630	U	57,270	$66,803,000	$6,159,000
5029	San Joaquin River, Reach 4A	57,522	U+T	11,500	$16,514,000	$7,579,000
5030	San Joaquin River, Reach 3	102,521	U	71,760	$98,358,000	$7,237,000
73	Merced County Stream Group, Unit 1	8,517	U	4,260	$10,487,000	$13,003,000
	Hazard Level LD Subtotal	**239,615**		**152,210**	**$193,551,000**	**$6,714,000**
	Area 3 Subtotal	**1,617,880**		**1,007,940**	**$1,006,251,000**	**$5,271,000**

U = Underseepage
T = Through Seepage
Sn = Non-seepage Related Stability

Note: Estimates are order of magnitude estimates.

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DRAFT TABLE 3
SOUTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 1

Segment		Segment Length (Feet)	Erosion Repair Length (Feet)	Remediation Cost ($)	Construction Cost Per Remediated Mile ($)
Erosion Catergory: Hazard Level B					
189	RD 544, Unit 1	31,833	31,830	$54,622,000	$9,060,000
256	RD 2062, Unit 3	29,105	8,730	$16,344,000	$9,883,000
334	RD 544, Unit 2	22,071	15,450	$26,510,000	$9,060,000
5006	Mormon Slough	58,967	29,480	$16,037,000	$2,872,000
5008	RD 544, Middle River	25,550	25,550	$35,677,000	$7,373,000
5010	RD 1, Middle River	53,320	53,320	$110,023,000	$10,895,000
5013	RD 2089, Grant Line Canal	4,400	4,400	$7,658,000	$9,190,000
Hazard Level B Subtotal		**225,246**	**168,760**	**$266,871,000**	**$8,349,000**

Note:
Estimates are order of magnitude estimates.
Construction cost includes direct construction costs plus contingency.

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12/23/2010

DRAFT TABLE 3
SOUTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 1

Segment		Segment Length (Feet)	Erosion Repair Length (Feet)	Remediation Cost ($)	Construction Cost Per Remediated Mile ($)
Erosion Catergory: Hazard Level C					
185	RD 1, Unit 1	5,904	590	$1,508,000	$13,486,000
188	RD 524, Unit 1	32,733	6,550	$11,430,000	$9,219,000
192	RD 2058, Unit 1	40,412	4,040	$7,644,000	$9,987,000
195	RD 2064, Unit 1	29,314	2,930	$5,118,000	$9,218,000
197	RD 2085, Unit 1	27,893	5,580	$9,740,000	$9,219,000
198	RD 2089, Unit 1	8,139	7,330	$16,278,000	$11,733,000
335	RD 2089, Unit 2	6,854	6,170	$10,585,000	$9,060,000
Hazard Level C Subtotal		**151,249**	**33,190**	**$62,303,000**	**$9,914,000**
Erosion Catergory: Hazard Level LD (A/B)					
5014	RD 1007, Tom Paine Slough	4,000	4,000	$6,261,000	$8,265,000
5015	RD 1007, Sugar Cut	6,350	6,350	$3,454,000	$2,872,000
5018	RD 1007, Old River	40,040	40,040	$62,122,000	$8,192,000
Hazard Level LD (A/B) Subt		**50,390**	**50,390**	**$71,837,000**	**$7,527,000**
Area 1 Subtotal		**426,885**	**252,340**	**$401,011,000**	**$8,391,000**

Note:
Estimates are order of magnitude estimates.
Construction cost includes direct construction costs plus contingency.

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12/23/2010

DRAFT TABLE 3
SOUTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 2

Segment		Segment Length (Feet)	Erosion Repair Length (Feet)	Remediation Cost ($)	Construction Cost Per Remediated Mile ($)
Erosion Catergory: Hazard Level C					
200	RD 2092, Unit 1	19,544	15,640	$24,258,000	$8,192,000
206	RD 2101, Unit 1	16,550	1,660	$3,415,000	$10,895,000
341	RD 2031, Unit 2	31,509	3,150	$5,501,000	$9,218,000
5001	Tuolumne River, Right Bank	36,539	32,890	$62,637,000	$10,057,000
Hazard Level C Subtotal		**104,142**	**53,340**	**$95,811,000**	**$9,487,000**
Erosion Catergory: Hazard Level LD (A/B)					
5002	Tuolumne River, Left Bank	16,745	6,700	$10,392,000	$8,192,000
Hazard Level LD (A/B) Subt		**16,745**	**6,700**	**$10,392,000**	**$8,192,000**
Area 2 Subtotal		**120,887**	**60,040**	**$106,203,000**	**$9,342,000**

Note:
Estimates are order of magnitude estimates.
Construction cost includes direct construction costs plus contingency.

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DRAFT TABLE 3
SOUTH NULE RACER
EROSION REMEDIATION COSTS GROUPED BY GAR STUDY AREA AND ASSIGNED CATEGORY

GAR Study Area: 3

Segment		Segment Length (Feet)	Erosion Repair Length (Feet)	Remediation Cost ($)	Construction Cost Per Remediated Mile ($)
Erosion Catergory: Hazard Level B					
5029	San Joaquin River, Reach 4A	57,522	5,750	$5,355,000	$4,915,000
5032	San Joaquin River Reach 2B	43,710	43,710	$66,647,000	$8,051,000
Hazard Level B Subtotal		**101,232**	**49,460**	**$72,002,000**	**$7,686,000**
Erosion Catergory: Hazard Level C					
5023	Madera County FCWCA, Berenda Slough	38,960	38,960	$56,278,000	$7,627,000
5024	Madera FCWCA, Berenda Slough	31,300	31,300	$45,213,000	$7,627,000
5025	Madera County FCWCA, Fresno River	27,700	27,700	$39,272,000	$7,486,000
5026	Madera County FCWCA, Fresno River	27,500	27,500	$38,988,000	$7,486,000
Hazard Level C Subtotal		**125,460**	**125,460**	**$179,751,000**	**$7,565,000**
Area 3 Subtotal		**226,692**	**174,920**	**$251,753,000**	**$7,599,000**

Note:
Estimates are order of magnitude estimates.
Construction cost includes direct construction costs plus contingency.

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DRAFT TABLE 4
SOUTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment		Segment Length (Feet)	Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	F/G Repair Cost ($)
188	RD 524, Unit 1	32,733	3,270	$1,262,000	$2,036,000	$6,000	$390,000	$1,659,000
189	RD 544, Unit 1	31,833	6,370	$1,482,000	$1,229,000	$12,000	$460,000	$1,954,000
201	RD 2094, Unit 1	14,679	2,940	$789,000	$1,419,000	$5,000	$244,000	$1,039,000
203	RD 2096, Unit 1	871	170	$49,000	$1,498,000	$10,000	$18,000	$77,000
257	RD 2064, Unit 2	32,550	3,260	$779,000	$1,264,000	$12,000	$243,000	$1,034,000
334	RD 544, Unit 2	22,071	4,410	$1,725,000	$2,063,000	$15,000	$535,000	$2,275,000
5007	RD 524, Burns Cut	8,820	880	$173,000	$1,036,000	$2,000	$54,000	$228,000
5008	RD 544, Middle River	25,550	2,560	$671,000	$1,387,000	$42,000	$219,000	$932,000
5009	RD 524, Middle River	11,880	1,190	$377,000	$1,677,000	$24,000	$123,000	$524,000
5010	RD 1, Middle River	53,320	5,330	$1,202,000	$1,190,000	$21,000	$376,000	$1,598,000
5019	RD 348, Mokelumne River	50,900	10,180	$3,219,000	$1,670,000	$165,000	$1,041,000	$4,425,000
Area 1 Subtotal:		**32,733**	**40,560**	**$11,728,000**	**$1,527,000**	**$314,000**	**$3,703,000**	**$15,745,000**

Note: F/G = Freeboard and Geometry
Construction cost includes direct construction costs plus contingency.
Owner cost includes engineering, construction management, escalation, temporary and permanent easements, etc.
Estimates are order of magnitude estimates.

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DRAFT TABLE 4
SOUTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment		Segment Length (Feet)	Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	F/G Repair Cost ($)
199	RD 2091, Unit 1	39,679	3,970	$1,140,000	$1,517,000	$7,000	$353,000	$1,500,000
200	RD 2092, Unit 1	19,544	1,950	$577,000	$1,559,000	$6,000	$179,000	$762,000
204	RD 2099, Unit 1	12,630	2,530	$737,000	$1,541,000	$5,000	$228,000	$970,000
205	RD 2100, Unit 1	13,952	2,790	$754,000	$1,426,000	$5,000	$234,000	$992,000
5001	Tuolumne River, Right Bank	36,539	18,270	$12,606,000	$3,643,000	$83,000	$3,904,000	$16,593,000
5002	Tuolumne River, Left Bank	16,745	8,370	$6,689,000	$4,218,000	$30,000	$2,068,000	$8,787,000
5003	San Joaquin River, Left Bank	7,000	7,000	$4,963,000	$3,744,000	$13,000	$1,531,000	$6,507,000
Area 2 Subtotal:		**39,679**	**44,880**	**$27,466,000**	**$3,231,000**	**$149,000**	**$8,497,000**	**$36,111,000**

Note: F/G = Freeboard and Geometry
Construction cost includes direct construction costs plus contingency.
Owner cost includes engineering, construction management, escalation, temporary and permanent easements, etc.
Estimates are order of magnitude estimates.

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DRAFT TABLE 4
SOUTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Segment		Segment Length (Feet)	Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	F/G Repair Cost ($)
177	Lower San Joaquin Levee District, Unit 2	72,510	21,750	$2,513,000	$610,000	$40,000	$786,000	$3,338,000
179	Lower San Joaquin Levee District, Unit 5	22,382	17,910	$2,090,000	$616,000	$33,000	$653,000	$2,777,000
180	Lower San Joaquin Levee District, Unit 5	6,439	5,150	$530,000	$543,000	$9,000	$174,000	$705,000
181	Lower San Joaquin Levee District, Unit 1	17,550	8,780	$1,038,000	$624,000	$16,000	$324,000	$1,378,000
183	Lower San Joaquin Levee District, Unit 3,	11,054	3,320	$359,000	$571,000	$6,000	$112,000	$477,000
184	Lower San Joaquin Levee District, Unit 5	15,830	1,580	$193,000	$644,000	$6,000	$61,000	$261,000
219	Lower San Joaquin Levee District, Unit 23	54,042	10,810	$1,308,000	$639,000	$48,000	$417,000	$1,772,000
220	Lower San Joaquin Levee District, Unit 24	44,251	8,850	$1,040,000	$621,000	$8,000	$323,000	$1,371,000
252	Lower San Joaquin Levee District, Unit 6	50,709	30,430	$3,552,000	$616,000	$56,000	$1,110,000	$4,718,000
253	Lower San Joaquin Levee District, Unit 6	86,704	26,010	$2,841,000	$577,000	$80,000	$899,000	$3,819,000
261	Lower San Joaquin levee District, Unit 17	85,013	8,500	$1,037,000	$644,000	$34,000	$330,000	$1,401,000
343	Lower San Joaquin Levee District, Unit 5	19,893	5,970	$1,130,000	$999,000	$11,000	$351,000	$1,491,000
344	Lower San Joaquin Levee District, Unit 22	9,210	8,290	$1,997,000	$1,272,000	$15,000	$619,000	$2,632,000
345	Lower San Joaquin Levee District, Unit 7	18,269	9,130	$1,042,000	$602,000	$17,000	$326,000	$1,384,000
346	Lower San Joaquin Levee District, Unit 8	20,734	10,370	$1,182,000	$602,000	$19,000	$370,000	$1,571,000
347	Lower San Joaquin Levee District, Unit 9	4,240	2,120	$394,000	$982,000	$4,000	$123,000	$521,000
348	Lower San Joaquin Levee District, Unit 10	4,175	1,250	$202,000	$852,000	$2,000	$63,000	$267,000
349	Lower San Joaquin Levee District, Unit 22	14,436	12,990	$936,000	$380,000	$7,000	$1,003,000	$1,232,000
350	Lower San Joaquin Levee District, Unit 22	5,433	4,890	$1,238,000	$1,336,000	$9,000	$384,000	$1,630,000

Note: F/G = Freeboard and Geometry
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Estimates are order of magnitude estimates.

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DRAFT TABLE 4
SOUTH NULE RACER
FREEBOARD AND GEOMETRY REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Segment		Segment Length (Feet)	Repair Length (Feet)	Construction Cost ($)	Construction Cost Per Remediated Mile ($)	Land Cost ($)	Owner Cost ($)	F/G Repair Cost ($)
351	Lower San Joaquin Levee District, Unit 6	50,271	30,160	$3,256,000	$570,000	$55,000	$1,019,000	$4,331,000
352	Lower San Joaquin Levee District, Unit 11	17,470	1,750	$199,000	$602,000	$3,000	$62,000	$265,000
357	Lower San Joaquin Levee District, Unit 18	84,351	42,180	$5,178,000	$648,000	$201,000	$1,655,000	$7,034,000
5025	Madera County FCWCA, Fresno River	27,700	5,540	$627,000	$598,000	$34,000	$204,000	$865,000
5026	Madera County FCWCA, Fresno River	27,500	2,750	$311,000	$597,000	$17,000	$101,000	$428,000
5028	San Joaquin River, Reach 4A	63,630	6,360	$686,000	$569,000	$0	$211,000	$896,000
5029	San Joaquin River, Reach 4A	57,522	5,750	$1,125,000	$1,032,000	$11,000	$349,000	$1,485,000
5030	San Joaquin River, Reach 3	102,521	10,250	$1,105,000	$569,000	$0	$340,000	$1,444,000
5031	San Joaquin River, Reach 4A	102,904	30,870	$6,009,000	$1,028,000	$0	$1,849,000	$7,858,000
5032	San Joaquin River Reach 2B	43,710	4,370	$479,000	$578,000	$8,000	$150,000	$637,000
5033	San Joaquin River, Reach 2B	39,740	3,970	$439,000	$584,000	$0	$135,000	$574,000
5034	Fresno Slough	15,160	1,520	$163,000	$569,000	$0	$50,000	$214,000
73	Merced County Stream Group, Unit 1	8,517	850	$160,000	$990,000	$0	$49,000	$209,000
74	Merced County Stream Group, Unit 2	9,689	2,910	$738,000	$1,341,000	$16,000	$232,000	$987,000
Area 3 Subtotal:		**72,510**	**347,330**	**$45,097,000**	**$686,000**	**$765,000**	**$14,834,000**	**$59,972,000**

Note: F/G = Freeboard and Geometry
Construction cost includes direct construction costs plus contingency.
Owner cost includes engineering, construction management, escalation, temporary and permanent easements, etc.
Estimates are order of magnitude estimates.

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Figures

Figure 1 Proposed Land Acquisition Approach (URS, 2010)
Figure 2 Typical Remediation Details (URS, 2010)
Figure 3 Rock Slope Protection (URS, 2010)
Figure 4 Freeboard and Geometry Repair (URS, 2010)
Figure 5 Remediation Selection Form (URS, 2010)

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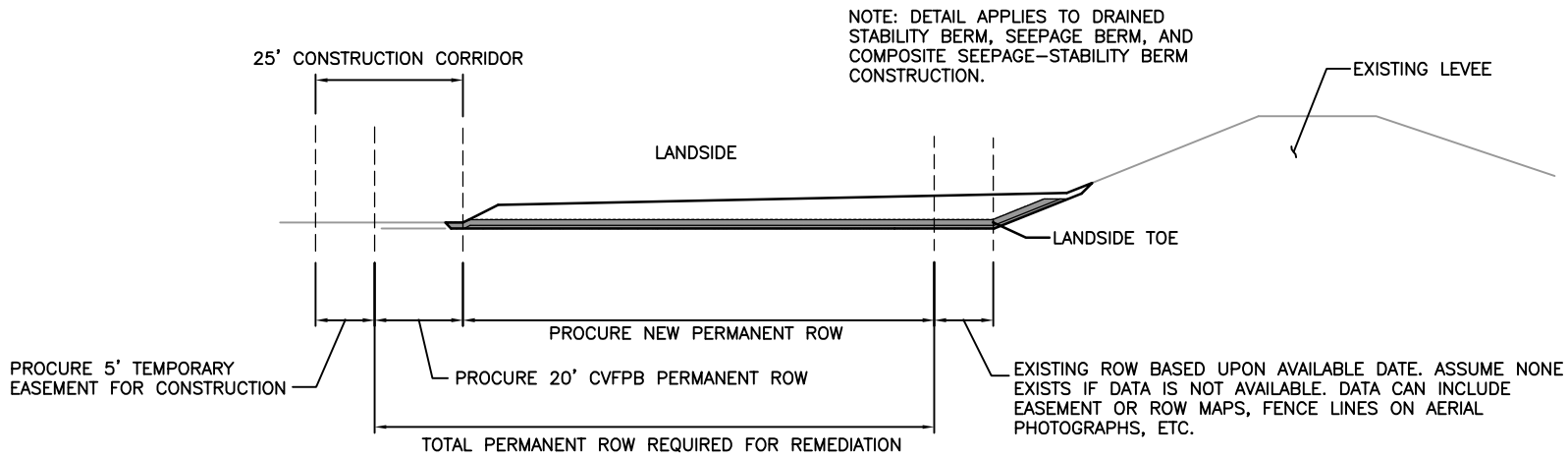
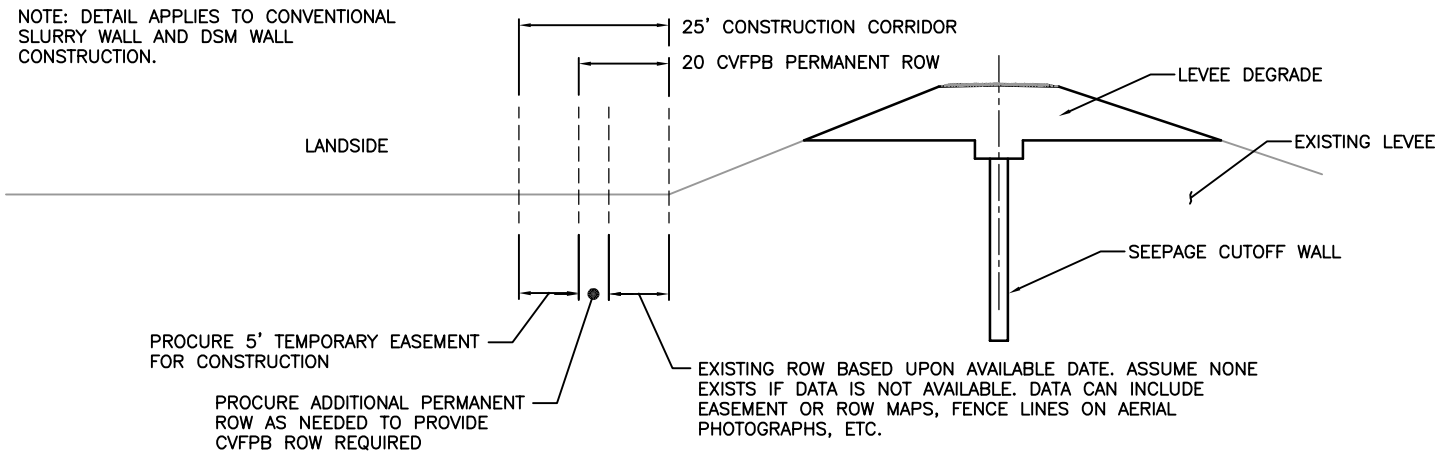
URS
2870 Gateway Oaks Drive,
Suite. 150, Sacramento,
California 95833
TEL: (916) 679-2000
FAX: (916) 679-2900

NULE - RACER

FIGURE 1
PROPOSED LAND ACQUISITION APPROACH

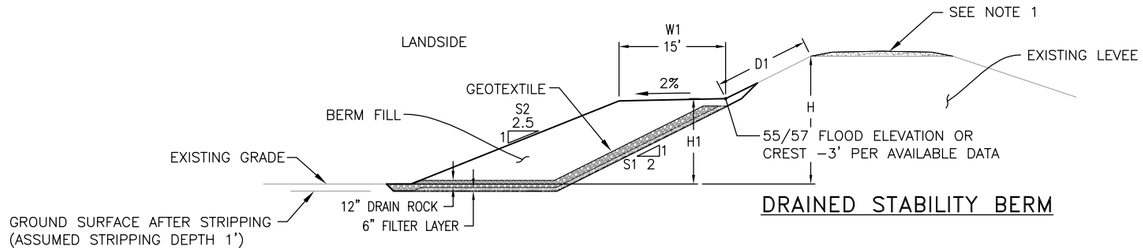


LAND ACQUISITION - BERM REMEDIATIONS

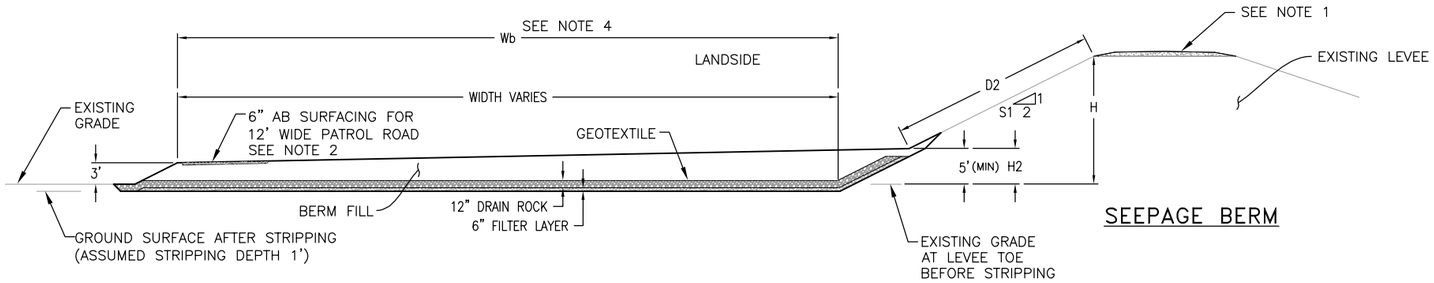


LAND ACQUISITION - SEEPAGE CUTOFF WALL REMEDIATIONS

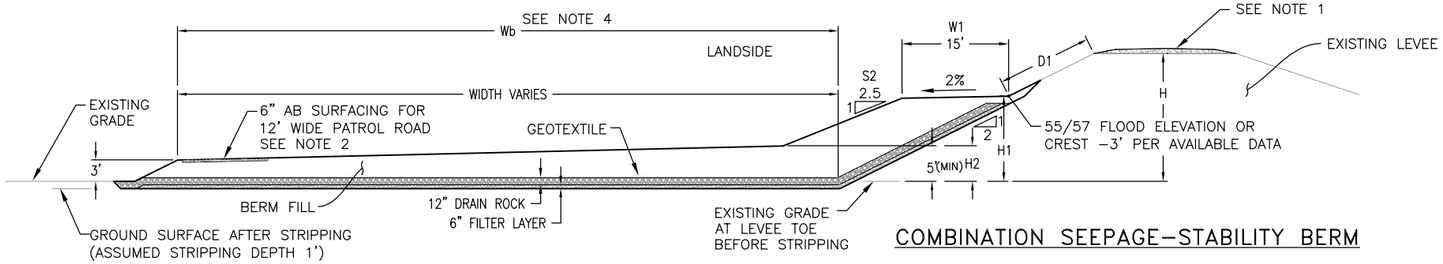
FIGURE 1



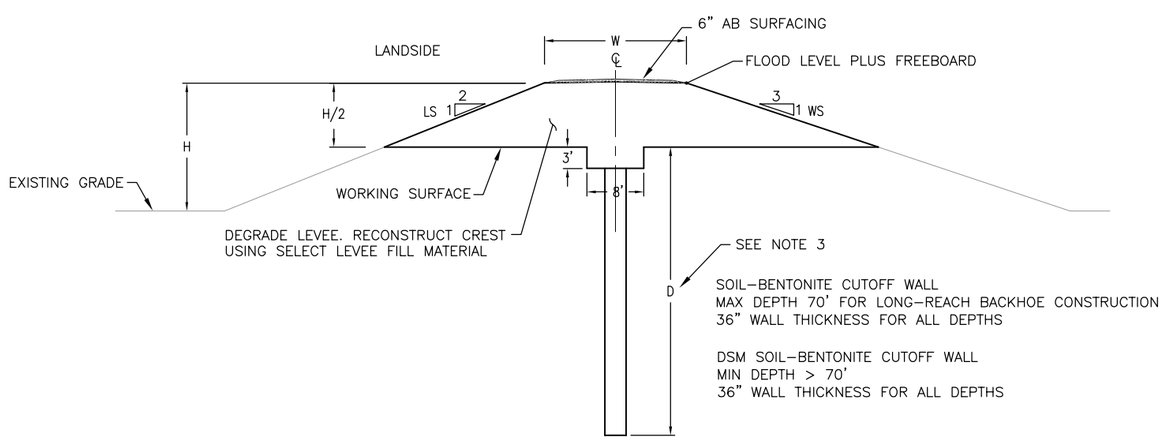
DRAINED STABILITY BERM



SEEPAGE BERM



COMBINATION SEEPAGE–STABILITY BERM



CUTOFF WALL

NOTES:

1. ASSUME THAT 4" OF AB IS ADDED TO THE CREST ROAD IN ALL LEVEE SEGMENTS OVER THE LENGTH WHERE REMEDIATIONS ARE INSTALLED TO ACCOUNT FOR DETERIORATION FROM CONSTRUCTION TRAFFIC.

2. PATROL ROAD COULD BE LOCATED IN CONSTRUCTION EASEMENT ALONG TOE OF SEEPAGE BERM.

3. SELECTION OF CUTOFF WALL DEPTH (D) IS BASED UPON LANDSIDE HEIGHT (H) OF LEVEE AND IS DETERMINED AS FOLLOWS:

   NO GEOTECHNICAL DATA AVAILABLE:
   SELECT H = LEVEE HEIGHT MEASURED FROM LANDSIDE TOE.
   DEPTH OF WALL MEASURED FROM FOUNDATION LEVEL IS 20' MINIMUM OR 3*H, WHICHEVER IS LARGER.
   ROUND RESULT TO THE NEAREST HIGHER FOOT AND ADD H/2 TO EXTEND TO DEGRADE LEVEL AND GET TOTAL WALL DEPTH FOR ESTIMATING.

   GEOTECHNICAL DATA AVAILABLE:
   SELECT H = LEVEE HEIGHT MEASURED FROM LANDSIDE TOE.
   IF AQUACLUDE >70' AND H<=23' THEN STOP WALL AT 70'
   ASSUME 70' IS MEASURED FROM DEGRADE LEVEL.
   (THIS ASSUMES GOING TO MAXIMUM WALL DEPTH FOR CONVENTIONAL WALL CONSTRUCTION)
   IF AQUACLUDE >70' AND H>23' THEN GO TO AQUACLUDE + 6' TOE–IN
   ADD H/2 TO EXTEND TO DEGRADE LEVEL AND GET TOTAL DSM WALL DEPTH FOR ESTIMATING.

4. SELECTION OF SEEPAGE BERM WIDTH (Wb) IS ALSO BASED UPON LANDSIDE HEIGHT OF LEVEE (H) AND IS DETERMINED AS FOLLOWS:

LEVEE LANDSIDE HEIGHT (FEET)	Wb (FEET)
LESS THAN 10'	4*H
10' TO 20'	5*H
GREATER THAN 20'	6*H

FIGURE 2

URS
2870 Gateway Oaks Drive, Suite 150, Sacramento, California 95833
main: (916) 679-2000
fax: (916) 679-2900

REVISIONS

NO.	DESCRIPTION	DATE	BY

NOT FOR CONSTRUCTION

DRAWN BY:
DESIGNED BY:
REVIEWED BY:
APPROVED BY:
SCALE:
HORIZONTAL:
VERTICAL:

SUBMITTED:
SUBMITTAL
APPROVED:

IF THIS BAR DOES NOT MEASURE 1" THEN ADJUST SCALE ACCORDINGLY

NULE – RACER

FIGURE 2
TYPICAL REMEDIATION DETAILS

PROJECT NO.

SHEET NO.

SHEET SEQUENCE
of

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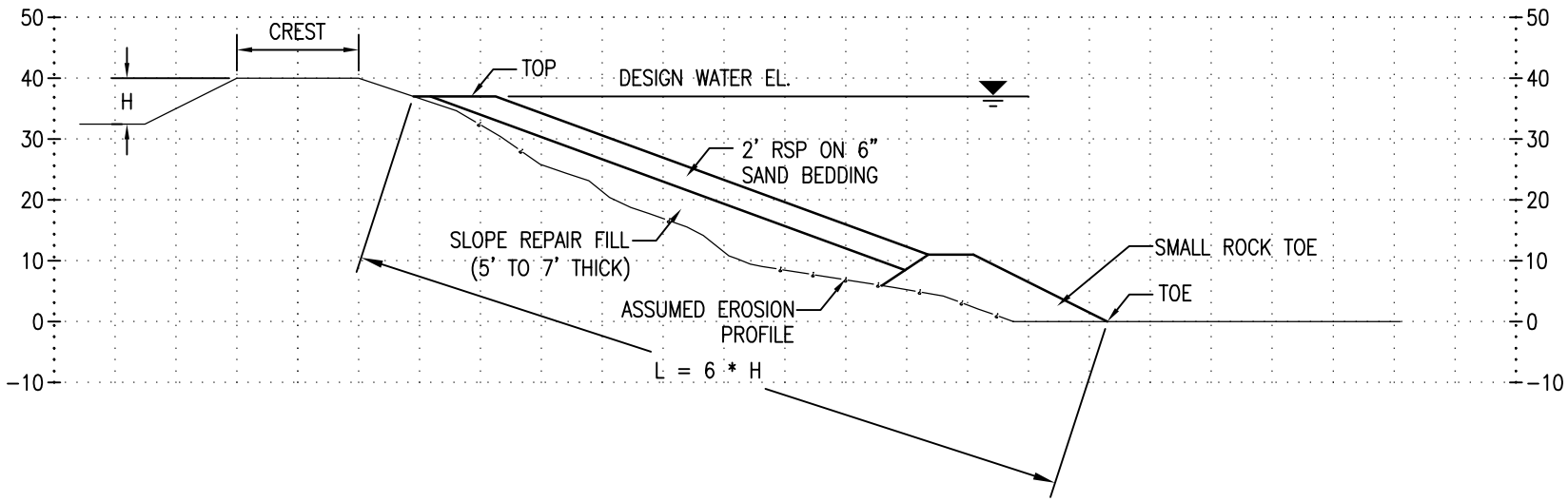
NULE – RACER

FIGURE 3
ROCK SLOPE PROTECTION



NOTES:

1. ASSUME THAT 4" OF AB IS ADDED TO THE CREST ROAD IN ALL LEVEE SEGMENTS OVER THE LENGTH WHERE REMEDIATIONS ARE INSTALLED TO ACCOUNT FOR DETERIORATION FROM CONSTRUCTION TRAFFIC.

FIGURE 3

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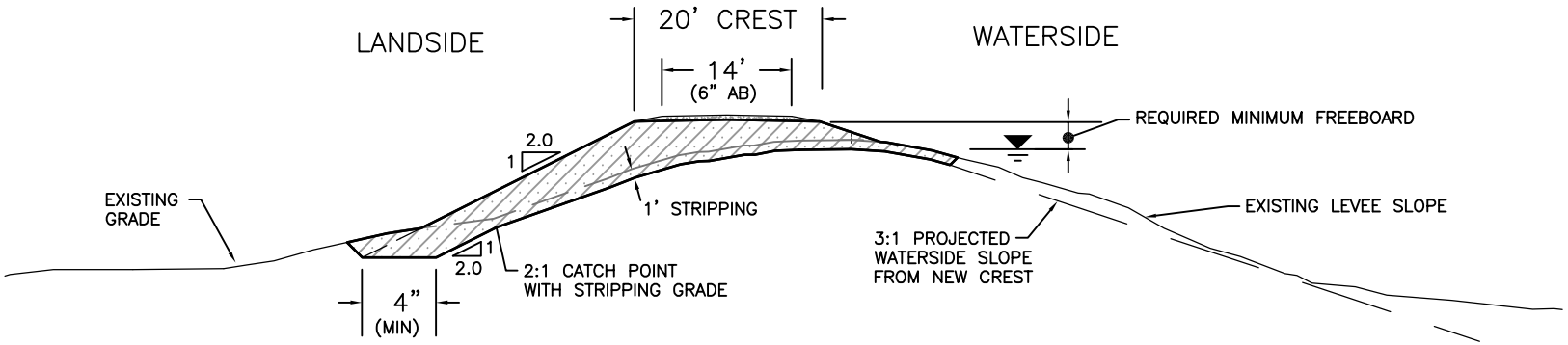

TYPICAL FREEBOARD AND GEOMETRY REPAIR FOR 20' CREST

NOTE: 12' CREST SIMILAR

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NULE – RACER

FIGURE 4
FREEBOARD AND GEOMETRY REPAIR

FIGURE 4

DWR Non Urban Levee Evaluations (NULE) Program
Selection of Remediation Alternatives for NULE RACER

Segment Identification and Location

Segment ID:
Reach No.:
Total Length: (feet)
Name:
Agency: RD
Unit: Unit
Levee Mile: LM to LM
NULE Stationing: Right Bank Sta to Sta

LAT Data Summary from Draft GAR, Dated June 2010

Potential Failure Mode	Categorization	Deficiency Extent (% of Total Length)	Comments
Underseepage			
Stability			
Through Seepage			
Erosion			

Evaluated By:
Area Lead:
Date:
Prepared By:
Date:

Select Alternative Parameters for Estimating - Seepage and Stability

Deficiency	Located Between		Length	Existing ROW	Remediation Alternatives Selected													ROW Land Use (%)				Comments
					Drained Stability	Berm	Seepage Berm		Combination Berm			Slurry Wall (Pick Only One)										
												See Note 1	Crest Width	Conventional Backhoe		DSM Wall						
	From	To	(Feet)	Width	"H"	"H1"	"H"	"W"	"H"	"H1"	"W"	"%"	"W"	"H"	"D"	"H"	"D"	"Orch"	"Agr"	"Res"	"Com"	

Note 1: Provide the estimated % of levee degrade material that could be reused for levee reconstruction for either the conventional backhoe option or the DSM wall option.

Select Alternative Parameters for Estimating - Rock Slope Protection and Geometry Repairs

Deficiency	Located Between		Length	Existing ROW	Rock Slope Protection		Geometry Repair		Replacement Levee		ROW Land Use (%)				Comments
	From	To	(Feet)	Width	Slope Length		"H"	"h1"	"Crest"	"H"	"Orch"	"Agr"	"Res"	"Com"	

FIGURE 5

ATTACHMENT 1

LIST OF KEY ESTIMATING ASSUMPTIONS

(URS, 2010)

ATTACHMENT 1

KEY ASSUMPTIONS FOR ESTIMATING
NULE RACER COST MEMORANDUM

	Assumptions and Discussion
1.	Cost estimate will include project and non-project levees within the Non-Urban Levee Evaluation (NULE) project scope for which information is available in the Draft Geotechnical Assessment Report (GAR).
2.	Remediation estimates will be prepared for levee segments with composite classifications of "B," "C," or "LD." Estimates currently include levee segments with an "LD" classification that could become an "A" classification based upon additional information obtained in the future.
3.	Construction cost estimates will be escalated at 3% to October 2011 based upon information received in the Central Valley Flood Management Plan (CVFMP)-Urban Levee Evaluation (ULE)/NULE coordination meeting held on July 7, 2010. The 3% value is conservative over the near future given the current economic climate.
4.	The NULE Remedial Alternative Cost Estimate Report (RACER) cost estimate to be provided to the Department of Water Resources (DWR), will include the cost estimate spreadsheet and several pages of text describing the work approach, key assumptions, and limitations. Costs will be provided by segment and for the overall project. A summary sheet will list the cost for alternatives considered for remediation of a deficiency where alternatives are feasible. The actual format for the spreadsheet will be developed as the work progresses through the Technical Approach Team meeting process.
5.	Because of the limited information available to evaluate levees for the GAR, the cost estimate will be an order-of-magnitude cost estimate comparable to a Class 4 estimate as defined by the American Association for the Advancement of Cost Estimating, which can vary in accuracy from -30% on the low side to from +20% to +50-percent on the high side.
6.	Preparation of estimates for the CVFMP process may require the addition of other remediation measures to the cost estimating tool. These will be added at a later date in a manner mutually agreed between DWR and URS. Adding remediation alternatives should not affect the NULE RACER cost estimate.
7.	A small percentage (approximately 6%) of levee mileage was not covered in the levee assessment tool (LAT)/GAR process due to complete lack of information, lack of authorized access, etc. The cost to remediate this mileage will be estimated as a percentage of the cost to remediate similar mileage where information is available. As a starting point, the percentage will be based upon the ratio of the mileage not evaluated to the total mileage in the program.
8.	Cost estimates for remediation alternatives will include: • Direct construction costs • Contingencies (30% of construction cost) • Design, Engineering costs (15% of construction cost) • CM (15% of construction cost) • Permitting/Legal (5% of construction cost) (See Items 16 and 17 also) • Environmental mitigation (25% or 35% of construction cost) (see Item 32 also) • Escalation (3% per year)
9.	The cost estimating tool is currently limited to eight remediation types: drained stability berm; seepage berm; combination seepage-stability berm; conventional slurry wall to maximum depth of 70 feet below working surface; deep soil mixing (DSM) wall for wall more than 70 feet deep measured below the working surface; erosion repair; and levee replacement in place; and freeboard/geometry.

Assumptions and Discussion

10. The only remediation being considered for waterside erosion is the placement of rock slope protection in deficient reaches. The length of slope repair on slope will be six times the landside levee height. The following costs per foot have been prepared for four levee heights:

Levee Height	Slope Length	$ Per Foot
5 feet	30 feet	$523
10 feet	60 feet	$1,070
15 feet	90 feet	$1,642
20 feet	120 feet	$2,240

The estimating tool will interpolate the cost per foot from the above values based on the actual levee height where remediation is required.

The lengths of levee to be remediated as specified in the Draft GAR are large and may result in a significant remediation cost compared to other deficiencies. As suggested by DWR, the cost memorandum will include a cost to repair all lengths specified in the Draft GAR and a cost to repair a lesser length (20% of the length specified in the Draft GAR). The latter cost assumes that other areas requiring remediation would be repaired as part of an ongoing maintenance program.

11. For any remediation requiring additional land acquisition, existing right-of-way (ROW) would be estimated from existing readily available data (assessor's maps, owner contact, fence lines on aerials, etc.). In the absence of such data, existing ROW width will be assumed to be zero. For the cost estimates provided in the cost memorandum, all estimates assume that no existing easement exists due to the general lack of easement data (see cost memorandum Figure 1 for easement requirements for estimating).

12. For any berm-type remediation requiring land acquisition, 20 feet of addition permanent ROW will be acquired along the landside toe of the remediation to satisfy planned Central Valley Flood Protection Board (CVFPB) easement requirements (see cost memorandum Figure 1).

13. For any berm remediation requiring additional land acquisition, 5 feet of additional temporary easement will be obtained such that the 5-foot temporary easement plus the adjacent 20-foot permanent easement for CVFPB will provide a construction easement of 25 feet along the landside toe of the remediation (see cost memorandum Figure 1).

14. For slurry wall or DSM remediations, the 20-foot CVFPB permanent easement (less any existing easement) and 5-foot temporary easement will also be obtained along the landside toe of the levee (see cost memorandum Figure 1).

15. No allowance will be included in the estimate for temporary or permanent property acquisition for levee segments with an "A" classification (unless freeboard/geometry repair is needed) or for reaches within a levee segment where no remediation measures are required based upon the LAT and GAR.

16. Costs for four land use categories are covered in the estimating tool: orchard, agricultural, industrial, and residential. Where remediations are required and land acquisition is needed, the percentage of each use category will be estimated from aerial photographs or other readily available information and a composite cost for temporary/permanent land acquisition based on the percentages will be used. The basic land costs currently being used in the cost estimating tool are:

Agricultural	$10,000 per acre
Orchard	$30,000 per acre
Industrial	$150,000 per acre
Residential	$300,000 per acre

	Assumptions and Discussion
17.	The temporary/permanent property acquisition costs described above address the cost of procuring the land. In addition, a 5% allowance for legal costs for land acquisition will also be included. The percentage will be multiplied by the total direct construction cost to obtain the legal cost percentage. Legal costs could be more expensive than the land acquisition cost depending upon the amount of land acquired.
18.	Wherever available, the United States Army Corps of Engineers (USACE) 55/57 water surface profiles are the design water surfaces for levee remediation evaluations. Where 55/57 water surface information is not available, the design water surface is set at the existing crest level less 3 feet, or at the 100-year water surface elevation, where appropriate.
19.	Remediation of levee geometry deficiencies is based upon the levee configuration described in the 1953 Memorandum of Understanding between the USACE (USA) and State of California. In summary these configurations are: 3:1 waterside slopes for all levees, 20-foot- or 12-foot-wide crest depending upon location, 2.5:1 landside slopes for bypass levees, and 2:1 landside slopes for other levees.
20.	Selection of remediation alternatives and extent of remediation required will be based upon information in the LAT and GAR wherever possible. Simplifying assumptions would be made where information is not available (see seepage berm and slurry wall items below as an example). Where specific lengths for required remediation alternatives are not provided in the LAT and GAR documentation, or cannot be readily determined, the percentage of total segment length requiring remediation as noted in the GAR will be used.
21.	The estimate assumes the use of hydroseeding to revegetate new slopes or restore other areas disturbed during construction. The cost for plantings, irrigation systems, fencing, etc., installed as part of the emergency levee repair program will not be reflected in the NULE RACER estimate.
22.	For estimating purposes, all slurry walls and DSM walls are assumed to be 36 inches wide regardless of depth.
23.	Levee degrade for slurry wall and DSM wall construction is assumed to be 50% of the height of the levee measured on the landside, and the 50% degrade is assumed to provide suitable working width for equipment. For low height levees (generally 5 feet high or less) that require a cutoff wall, the levee section would be removed to existing grade measured on the landside.
24.	Imported or on-site material used to reconstruct levees within the levee prism or to construct drained stability berms is assumed to meet current USACE criteria for select levee fill. Material used to construct seepage berms (other than drain layers) can be any suitable material.
25.	NULE south will use different borrow rates from NULE north because suitable sandy material for berm construction may be more readily available close to project sites. Unit rates for borrow for both areas will be included in the cost estimating tool.

	Assumptions and Discussion
26.	There may be areas where the length of seepage berm or depth of slurry wall cannot be determined based upon available information. In this case, an approximation method is used to select wall depths and seepage berm widths that would provide comparable levels of protection. Selections of wall depth and berm width are based upon landside height of levee and are as follows: <u>No Geotechnical Data Available:</u> Select H = Levee height measured from landside toe Depth of wall measured from foundation level is 20 feet minimum or 3*H, whichever is larger. Round result to the nearest higher foot and add H/2 to extend to degrade level and get total wall depth for estimating. <u>Geotechnical Data Available:</u> Select H = Levee height measured from landside toe If aquaclude >70 feet and H<= 23 feet then stop wall at 70 feet Assume 70 feet is measured from degrade level. (This assumes going to the maximum wall depth for conventional wall construction) If aquaclude >70 feet and H>23 feet then go to aquaclude + 6 feet toe-in Add H/2 to extend to degrade level and get total DSM wall depth for estimating
27.	The cost estimate will not include any allowance for ongoing operation and maintenance costs of facilities after remediations are constructed.
28.	The cost to make animal burrow repairs will not be included in the cost estimate. However, the documentation for the cost memorandum will include an estimate of the average cost per mile to repair such damage based upon DWR experience. DWR will provide the cost to URS for incorporation in the report. Areas where heavy rodent damage was noted are documented in the LAT and GAR.
29.	For estimating purposes, seepage berms and combined seepage-stability berms include acquiring a 20-foot-wide strip of land along the full length of the landside toe of berm for a CVFPB easement. An additional 5-foot-wide strip of land will be acquired as a temporary easement so that the temporary and CVFPB easements together provide a 25-foot-wide easement for construction.
30.	For estimating purposes, all levee sections degraded to construct slurry walls will include a new crest road with 6 inches of aggregate base (AB). AB section will be placed above the levee crest elevation required for freeboard. Where paved public roads are known to exist on the crest of a levee, an allowance will be included for repaving.
31.	For estimating purposes, levee sections where landside berms are constructed or erosion protection is placed will have up to 4 inches of AB added to the crest to supplement existing surfacing to address possible deterioration of the existing crest road due to construction activities.
32.	A low environmental mitigation cost factor and a high environmental mitigation cost factor will be used. The low factor will be 25% and the high factor will be 35 percent. These factors will be multiplied by the direct construction cost for a remediation to estimate the environmental mitigation cost. All cost estimates will begin at 25 percent. A biologist will review available data for a levee region (such as state environmental databases, County General Plans, etc.) and determine those requiring the higher percentage based upon the possible presence of wetlands, wetland indicator species, or threatened or endangered species. Any main stem levee requiring waterside erosion remediation will also be assigned the higher environmental mitigation percentage.

ATTACHMENT 2

SEGMENT SPECIFIC REMEDIATION ALERNATIVE COST ESTIMATES GROUPED BY GAR STUDY AREA

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 1

Segment 201: RD 2094, Unit 1

Total Segment Length (Feet):	14,679	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$17,915,000
Structural Repair Subtotal:	**$17,915,000**
Freeboard/Geometry Repair:	$1,039,000
Non-Structural Repair Subtotal:	**$1,039,000**
Total Alternative 1 Cost:	**$18,954,000**

Alternative 2

Seepage Cutoff Wall Cost:	$38,844,000
Structural Repair Subtotal:	**$38,844,000**
Freeboard/Geometry Repair:	$1,039,000
Non-Structural Repair Subtotal:	**$1,039,000**
Total Alternative 2 Cost:	**$39,883,000**

Segment 203: RD 2096, Unit 1

Total Segment Length (Feet):	871	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$2,176,000
Structural Repair Subtotal:	**$2,176,000**
Freeboard/Geometry Repair:	$77,000
Non-Structural Repair Subtotal:	**$77,000**
Total Alternative 1 Cost:	**$2,254,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Alternative 2

Seepage Cutoff Wall Cost:	$2,709,000
Structural Repair Subtotal:	**$2,709,000**
Freeboard/Geometry Repair:	$77,000
Non-Structural Repair Subtotal:	**$77,000**
Total Alternative 2 Cost:	**$2,787,000**

Segment 259: RD 2107, Unit 2

Total Segment Length (Feet):	9,599	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	100	Deficiencies Being Remediated:	U+Sn+T

Alternative 1

Combo Berm Cost:	$10,771,000
Structural Repair Subtotal:	**$10,771,000**
Total Alternative 1 Cost:	**$10,771,000**

Alternative 2

Seepage Cutoff Wall Cost:	$16,834,000
Structural Repair Subtotal:	**$16,834,000**
Total Alternative 2 Cost:	**$16,834,000**

Segment 336: RD 2062, Unit 2

Total Segment Length (Feet):	29,319	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	70	Deficiencies Being Remediated:	U+FG

Alternative 1

Combo Berm Cost:	$13,007,000
Structural Repair Subtotal:	**$13,007,000**
Total Alternative 1 Cost:	**$13,007,000**

Alternative 2

Seepage Cutoff Wall Cost:	$32,797,000
Structural Repair Subtotal:	**$32,797,000**
Total Alternative 2 Cost:	**$32,797,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 5006: Mormon Slough

Total Segment Length (Feet):	58,967	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	50	Deficiencies Being Remediated:	E+FG

Alternative 1

Erosion Repair:	$16,037,000
Non-Structural Repair Subtotal:	**$16,037,000**
Total Alternative 1 Cost:	**$16,037,000**

Segment 5013: RD 2089, Grant Line Canal

Total Segment Length (Feet):	4,400	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	100	Deficiencies Being Remediated:	U+E

Alternative 1

S Berm Cost:	$3,870,000
Structural Repair Subtotal:	**$3,870,000**
Erosion Repair:	$7,658,000
Non-Structural Repair Subtotal:	**$7,658,000**
Total Alternative 1 Cost:	**$11,528,000**

Alternative 2

Seepage Cutoff Wall Cost:	$5,188,000
Structural Repair Subtotal:	**$5,188,000**
Erosion Repair:	$7,658,000
Non-Structural Repair Subtotal:	**$7,658,000**
Total Alternative 2 Cost:	**$12,847,000**

Segment 185: RD 1, Unit 1

Total Segment Length (Feet):	5,904	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+Sn+T+E

Alternative 1

Combo Berm Cost:	$9,932,000
Structural Repair Subtotal:	**$9,932,000**
Erosion Repair:	$1,508,000
Non-Structural Repair Subtotal:	**$1,508,000**
Total Alternative 1 Cost:	**$11,440,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Alternative 2

Seepage Cutoff Wall Cost:	$18,324,000
Structural Repair Subtotal:	**$18,324,000**
Erosion Repair:	$1,508,000
Non-Structural Repair Subtotal:	**$1,508,000**
Total Alternative 2 Cost:	**$19,832,000**

Segment 188: RD 524, Unit 1

Total Segment Length (Feet):	32,733	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	50	Deficiencies Being Remediated:	U+T+E+FG

Alternative 1

Combo Berm Cost:	$33,325,000
Structural Repair Subtotal:	**$33,325,000**
Erosion Repair:	$11,430,000
Freeboard/Geometry Repair:	$1,659,000
Non-Structural Repair Subtotal:	**$13,089,000**
Total Alternative 1 Cost:	**$46,414,000**

Alternative 2

Seepage Cutoff Wall Cost:	$36,923,000
Structural Repair Subtotal:	**$36,923,000**
Erosion Repair:	$11,430,000
Freeboard/Geometry Repair:	$1,659,000
Non-Structural Repair Subtotal:	**$13,089,000**
Total Alternative 2 Cost:	**$50,012,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 189: RD 544, Unit 1

Total Segment Length (Feet):	31,833	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+E+FG

Alternative 1

Combo Berm Cost:	$33,824,000
Structural Repair Subtotal:	**$33,824,000**
Erosion Repair:	$54,622,000
Freeboard/Geometry Repair:	$1,954,000
Non-Structural Repair Subtotal:	**$56,576,000**
Total Alternative 1 Cost:	**$90,400,000**

Alternative 2

Seepage Cutoff Wall Cost:	$47,030,000
Structural Repair Subtotal:	**$47,030,000**
Erosion Repair:	$54,622,000
Freeboard/Geometry Repair:	$1,954,000
Non-Structural Repair Subtotal:	**$56,576,000**
Total Alternative 2 Cost:	**$103,605,000**

Segment 192: RD 2058, Unit 1

Total Segment Length (Feet):	40,412	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	50	Deficiencies Being Remediated:	U+T+E

Alternative 1

Combo Berm Cost:	$43,567,000
Structural Repair Subtotal:	**$43,567,000**
Erosion Repair:	$7,644,000
Non-Structural Repair Subtotal:	**$7,644,000**
Total Alternative 1 Cost:	**$51,210,000**

Alternative 2

Seepage Cutoff Wall Cost:	$72,881,000
Structural Repair Subtotal:	**$72,881,000**
Erosion Repair:	$7,644,000
Non-Structural Repair Subtotal:	**$7,644,000**
Total Alternative 2 Cost:	**$80,524,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 195: RD 2064, Unit 1

Total Segment Length (Feet):	29,314	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+E+FG

Alternative 1

Combo Berm Cost:	$39,697,000
Structural Repair Subtotal:	**$39,697,000**
Erosion Repair:	$5,118,000
Non-Structural Repair Subtotal:	**$5,118,000**
Total Alternative 1 Cost:	**$44,815,000**

Alternative 2

Seepage Cutoff Wall Cost:	$85,169,000
Structural Repair Subtotal:	**$85,169,000**
Erosion Repair:	$5,118,000
Non-Structural Repair Subtotal:	**$5,118,000**
Total Alternative 2 Cost:	**$90,287,000**

Segment 196: RD 2075, Unit 1

Total Segment Length (Feet):	39,202	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$53,317,000
Structural Repair Subtotal:	**$53,317,000**
Total Alternative 1 Cost:	**$53,317,000**

Alternative 2

Seepage Cutoff Wall Cost:	$105,970,000
Structural Repair Subtotal:	**$105,970,000**
Total Alternative 2 Cost:	**$105,970,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 197: RD 2085, Unit 1

Total Segment Length (Feet): 27,893 Overall Reach Categorization: Hazard Level C

Remediated Length (%): 100 Deficiencies Being Remediated: U+T+E

Alternative 1

Combo Berm Cost:	$23,968,000
Seepage Cutoff Wall Cost:	$25,525,000
Structural Repair Subtotal:	**$49,493,000**
Erosion Repair:	$9,740,000
Non-Structural Repair Subtotal:	**$9,740,000**
Total Alternative 1 Cost:	**$59,233,000**

Alternative 2

Seepage Cutoff Wall Cost:	$81,311,000
Structural Repair Subtotal:	**$81,311,000**
Erosion Repair:	$9,740,000
Non-Structural Repair Subtotal:	**$9,740,000**
Total Alternative 2 Cost:	**$91,051,000**

Segment 198: RD 2089, Unit 1

Total Segment Length (Feet): 8,139 Overall Reach Categorization: Hazard Level C

Remediated Length (%): 90 Deficiencies Being Remediated: U+Sn+T+E

Alternative 1

Combo Berm Cost:	$11,799,000
Structural Repair Subtotal:	**$11,799,000**
Erosion Repair:	$16,278,000
Non-Structural Repair Subtotal:	**$16,278,000**
Total Alternative 1 Cost:	**$28,077,000**

Alternative 2

Seepage Cutoff Wall Cost:	$24,088,000
Structural Repair Subtotal:	**$24,088,000**
Erosion Repair:	$16,278,000
Non-Structural Repair Subtotal:	**$16,278,000**
Total Alternative 2 Cost:	**$40,366,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 202: RD 2095, Unit 1

Total Segment Length (Feet):	7,297	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T

Alternative 1

Combo Berm Cost:	$8,900,000
Structural Repair Subtotal:	**$8,900,000**
Total Alternative 1 Cost:	**$8,900,000**

Alternative 2

Seepage Cutoff Wall Cost:	$12,901,000
Structural Repair Subtotal:	**$12,901,000**
Total Alternative 2 Cost:	**$12,901,000**

Segment 208: RD 2107, Unit 1

Total Segment Length (Feet):	12,299	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+Sn+T

Alternative 1

Combo Berm Cost:	$19,069,000
Structural Repair Subtotal:	**$19,069,000**
Total Alternative 1 Cost:	**$19,069,000**

Alternative 2

Seepage Cutoff Wall Cost:	$37,271,000
Structural Repair Subtotal:	**$37,271,000**
Total Alternative 2 Cost:	**$37,271,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 256: RD 2062, Unit 3

Total Segment Length (Feet):	29,105	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	80	Deficiencies Being Remediated:	U+Sn+T+E

Alternative 1

Combo Berm Cost:	$31,406,000
Structural Repair Subtotal:	**$31,406,000**
Erosion Repair:	$16,344,000
Non-Structural Repair Subtotal:	**$16,344,000**
Total Alternative 1 Cost:	**$47,750,000**

Alternative 2

Seepage Cutoff Wall Cost:	$67,439,000
Structural Repair Subtotal:	**$67,439,000**
Erosion Repair:	$16,344,000
Non-Structural Repair Subtotal:	**$16,344,000**
Total Alternative 2 Cost:	**$83,783,000**

Segment 257: RD 2064, Unit 2

Total Segment Length (Feet):	32,550	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	60	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$25,699,000
Structural Repair Subtotal:	**$25,699,000**
Freeboard/Geometry Repair:	$1,034,000
Non-Structural Repair Subtotal:	**$1,034,000**
Total Alternative 1 Cost:	**$26,734,000**

Alternative 2

Seepage Cutoff Wall Cost:	$54,827,000
Structural Repair Subtotal:	**$54,827,000**
Freeboard/Geometry Repair:	$1,034,000
Non-Structural Repair Subtotal:	**$1,034,000**
Total Alternative 2 Cost:	**$55,861,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 258: RD 2095, Unit 2

Total Segment Length (Feet):	18,172	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	80	Deficiencies Being Remediated:	U+T

Alternative 1

Combo Berm Cost:	$20,474,000
Structural Repair Subtotal:	**$20,474,000**
Total Alternative 1 Cost:	**$20,474,000**

Alternative 2

Seepage Cutoff Wall Cost:	$45,545,000
Structural Repair Subtotal:	**$45,545,000**
Total Alternative 2 Cost:	**$45,545,000**

Segment 334: RD 544, Unit 2

Total Segment Length (Feet):	22,071	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	70	Deficiencies Being Remediated:	U+T+E+FG

Alternative 1

Combo Berm Cost:	$5,740,000
Structural Repair Subtotal:	**$5,740,000**
Erosion Repair:	$26,510,000
Freeboard/Geometry Repair:	$2,275,000
Non-Structural Repair Subtotal:	**$28,785,000**
Total Alternative 1 Cost:	**$34,525,000**

Alternative 2

Seepage Cutoff Wall Cost:	$11,882,000
Structural Repair Subtotal:	**$11,882,000**
Erosion Repair:	$26,510,000
Freeboard/Geometry Repair:	$2,275,000
Non-Structural Repair Subtotal:	**$28,785,000**
Total Alternative 2 Cost:	**$40,667,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 335: RD 2089, Unit 2

Total Segment Length (Feet):	6,854	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	90	Deficiencies Being Remediated:	U+T+E

Alternative 1

Combo Berm Cost:	$6,103,000
Structural Repair Subtotal:	**$6,103,000**
Erosion Repair:	$10,585,000
Non-Structural Repair Subtotal:	**$10,585,000**
Total Alternative 1 Cost:	**$16,688,000**

Alternative 2

Seepage Cutoff Wall Cost:	$8,837,000
Structural Repair Subtotal:	**$8,837,000**
Erosion Repair:	$10,585,000
Non-Structural Repair Subtotal:	**$10,585,000**
Total Alternative 2 Cost:	**$19,421,000**

Segment 5008: RD 544, Middle River

Total Segment Length (Feet):	25,550	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+E+FG

Alternative 1

S Berm Cost:	$8,211,000
Combo Berm Cost:	$18,717,000
Structural Repair Subtotal:	**$26,929,000**
Erosion Repair:	$35,677,000
Freeboard/Geometry Repair:	$932,000
Non-Structural Repair Subtotal:	**$36,609,000**
Total Alternative 1 Cost:	**$63,538,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Alternative 2

Seepage Cutoff Wall Cost:	$29,926,000
Structural Repair Subtotal:	**$29,926,000**
Erosion Repair:	$35,677,000
Freeboard/Geometry Repair:	$932,000
Non-Structural Repair Subtotal:	**$36,609,000**
Total Alternative 2 Cost:	**$66,535,000**

Segment 5010: RD 1, Middle River

Total Segment Length (Feet):	53,320	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+E+FG

Alternative 1

S Berm Cost:	$7,622,000
Combo Berm Cost:	$37,410,000
Structural Repair Subtotal:	**$45,031,000**
Erosion Repair:	$110,023,000
Freeboard/Geometry Repair:	$1,598,000
Non-Structural Repair Subtotal:	**$111,621,000**
Total Alternative 1 Cost:	**$156,653,000**

Alternative 2

Seepage Cutoff Wall Cost:	$68,153,000
Structural Repair Subtotal:	**$68,153,000**
Erosion Repair:	$110,023,000
Freeboard/Geometry Repair:	$1,598,000
Non-Structural Repair Subtotal:	**$111,621,000**
Total Alternative 2 Cost:	**$179,774,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 5019: RD 348, Mokelumne River

Total Segment Length (Feet): 50,900 — Overall Reach Categorization: Hazard Level C

Remediated Length (%): 20 — Deficiencies Being Remediated: U+T

Alternative 1

Combo Berm Cost:	$16,676,000
Seepage Cutoff Wall Cost:	$2,513,000
Structural Repair Subtotal:	**$19,188,000**
Freeboard/Geometry Repair:	$4,425,000
Non-Structural Repair Subtotal:	**$4,425,000**
Total Alternative 1 Cost:	**$23,613,000**

Alternative 2

Seepage Cutoff Wall Cost:	$21,569,000
Structural Repair Subtotal:	**$21,569,000**
Freeboard/Geometry Repair:	$4,425,000
Non-Structural Repair Subtotal:	**$4,425,000**
Total Alternative 2 Cost:	**$25,994,000**

Segment 5009: RD 524, Middle River

Total Segment Length (Feet): 11,880 — Overall Reach Categorization: Hazard Level LD (A/B)

Remediated Length (%): 60 — Deficiencies Being Remediated: U+T+FG

Alternative 1

Combo Berm Cost:	$13,807,000
Structural Repair Subtotal:	**$13,807,000**
Freeboard/Geometry Repair:	$524,000
Non-Structural Repair Subtotal:	**$524,000**
Total Alternative 1 Cost:	**$14,331,000**

Alternative 2

Seepage Cutoff Wall Cost:	$16,583,000
Structural Repair Subtotal:	**$16,583,000**
Freeboard/Geometry Repair:	$524,000
Non-Structural Repair Subtotal:	**$524,000**
Total Alternative 2 Cost:	**$17,107,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 5014: RD 1007, Tom Paine Slough

Total Segment Length (Feet): 4,000 Overall Reach Categorization: Hazard Level LD (A/B)
Remediated Length (%): 100 Deficiencies Being Remediated: E

Alternative 1

Erosion Repair:	$6,261,000
Non-Structural Repair Subtotal:	**$6,261,000**
Total Alternative 1 Cost:	**$6,261,000**

Segment 5015: RD 1007, Sugar Cut

Total Segment Length (Feet): 6,350 Overall Reach Categorization: Hazard Level LD (A/B)
Remediated Length (%): 100 Deficiencies Being Remediated: U+E

Alternative 1

S Berm Cost:	$1,235,000
Structural Repair Subtotal:	**$1,235,000**
Erosion Repair:	$3,454,000
Non-Structural Repair Subtotal:	**$3,454,000**
Total Alternative 1 Cost:	**$4,689,000**

Alternative 2

Seepage Cutoff Wall Cost:	$1,830,000
Structural Repair Subtotal:	**$1,830,000**
Erosion Repair:	$3,454,000
Non-Structural Repair Subtotal:	**$3,454,000**
Total Alternative 2 Cost:	**$5,284,000**

Segment 5018: RD 1007, Old River

Total Segment Length (Feet): 40,040 Overall Reach Categorization: Hazard Level LD (A/B)
Remediated Length (%): 100 Deficiencies Being Remediated: U+E

Alternative 1

S Berm Cost:	$21,750,000
Structural Repair Subtotal:	**$21,750,000**
Erosion Repair:	$62,122,000
Non-Structural Repair Subtotal:	**$62,122,000**
Total Alternative 1 Cost:	**$83,872,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Alternative 2

Seepage Cutoff Wall Cost:	$25,476,000
Structural Repair Subtotal:	**$25,476,000**
Erosion Repair:	$62,122,000
Non-Structural Repair Subtotal:	**$62,122,000**
Total Alternative 2 Cost:	**$87,599,000**

Segment 5012: RD 2089, Dryland levee

Total Segment Length (Feet):	5,950	Overall Reach Categorization:	Hazard Level LD (B/C)
Remediated Length (%):	100	Deficiencies Being Remediated:	U+Sn+T

Alternative 1

Combo Berm Cost:	$11,836,000
Structural Repair Subtotal:	**$11,836,000**
Total Alternative 1 Cost:	**$11,836,000**

Alternative 2

Seepage Cutoff Wall Cost:	$19,879,000
Structural Repair Subtotal:	**$19,879,000**
Total Alternative 2 Cost:	**$19,879,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 2

Segment 207: RD 2102, Unit 1

Total Segment Length (Feet):	9,476	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	100	Deficiencies Being Remediated:	U+Sn+T

Alternative 1

Stability Berm Cost:	$432,000
Combo Berm Cost:	$7,976,000
Structural Repair Subtotal:	**$8,408,000**
Total Alternative 1 Cost:	**$8,408,000**

Alternative 2

Seepage Cutoff Wall Cost:	$14,107,000
Structural Repair Subtotal:	**$14,107,000**
Total Alternative 2 Cost:	**$14,107,000**

Segment 190: RD 1602, Unit 1

Total Segment Length (Feet):	32,866	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	90	Deficiencies Being Remediated:	U+T

Alternative 1

Combo Berm Cost:	$30,411,000
Structural Repair Subtotal:	**$30,411,000**
Total Alternative 1 Cost:	**$30,411,000**

Alternative 2

Seepage Cutoff Wall Cost:	$47,829,000
Structural Repair Subtotal:	**$47,829,000**
Total Alternative 2 Cost:	**$47,829,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 191: RD 2031, Unit 1

Total Segment Length (Feet):	37,242	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	40	Deficiencies Being Remediated:	U+T

Alternative 1

Combo Berm Cost:	$15,046,000
Structural Repair Subtotal:	**$15,046,000**
Total Alternative 1 Cost:	**$15,046,000**

Alternative 2

Seepage Cutoff Wall Cost:	$22,076,000
Structural Repair Subtotal:	**$22,076,000**
Total Alternative 2 Cost:	**$22,076,000**

Segment 194: RD 2063, Unit 1

Total Segment Length (Feet):	55,066	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	90	Deficiencies Being Remediated:	U+T

Alternative 1

Combo Berm Cost:	$43,273,000
Seepage Cutoff Wall Cost:	$16,804,000
Structural Repair Subtotal:	**$60,077,000**
Total Alternative 1 Cost:	**$60,077,000**

Alternative 2

Seepage Cutoff Wall Cost:	$84,444,000
Structural Repair Subtotal:	**$84,444,000**
Total Alternative 2 Cost:	**$84,444,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 199: RD 2091, Unit 1

Total Segment Length (Feet):	39,679	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	70	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$37,462,000
Structural Repair Subtotal:	**$37,462,000**
Freeboard/Geometry Repair:	$1,500,000
Non-Structural Repair Subtotal:	**$1,500,000**
Total Alternative 1 Cost:	**$38,962,000**

Alternative 2

Seepage Cutoff Wall Cost:	$125,866,000
Structural Repair Subtotal:	**$125,866,000**
Freeboard/Geometry Repair:	$1,500,000
Non-Structural Repair Subtotal:	**$1,500,000**
Total Alternative 2 Cost:	**$127,367,000**

Segment 200: RD 2092, Unit 1

Total Segment Length (Feet):	19,544	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	80	Deficiencies Being Remediated:	U+T+E+FG

Alternative 1

Combo Berm Cost:	$20,104,000
Structural Repair Subtotal:	**$20,104,000**
Erosion Repair:	$24,258,000
Freeboard/Geometry Repair:	$762,000
Non-Structural Repair Subtotal:	**$25,020,000**
Total Alternative 1 Cost:	**$45,124,000**

Alternative 2

Seepage Cutoff Wall Cost:	$23,222,000
Structural Repair Subtotal:	**$23,222,000**
Erosion Repair:	$24,258,000
Freeboard/Geometry Repair:	$762,000
Non-Structural Repair Subtotal:	**$25,020,000**
Total Alternative 2 Cost:	**$48,242,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 204: RD 2099, Unit 1

Total Segment Length (Feet):	12,630	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	90	Deficiencies Being Remediated:	U+Sn+T+FG

Alternative 1

Combo Berm Cost:	$15,331,000
Structural Repair Subtotal:	**$15,331,000**
Freeboard/Geometry Repair:	$970,000
Non-Structural Repair Subtotal:	**$970,000**
Total Alternative 1 Cost:	**$16,301,000**

Alternative 2

Seepage Cutoff Wall Cost:	$19,205,000
Structural Repair Subtotal:	**$19,205,000**
Freeboard/Geometry Repair:	$970,000
Non-Structural Repair Subtotal:	**$970,000**
Total Alternative 2 Cost:	**$20,176,000**

Segment 205: RD 2100, Unit 1

Total Segment Length (Feet):	13,952	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	90	Deficiencies Being Remediated:	U+Sn+T+FG

Alternative 1

Combo Berm Cost:	$14,444,000
Structural Repair Subtotal:	**$14,444,000**
Freeboard/Geometry Repair:	$992,000
Non-Structural Repair Subtotal:	**$1,355,000**
Misc. Hazards Cost:	$363,000
Total Alternative 1 Cost:	**$16,161,000**

Alternative 2

Seepage Cutoff Wall Cost:	$19,653,000
Structural Repair Subtotal:	**$19,653,000**
Freeboard/Geometry Repair:	$992,000
Non-Structural Repair Subtotal:	**$1,355,000**
Misc. Hazards Cost:	$363,000
Total Alternative 2 Cost:	**$21,371,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 206: RD 2101, Unit 1

Total Segment Length (Feet): 16,550 Overall Reach Categorization: Hazard Level C

Remediated Length (%): 90 Deficiencies Being Remediated: U+T+E

Alternative 1

Combo Berm Cost:	$20,090,000
Structural Repair Subtotal:	**$20,090,000**
Erosion Repair:	$3,415,000
Non-Structural Repair Subtotal:	**$3,415,000**
Total Alternative 1 Cost:	**$23,505,000**

Alternative 2

Seepage Cutoff Wall Cost:	$36,047,000
Structural Repair Subtotal:	**$36,047,000**
Erosion Repair:	$3,415,000
Non-Structural Repair Subtotal:	**$3,415,000**
Total Alternative 2 Cost:	**$39,462,000**

Segment 341: RD 2031, Unit 2

Total Segment Length (Feet): 31,509 Overall Reach Categorization: Hazard Level C

Remediated Length (%): 70 Deficiencies Being Remediated: U+T+E

Alternative 1

Combo Berm Cost:	$29,380,000
Structural Repair Subtotal:	**$29,380,000**
Erosion Repair:	$5,501,000
Non-Structural Repair Subtotal:	**$5,501,000**
Total Alternative 1 Cost:	**$34,882,000**

Alternative 2

Seepage Cutoff Wall Cost:	$55,276,000
Structural Repair Subtotal:	**$55,276,000**
Erosion Repair:	$5,501,000
Non-Structural Repair Subtotal:	**$5,501,000**
Total Alternative 2 Cost:	**$60,777,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 5001: Tuolumne River, Right Bank

Total Segment Length (Feet):	36,539	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+E+FG

Alternative 1

Combo Berm Cost:	$54,914,000
Structural Repair Subtotal:	**$54,914,000**
Erosion Repair:	$62,637,000
Freeboard/Geometry Repair:	$16,593,000
Non-Structural Repair Subtotal:	**$79,229,000**
Total Alternative 1 Cost:	**$134,144,000**

Alternative 2

Seepage Cutoff Wall Cost:	$85,802,000
Structural Repair Subtotal:	**$85,802,000**
Erosion Repair:	$62,637,000
Freeboard/Geometry Repair:	$16,593,000
Non-Structural Repair Subtotal:	**$79,229,000**
Total Alternative 2 Cost:	**$165,032,000**

Segment 5002: Tuolumne River, Left Bank

Total Segment Length (Feet):	16,745	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	70	Deficiencies Being Remediated:	U+T+E+FG

Alternative 1

Combo Berm Cost:	$13,834,000
Structural Repair Subtotal:	**$13,834,000**
Erosion Repair:	$10,392,000
Freeboard/Geometry Repair:	$8,787,000
Non-Structural Repair Subtotal:	**$19,179,000**
Misc. Hazards Cost:	$326,000
Total Alternative 1 Cost:	**$33,339,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Alternative 2

Seepage Cutoff Wall Cost:	$21,646,000
Structural Repair Subtotal:	**$21,646,000**
Erosion Repair:	$10,392,000
Freeboard/Geometry Repair:	$8,787,000
Non-Structural Repair Subtotal:	**$19,179,000**
Misc. Hazards Cost:	$326,000
Total Alternative 2 Cost:	**$41,151,000**

Segment 5003: San Joaquin River, Left Bank

Total Segment Length (Feet):	7,000	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+E+FG

Alternative 1

Combo Berm Cost:	$8,696,000
Structural Repair Subtotal:	**$8,696,000**
Freeboard/Geometry Repair:	$6,507,000
Non-Structural Repair Subtotal:	**$6,507,000**
Misc. Hazards Cost:	$567,000
Total Alternative 1 Cost:	**$15,770,000**

Alternative 2

Seepage Cutoff Wall Cost:	$12,014,000
Structural Repair Subtotal:	**$12,014,000**
Freeboard/Geometry Repair:	$6,507,000
Non-Structural Repair Subtotal:	**$6,507,000**
Misc. Hazards Cost:	$567,000
Total Alternative 2 Cost:	**$19,088,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

GAR Study Area: 3

Segment 12: Madera County FCWCA, Unit 4

Total Segment Length (Feet): 11,711 Overall Reach Categorization: Hazard Level B
Remediated Length (%): 40 Deficiencies Being Remediated: U+T

Alternative 1

Combo Berm Cost:	$3,473,000
Structural Repair Subtotal:	**$3,473,000**
Total Alternative 1 Cost:	**$3,473,000**

Alternative 2

Seepage Cutoff Wall Cost:	$4,564,000
Structural Repair Subtotal:	**$4,564,000**
Total Alternative 2 Cost:	**$4,564,000**

Segment 176: Lower San Joaquin River Levee District, Unit 1

Total Segment Length (Feet): 59,855 Overall Reach Categorization: Hazard Level B
Remediated Length (%): 60 Deficiencies Being Remediated: U+T

Alternative 1

Stability Berm Cost:	$9,695,000
S Berm Cost:	$13,534,000
Structural Repair Subtotal:	**$23,229,000**
Misc. Hazards Cost:	$485,000
Total Alternative 1 Cost:	**$23,714,000**

Alternative 2

Seepage Cutoff Wall Cost:	$37,948,000
Structural Repair Subtotal:	**$37,948,000**
Misc. Hazards Cost:	$485,000
Total Alternative 2 Cost:	**$38,433,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 179: Lower San Joaquin Levee District, Unit 5

Total Segment Length (Feet): 22,382 Overall Reach Categorization: Hazard Level B

Remediated Length (%): 80 Deficiencies Being Remediated: T+FG

Alternative 1

Stability Berm Cost:	$8,116,000
Structural Repair Subtotal:	**$8,116,000**
Freeboard/Geometry Repair:	$2,777,000
Non-Structural Repair Subtotal:	**$2,777,000**
Total Alternative 1 Cost:	**$10,893,000**

Alternative 2

Seepage Cutoff Wall Cost:	$15,161,000
Structural Repair Subtotal:	**$15,161,000**
Freeboard/Geometry Repair:	$2,777,000
Non-Structural Repair Subtotal:	**$2,777,000**
Total Alternative 2 Cost:	**$17,937,000**

Segment 180: Lower San Joaquin Levee District, Unit 5

Total Segment Length (Feet): 6,439 Overall Reach Categorization: Hazard Level B

Remediated Length (%): 100 Deficiencies Being Remediated: T+FG

Alternative 1

Stability Berm Cost:	$3,536,000
Structural Repair Subtotal:	**$3,536,000**
Freeboard/Geometry Repair:	$705,000
Non-Structural Repair Subtotal:	**$705,000**
Total Alternative 1 Cost:	**$4,241,000**

Alternative 2

Seepage Cutoff Wall Cost:	$6,362,000
Structural Repair Subtotal:	**$6,362,000**
Freeboard/Geometry Repair:	$705,000
Non-Structural Repair Subtotal:	**$705,000**
Total Alternative 2 Cost:	**$7,067,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 184: Lower San Joaquin Levee District, Unit 5

Total Segment Length (Feet):	15,830	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Stability Berm Cost:	$10,196,000
Combo Berm Cost:	$1,818,000
Structural Repair Subtotal:	**$12,015,000**
Freeboard/Geometry Repair:	$261,000
Non-Structural Repair Subtotal:	**$261,000**
Total Alternative 1 Cost:	**$12,275,000**

Alternative 2

Seepage Cutoff Wall Cost:	$20,945,000
Structural Repair Subtotal:	**$20,945,000**
Freeboard/Geometry Repair:	$261,000
Non-Structural Repair Subtotal:	**$261,000**
Total Alternative 2 Cost:	**$21,206,000**

Segment 218: Lower San Joaquin Levee District, Unit 5

Total Segment Length (Feet):	14,973	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T

Alternative 1

Stability Berm Cost:	$4,859,000
Combo Berm Cost:	$7,555,000
Structural Repair Subtotal:	**$12,415,000**
Total Alternative 1 Cost:	**$12,415,000**

Alternative 2

Seepage Cutoff Wall Cost:	$29,673,000
Structural Repair Subtotal:	**$29,673,000**
Total Alternative 2 Cost:	**$29,673,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 254: Lower San Joaquin Levee District, Unit 15

Total Segment Length (Feet): 10,631 Overall Reach Categorization: Hazard Level B

Remediated Length (%): 90 Deficiencies Being Remediated: U+T

Alternative 1

S Berm Cost:	$3,763,000
Combo Berm Cost:	$4,727,000
Structural Repair Subtotal:	**$8,490,000**
Total Alternative 1 Cost:	**$8,490,000**

Alternative 2

Seepage Cutoff Wall Cost:	$26,124,000
Structural Repair Subtotal:	**$26,124,000**
Total Alternative 2 Cost:	**$26,124,000**

Segment 345: Lower San Joaquin Levee District, Unit 7

Total Segment Length (Feet): 18,269 Overall Reach Categorization: Hazard Level B

Remediated Length (%): 50 Deficiencies Being Remediated: U

Alternative 1

S Berm Cost:	$2,962,000
Structural Repair Subtotal:	**$2,962,000**
Freeboard/Geometry Repair:	$1,384,000
Non-Structural Repair Subtotal:	**$1,384,000**
Total Alternative 1 Cost:	**$4,346,000**

Alternative 2

Seepage Cutoff Wall Cost:	$4,466,000
Structural Repair Subtotal:	**$4,466,000**
Freeboard/Geometry Repair:	$1,384,000
Non-Structural Repair Subtotal:	**$1,384,000**
Total Alternative 2 Cost:	**$5,850,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 346: Lower San Joaquin Levee District, Unit 8

Total Segment Length (Feet):	20,734	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	50	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$1,844,000
Structural Repair Subtotal:	**$1,844,000**
Freeboard/Geometry Repair:	$1,571,000
Non-Structural Repair Subtotal:	**$1,571,000**
Total Alternative 1 Cost:	**$3,415,000**

Alternative 2

Seepage Cutoff Wall Cost:	$2,939,000
Structural Repair Subtotal:	**$2,939,000**
Freeboard/Geometry Repair:	$1,571,000
Non-Structural Repair Subtotal:	**$1,571,000**
Total Alternative 2 Cost:	**$4,510,000**

Segment 353: Lower San Joaquin Levee District, Unit 25

Total Segment Length (Feet):	13,100	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	50	Deficiencies Being Remediated:	U

Alternative 1

S Berm Cost:	$5,779,000
Structural Repair Subtotal:	**$5,779,000**
Total Alternative 1 Cost:	**$5,779,000**

Alternative 2

Seepage Cutoff Wall Cost:	$8,286,000
Structural Repair Subtotal:	**$8,286,000**
Total Alternative 2 Cost:	**$8,286,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 356: Lower San Joaquin Levee District, Unit 13

Total Segment Length (Feet):	7,079	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	80	Deficiencies Being Remediated:	U+T

Alternative 1

Combo Berm Cost:	$4,376,000
Structural Repair Subtotal:	**$4,376,000**
Total Alternative 1 Cost:	**$4,376,000**

Alternative 2

Seepage Cutoff Wall Cost:	$7,200,000
Structural Repair Subtotal:	**$7,200,000**
Total Alternative 2 Cost:	**$7,200,000**

Segment 358: Lower San Joaquin Levee District, Unit 14

Total Segment Length (Feet):	7,059	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	80	Deficiencies Being Remediated:	U+T

Alternative 1

Combo Berm Cost:	$4,263,000
Structural Repair Subtotal:	**$4,263,000**
Total Alternative 1 Cost:	**$4,263,000**

Alternative 2

Seepage Cutoff Wall Cost:	$7,208,000
Structural Repair Subtotal:	**$7,208,000**
Total Alternative 2 Cost:	**$7,208,000**

Segment 359: Lower San Joaquin Levee District, Unit 16

Total Segment Length (Feet):	10,304	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	90	Deficiencies Being Remediated:	U+T

Alternative 1

S Berm Cost:	$3,094,000
Combo Berm Cost:	$3,889,000
Structural Repair Subtotal:	**$6,983,000**
Total Alternative 1 Cost:	**$6,983,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Alternative 2

Seepage Cutoff Wall Cost:	$23,047,000
Structural Repair Subtotal:	**$23,047,000**
Total Alternative 2 Cost:	**$23,047,000**

Segment 5033: San Joaquin River, Reach 2B

Total Segment Length (Feet):	39,740	Overall Reach Categorization:	Hazard Level B
Remediated Length (%):	50	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Seepage Cutoff Wall Cost:	$39,493,000
Structural Repair Subtotal:	**$39,493,000**
Freeboard/Geometry Repair:	$574,000
Non-Structural Repair Subtotal:	**$574,000**
Total Alternative 1 Cost:	**$40,067,000**

Segment 177: Lower San Joaquin Levee District, Unit 2

Total Segment Length (Feet):	72,510	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	50	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$28,889,000
Structural Repair Subtotal:	**$28,889,000**
Freeboard/Geometry Repair:	$3,338,000
Non-Structural Repair Subtotal:	**$3,338,000**
Total Alternative 1 Cost:	**$32,228,000**

Alternative 2

Seepage Cutoff Wall Cost:	$62,127,000
Structural Repair Subtotal:	**$62,127,000**
Freeboard/Geometry Repair:	$3,338,000
Non-Structural Repair Subtotal:	**$3,338,000**
Total Alternative 2 Cost:	**$65,465,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 178: Lower San Joaquin Levee District, Unit 1

Total Segment Length (Feet):	41,806	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	90	Deficiencies Being Remediated:	U+T

Alternative 1

Stability Berm Cost:	$2,447,000
Combo Berm Cost:	$27,902,000
Structural Repair Subtotal:	**$30,349,000**
Total Alternative 1 Cost:	**$30,349,000**

Alternative 2

Seepage Cutoff Wall Cost:	$65,027,000
Structural Repair Subtotal:	**$65,027,000**
Total Alternative 2 Cost:	**$65,027,000**

Segment 181: Lower San Joaquin Levee District, Unit 1

Total Segment Length (Feet):	17,550	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	70	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$10,249,000
Structural Repair Subtotal:	**$10,249,000**
Freeboard/Geometry Repair:	$1,378,000
Non-Structural Repair Subtotal:	**$1,378,000**
Total Alternative 1 Cost:	**$11,627,000**

Alternative 2

Seepage Cutoff Wall Cost:	$20,331,000
Structural Repair Subtotal:	**$20,331,000**
Freeboard/Geometry Repair:	$1,378,000
Non-Structural Repair Subtotal:	**$1,378,000**
Total Alternative 2 Cost:	**$21,709,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 182: Lower San Joaquin Levee District, Unit 5

Total Segment Length (Feet):	104,000	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+FG

Alternative 1

S Berm Cost:	$55,404,000
Combo Berm Cost:	$58,095,000
Structural Repair Subtotal:	**$113,499,000**
Misc. Hazards Cost:	$8,770,000
Total Alternative 1 Cost:	**$122,269,000**

Alternative 2

Seepage Cutoff Wall Cost:	$198,162,000
Structural Repair Subtotal:	**$198,162,000**
Misc. Hazards Cost:	$8,770,000
Total Alternative 2 Cost:	**$206,932,000**

Segment 183: Lower San Joaquin Levee District, Unit 3,

Total Segment Length (Feet):	11,054	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$7,587,000
Structural Repair Subtotal:	**$7,587,000**
Freeboard/Geometry Repair:	$477,000
Non-Structural Repair Subtotal:	**$477,000**
Total Alternative 1 Cost:	**$8,064,000**

Alternative 2

Seepage Cutoff Wall Cost:	$10,831,000
Structural Repair Subtotal:	**$10,831,000**
Freeboard/Geometry Repair:	$477,000
Non-Structural Repair Subtotal:	**$477,000**
Total Alternative 2 Cost:	**$11,308,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 219: Lower San Joaquin Levee District, Unit 23

Total Segment Length (Feet):	54,042	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	30	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$13,947,000
Structural Repair Subtotal:	**$13,947,000**
Freeboard/Geometry Repair:	$1,772,000
Non-Structural Repair Subtotal:	**$1,772,000**
Misc. Hazards Cost:	$1,352,000
Total Alternative 1 Cost:	**$17,071,000**

Alternative 2

Seepage Cutoff Wall Cost:	$27,499,000
Structural Repair Subtotal:	**$27,499,000**
Freeboard/Geometry Repair:	$1,772,000
Non-Structural Repair Subtotal:	**$1,772,000**
Misc. Hazards Cost:	$1,352,000
Total Alternative 2 Cost:	**$30,623,000**

Segment 220: Lower San Joaquin Levee District, Unit 24

Total Segment Length (Feet):	44,251	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	50	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$17,058,000
Structural Repair Subtotal:	**$17,058,000**
Freeboard/Geometry Repair:	$1,371,000
Non-Structural Repair Subtotal:	**$1,371,000**
Misc. Hazards Cost:	$1,067,000
Total Alternative 1 Cost:	**$19,496,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Alternative 2

Seepage Cutoff Wall Cost:	$36,729,000
Structural Repair Subtotal:	**$36,729,000**
Freeboard/Geometry Repair:	$1,371,000
Non-Structural Repair Subtotal:	**$1,371,000**
Misc. Hazards Cost:	$1,067,000
Total Alternative 2 Cost:	**$39,167,000**

Segment 252: Lower San Joaquin Levee District, Unit 6

Total Segment Length (Feet):	50,709	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$69,190,000
Structural Repair Subtotal:	**$69,190,000**
Freeboard/Geometry Repair:	$4,718,000
Non-Structural Repair Subtotal:	**$4,718,000**
Misc. Hazards Cost:	$12,537,000
Total Alternative 1 Cost:	**$86,444,000**

Alternative 2

Seepage Cutoff Wall Cost:	$83,915,000
Structural Repair Subtotal:	**$83,915,000**
Freeboard/Geometry Repair:	$4,718,000
Non-Structural Repair Subtotal:	**$4,718,000**
Misc. Hazards Cost:	$12,537,000
Total Alternative 2 Cost:	**$101,169,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 253: Lower San Joaquin Levee District, Unit 6

Total Segment Length (Feet):	86,704	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	40	Deficiencies Being Remediated:	U+T+FG

Alternative 1

S Berm Cost:	$30,963,000
Combo Berm Cost:	$10,710,000
Structural Repair Subtotal:	**$41,673,000**
Freeboard/Geometry Repair:	$3,819,000
Non-Structural Repair Subtotal:	**$3,819,000**
Total Alternative 1 Cost:	**$45,492,000**

Alternative 2

Seepage Cutoff Wall Cost:	$89,429,000
Structural Repair Subtotal:	**$89,429,000**
Freeboard/Geometry Repair:	$3,819,000
Non-Structural Repair Subtotal:	**$3,819,000**
Total Alternative 2 Cost:	**$93,248,000**

Segment 261: Lower San Joaquin levee District, Unit 17

Total Segment Length (Feet):	85,013	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	90	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$80,741,000
Structural Repair Subtotal:	**$80,741,000**
Freeboard/Geometry Repair:	$1,401,000
Non-Structural Repair Subtotal:	**$1,401,000**
Total Alternative 1 Cost:	**$82,143,000**

Alternative 2

Seepage Cutoff Wall Cost:	$213,684,000
Structural Repair Subtotal:	**$213,684,000**
Freeboard/Geometry Repair:	$1,401,000
Non-Structural Repair Subtotal:	**$1,401,000**
Total Alternative 2 Cost:	**$215,085,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 27: Madera County FCWCA, Unit 5

Total Segment Length (Feet):	47,744	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	90	Deficiencies Being Remediated:	U+T

Alternative 1

Combo Berm Cost:	$33,833,000
Structural Repair Subtotal:	**$33,833,000**
Total Alternative 1 Cost:	**$33,833,000**

Alternative 2

Seepage Cutoff Wall Cost:	$50,113,000
Structural Repair Subtotal:	**$50,113,000**
Total Alternative 2 Cost:	**$50,113,000**

Segment 28: Madera County FCWCA, Unit 6

Total Segment Length (Feet):	47,492	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	50	Deficiencies Being Remediated:	U+T

Alternative 1

Combo Berm Cost:	$17,954,000
Structural Repair Subtotal:	**$17,954,000**
Total Alternative 1 Cost:	**$17,954,000**

Alternative 2

Seepage Cutoff Wall Cost:	$26,206,000
Structural Repair Subtotal:	**$26,206,000**
Total Alternative 2 Cost:	**$26,206,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 351: Lower San Joaquin Levee District, Unit 6

Total Segment Length (Feet):	50,271	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Stability Berm Cost:	$13,624,000
Combo Berm Cost:	$19,416,000
Structural Repair Subtotal:	**$33,040,000**
Freeboard/Geometry Repair:	$4,331,000
Non-Structural Repair Subtotal:	**$4,331,000**
Total Alternative 1 Cost:	**$37,371,000**

Alternative 2

Seepage Cutoff Wall Cost:	$58,554,000
Structural Repair Subtotal:	**$58,554,000**
Freeboard/Geometry Repair:	$4,331,000
Non-Structural Repair Subtotal:	**$4,331,000**
Total Alternative 2 Cost:	**$62,885,000**

Segment 352: Lower San Joaquin Levee District, Unit 11

Total Segment Length (Feet):	17,470	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	60	Deficiencies Being Remediated:	U

Alternative 1

S Berm Cost:	$10,148,000
Structural Repair Subtotal:	**$10,148,000**
Freeboard/Geometry Repair:	$265,000
Non-Structural Repair Subtotal:	**$265,000**
Total Alternative 1 Cost:	**$10,413,000**

Alternative 2

Seepage Cutoff Wall Cost:	$17,204,000
Structural Repair Subtotal:	**$17,204,000**
Freeboard/Geometry Repair:	$265,000
Non-Structural Repair Subtotal:	**$265,000**
Total Alternative 2 Cost:	**$17,469,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 354: Lower San Joaquin Levee District, Unit 12

Total Segment Length (Feet):	17,958	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	50	Deficiencies Being Remediated:	U

Alternative 1

S Berm Cost:	$8,895,000
Structural Repair Subtotal:	**$8,895,000**
Total Alternative 1 Cost:	**$8,895,000**

Alternative 2

Seepage Cutoff Wall Cost:	$15,080,000
Structural Repair Subtotal:	**$15,080,000**
Total Alternative 2 Cost:	**$15,080,000**

Segment 357: Lower San Joaquin Levee District, Unit 18

Total Segment Length (Feet):	84,351	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	70	Deficiencies Being Remediated:	U+T+FG

Alternative 1

Combo Berm Cost:	$63,847,000
Structural Repair Subtotal:	**$63,847,000**
Freeboard/Geometry Repair:	$7,034,000
Non-Structural Repair Subtotal:	**$7,034,000**
Total Alternative 1 Cost:	**$70,881,000**

Alternative 2

Seepage Cutoff Wall Cost:	$165,400,000
Structural Repair Subtotal:	**$165,400,000**
Freeboard/Geometry Repair:	$7,034,000
Non-Structural Repair Subtotal:	**$7,034,000**
Total Alternative 2 Cost:	**$172,435,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 5023: Madera County FCWCA, Berenda Slough

Total Segment Length (Feet):	38,960	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+E

Alternative 1

Combo Berm Cost:	$11,659,000
Seepage Cutoff Wall Cost:	$2,353,000
Structural Repair Subtotal:	**$14,013,000**
Erosion Repair:	$56,278,000
Non-Structural Repair Subtotal:	**$56,278,000**
Total Alternative 1 Cost:	**$70,290,000**

Alternative 2

Seepage Cutoff Wall Cost:	$24,012,000
Structural Repair Subtotal:	**$24,012,000**
Erosion Repair:	$56,278,000
Non-Structural Repair Subtotal:	**$56,278,000**
Total Alternative 2 Cost:	**$80,289,000**

Segment 5024: Madera FCWCA, Berenda Slough

Total Segment Length (Feet):	31,300	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+E

Alternative 1

Combo Berm Cost:	$19,610,000
Structural Repair Subtotal:	**$19,610,000**
Erosion Repair:	$45,213,000
Non-Structural Repair Subtotal:	**$45,213,000**
Total Alternative 1 Cost:	**$64,823,000**

Alternative 2

Seepage Cutoff Wall Cost:	$33,405,000
Structural Repair Subtotal:	**$33,405,000**
Erosion Repair:	$45,213,000
Non-Structural Repair Subtotal:	**$45,213,000**
Total Alternative 2 Cost:	**$78,618,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 5025: Madera County FCWCA, Fresno River

Total Segment Length (Feet):	27,700	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+E

Alternative 1

Combo Berm Cost:	$8,330,000
Structural Repair Subtotal:	**$8,330,000**
Erosion Repair:	$39,272,000
Freeboard/Geometry Repair:	$865,000
Non-Structural Repair Subtotal:	**$40,137,000**
Total Alternative 1 Cost:	**$48,467,000**

Alternative 2

Seepage Cutoff Wall Cost:	$12,919,000
Structural Repair Subtotal:	**$12,919,000**
Erosion Repair:	$39,272,000
Freeboard/Geometry Repair:	$865,000
Non-Structural Repair Subtotal:	**$40,137,000**
Total Alternative 2 Cost:	**$53,056,000**

Segment 5026: Madera County FCWCA, Fresno River

Total Segment Length (Feet):	27,500	Overall Reach Categorization:	Hazard Level C
Remediated Length (%):	100	Deficiencies Being Remediated:	U+T+E

Alternative 1

Combo Berm Cost:	$6,785,000
Structural Repair Subtotal:	**$6,785,000**
Erosion Repair:	$38,988,000
Freeboard/Geometry Repair:	$428,000
Non-Structural Repair Subtotal:	**$39,416,000**
Total Alternative 1 Cost:	**$46,201,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Alternative 2

Seepage Cutoff Wall Cost:	$11,072,000
Structural Repair Subtotal:	**$11,072,000**
Erosion Repair:	$38,988,000
Freeboard/Geometry Repair:	$428,000
Non-Structural Repair Subtotal:	**$39,416,000**
Total Alternative 2 Cost:	**$50,488,000**

Segment 5031: San Joaquin River, Reach 4A

Total Segment Length (Feet): 102,904 Overall Reach Categorization: Hazard Level C

Remediated Length (%): 30 Deficiencies Being Remediated: U+T+FG

Alternative 1

Combo Berm Cost:	$1,590,000
Seepage Cutoff Wall Cost:	$20,959,000
Structural Repair Subtotal:	**$22,548,000**
Freeboard/Geometry Repair:	$7,858,000
Non-Structural Repair Subtotal:	**$7,858,000**
Misc. Hazards Cost:	$2,409,000
Total Alternative 1 Cost:	**$32,816,000**

Alternative 2

Seepage Cutoff Wall Cost:	$23,310,000
Structural Repair Subtotal:	**$23,310,000**
Freeboard/Geometry Repair:	$7,858,000
Non-Structural Repair Subtotal:	**$7,858,000**
Misc. Hazards Cost:	$2,409,000
Total Alternative 2 Cost:	**$33,578,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 5032: San Joaquin River Reach 2B

Total Segment Length (Feet): 43,710 Overall Reach Categorization: Hazard Level C

Remediated Length (%): 100 Deficiencies Being Remediated: U+T+E

Alternative 1

Combo Berm Cost:	$4,950,000
Seepage Cutoff Wall Cost:	$12,540,000
Structural Repair Subtotal:	**$17,490,000**
Erosion Repair:	$66,647,000
Freeboard/Geometry Repair:	$637,000
Non-Structural Repair Subtotal:	**$67,283,000**
Total Alternative 1 Cost:	**$84,773,000**

Alternative 2

Seepage Cutoff Wall Cost:	$23,682,000
Structural Repair Subtotal:	**$23,682,000**
Erosion Repair:	$66,647,000
Freeboard/Geometry Repair:	$637,000
Non-Structural Repair Subtotal:	**$67,283,000**
Total Alternative 2 Cost:	**$90,966,000**

Segment 5034: Fresno Slough

Total Segment Length (Feet): 15,160 Overall Reach Categorization: Hazard Level C

Remediated Length (%): 30 Deficiencies Being Remediated: U+T+FG

Alternative 1

Seepage Cutoff Wall Cost:	$5,289,000
Structural Repair Subtotal:	**$5,289,000**
Freeboard/Geometry Repair:	$214,000
Non-Structural Repair Subtotal:	**$214,000**
Total Alternative 1 Cost:	**$5,502,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 355: Lower San Joaquin Levee District, Unit 4

Total Segment Length (Feet): 7,425 Overall Reach Categorization: Hazard Level LD (A/B)
Remediated Length (%): 100 Deficiencies Being Remediated: U

Alternative 1

Combo Berm Cost:	$1,389,000
Seepage Cutoff Wall Cost:	$7,686,000
Structural Repair Subtotal:	**$9,075,000**
Total Alternative 1 Cost:	**$9,075,000**

Alternative 2

Seepage Cutoff Wall Cost:	$10,555,000
Structural Repair Subtotal:	**$10,555,000**
Total Alternative 2 Cost:	**$10,555,000**

Segment 5028: San Joaquin River, Reach 4A

Total Segment Length (Feet): 63,630 Overall Reach Categorization: Hazard Level LD (A/B)
Remediated Length (%): 90 Deficiencies Being Remediated: U+FG

Alternative 1

S Berm Cost:	$2,444,000
Seepage Cutoff Wall Cost:	$64,360,000
Structural Repair Subtotal:	**$66,803,000**
Freeboard/Geometry Repair:	$896,000
Non-Structural Repair Subtotal:	**$896,000**
Total Alternative 1 Cost:	**$67,700,000**

Alternative 2

Seepage Cutoff Wall Cost:	$68,178,000
Structural Repair Subtotal:	**$68,178,000**
Freeboard/Geometry Repair:	$896,000
Non-Structural Repair Subtotal:	**$896,000**
Total Alternative 2 Cost:	**$69,074,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Segment 5030: San Joaquin River, Reach 3

Total Segment Length (Feet):	102,521	Overall Reach Categorization:	Hazard Level LD (A/B)
Remediated Length (%):	70	Deficiencies Being Remediated:	U+FG

Alternative 1

Seepage Cutoff Wall Cost:	$98,358,000
Structural Repair Subtotal:	**$98,358,000**
Freeboard/Geometry Repair:	$1,444,000
Non-Structural Repair Subtotal:	**$1,444,000**
Total Alternative 1 Cost:	**$99,802,000**

Segment 73: Merced County Stream Group, Unit 1

Total Segment Length (Feet):	8,517	Overall Reach Categorization:	Hazard Level LD (A/B)
Remediated Length (%):	50	Deficiencies Being Remediated:	U+FG

Alternative 1

Seepage Cutoff Wall Cost:	$10,487,000
Structural Repair Subtotal:	**$10,487,000**
Freeboard/Geometry Repair:	$209,000
Non-Structural Repair Subtotal:	**$209,000**
Total Alternative 1 Cost:	**$10,696,000**

Segment 5029: San Joaquin River, Reach 4A

Total Segment Length (Feet):	57,522	Overall Reach Categorization:	Hazard Level LD (B/C)
Remediated Length (%):	20	Deficiencies Being Remediated:	U+T+E

Alternative 1

Combo Berm Cost:	$4,417,000
Seepage Cutoff Wall Cost:	$10,929,000
Structural Repair Subtotal:	**$15,346,000**
Erosion Repair:	$5,355,000
Freeboard/Geometry Repair:	$1,485,000
Non-Structural Repair Subtotal:	**$68,392,000**
Total Alternative 1 Cost:	**$22,185,000**

Note: Estimates are order of magnitude estimates.

DRAFT TABLE 5
SOUTH NULE RACER
ALTERNATIVE REMEDIATION COSTS GROUPED BY GAR STUDY AREA

Alternative 2

Seepage Cutoff Wall Cost:	$21,858,000
Structural Repair Subtotal:	**$21,858,000**
Erosion Repair:	$5,355,000
Freeboard/Geometry Repair:	$1,485,000
Non-Structural Repair Subtotal:	**$68,392,000**
Total Alternative 2 Cost:	**$28,697,000**

Note: Estimates are order of magnitude estimates.

ATTACHMENT 3

RESPONSES TO AGENCY COMMENTS

AGENCY COMMENTS

Client	DWR	Contract Number:	4600008102
Program Name	DWR Non-Urban Levee Geotechnical Evaluations Program		
Document in Review/Rev No.	NORTH NULE - REMEDIATION ALTERNATIVES AND COST ESTIMATE REPORT MEMORANDUM (RACER)	Document Date:	December-10
Reviewer:	Chris Jones and Vince Rodriguez, DWR	Review Date:	December 3, 2010
Responder:	Fran Bean	Response Date:	December 23, 2010
Verified by:		Verification Date:	

[1]Status: A = Will Incorporate; B = Needs further Discussions; C = Comment Acknowledged/No Action Needed

No.	Reference	Comment	Status[1]	Response to Comments	Reply Verified	Included In Report
1	1.0, par 2	It seems simpler to refer to this as the North NULE Study Area, as this term was defined in the first paragraph. Please change throughout TM.	A	"North NULE Study Area" will replace "North Non-Urban Sacramento River Valley Flood Control System" after the initial definition in the first paragraph.		
2	2.0	TAT stands for "Technical Approach Team"	A	"Technical Advisory Team" will be replaced by "Technical Approach Team" throughout the final document.		
3	2.0	should be "and a list of action items" or "and lists of action items"	A	The text will be revised to read "...and a list of action items…"		
4	3.1.1	Is "stem" commonly used in this context? If not, please clarify.	A	The word stem in this context is acceptable. However, for clarity the sentence will be revised with "main river system levees" replacing "main stem river levees".		
5	3.1.3	I think "local" would be more appropriate than "State"	A	The text will be revised so that "State" is replaced by "local."		
6	3.1.3	Please remove "inflated."	A	The text will be revised so that "inflated" is replaced by "higher"		
7	3.1.7	The remediation costs for these missing segments should be estimated according to Assumption No. 7 in the Key Assumptions list.	A	Text will be added to the report including a prorated cost for the additional segments.		
8	3.1.8	We need to add an average cost per mile for burrow repair, based on DWR experience. This is described in the Key Assumptions list (Item No. 30).	A	Information received from DWR regarding average cost per mile for burrow repair will be incorporated into text.		
9	3.2, par 1	Please be consistent when using numerals or spelled numbers (e.g., 20 vs. twenty). This sentence uses "20" and "six."	C	Numbers below ten are typically spelled out, anything 11 and higher is permissible to use as a number, e.g., 20.		
10	5.0 par 6 mid page	Wasn't the 20% only for erosion?	A	Yes. Sentence being clarified to apply to erosion case only.		
11	Table 1	It would be helpful to have a summary at the beginning of this table that sums the presented information for all study areas.	A	Table 1 will be revised to include an over-all summary table.		
12	Table 1	Please add footnote to define "Structural Remediations."	A	Table 1 will be revised to include a footnote clarifying "Structural Remediations".		
13	Tables 2 and 3	Can a remediation cost per mile be added in these subtotal rows? This comment applies to Tables 2 and 3.	A	Tables 2 and 3 will be revised to include subtotals for remediation cost per mile.		

AGENCY COMMENTS

Client	DWR	Contract Number:	4600008102
Program Name	DWR Non-Urban Levee Geotechnical Evaluations Program		
Document in Review/Rev No.	NULE - Draft Remediation and Cost Estimating Report (RACER) Tool	Document Date:	December-10
Reviewer:	Pirathapan Yogeswaran and Arasan Singanayaham, DWR	Review Date:	December 13, 2010
Responder:	Fran Bean	Response Date:	December 23, 2010
Verified by:		Verification Date:	

[1]Status: A = Will Incorporate; B = Needs further Discussions; C = Comment Acknowledged/No Action Needed

No.	Reference	Comment	Status[1]	Response to Comments	Reply Verified	Included In Report
1	Figure 4	Figure 4 (Freeboard and Geometry Repair) was not discussed in the text. Other Figures were at least mentioned in the text.	A	Text will be included in the Final Memorandum referencing Figure 4.		
2	Levee Lengths inconsistent	Levee lengths were rounded off in Table 2 (Through seepage, Underseepage, and Stability Remediation). But in Table 3 (Erosion Remediation Cost) actual lengths are presented. Was this was the intention?	A	Actual levee segment lengths will be presented on each applicable table, remediation lengths will be rounded in each table.		

CENTRAL VALLEY
FLOOD MANAGEMENT
PLANNING PROGRAM

FloodSAFE
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2012 Central Valley Flood Protection Plan

Attachment 8J: Cost Estimates Appendix D – Protection of Small Communities

June 2012

STATE OF CALIFORNIA
THE NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

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Table of Contents

1.0 Introduction D-1-1
- 1.1 Background D-1-1

2.0 Conceptual Design Approach D-2-1
- 2.1 Levee Design Criteria D-2-2
- 2.2 Cost Estimating D-2-2
- 2.3 Common Elements D-2-2
- 2.4 Reconstruction-in-Place Cost D-2-4
- 2.5 New Levee Cost D-2-5

3.0 Small Community Characteristics and Cost D-3-1

4.0 Group A Communities D-4-1
- 4.1 Knights Landing D-4-1
- 4.2 Grayson D-4-3
- 4.3 Isleton D-4-6
- 4.4 Walnut Grove D-4-8
- 4.5 Meridian D-4-10
- 4.6 Nicolaus D-4-12
- 4.7 Courtland D-4-14
- 4.8 Robbins D-4-16
- 4.9 Hood D-4-18
- 4.10 Friant D-4-20

5.0 Group B Communities D-5-1
- 5.1 Firebaugh D-5-2
- 5.2 Colusa D-5-5
- 5.3 Durham D-5-8
- 5.4 Wheatland D-5-10
- 5.5 Glenn D-5-12
- 5.6 Clarksburg D-5-14
- 5.7 Tehama D-5-16
- 5.8 Grimes D-5-18
- 5.9 Butte City D-5-20

5.10 Mendota D-5-22
5.11 Communities Not Assessed D-5-24

6.0 Group C Communities D-6-1
6.1 Dos Palos/South Dos Palos D-6-1
6.2 Biggs D-6-3
6.3 Upper Lake D-6-3
6.4 Communities Not Assessed D-6-5

7.0 References D-7-1

8.0 Acronyms and Abbreviations D-8-1

List of Tables

Table D-2-1. Common Elements – Direct Unit Costs D-2-4

Table D-2-2. Common Elements – Indirect Costs D-2-4

Table D-3-1. Summary of Small Community Characteristics and Cost Estimates D-3-2

List of Figures

Figure D-1-1. Small Communities Within Sacramento River Basin D-1-3

Figure D-1-2. Small Communities Within San Joaquin River Basin D-1-4

Figure D-4-1. Knights Landing Levees Approach D-4-2

Figure D-4-2. Grayson Levees Approach D-4-5

Figure D-4-3. Isleton Levees Approach D-4-7

Figure D-4-4. Walnut Grove Levees Approach D-4-9

Figure D-4-5. Meridian Levees Approach D-4-11

Figure D-4-6. Nicolaus Levees Approach D-4-13

Figure D-4-7. Courtland Levees Approach D-4-15

Figure D-4-8. Robbins Levee Approach..... D-4-17

Figure D-4-9. Hood Levees Approach D-4-19

Figure D-4-10. Friant Levees Approach..... D-4-21

Figure D-5-1. Firebaugh Levees Approach..... D-5-4

Figure D-5-2. Colusa Levees Approach..... D-5-7

Figure D-5-3. Durham Levees Approach D-5-9

Figure D-5-4. Wheatland Levees Approach..... D-5-11

Figure D-5-5. Glenn Levees Approach D-5-13

Figure D-5-6. Clarksburg Levees Approach..... D-5-15

Figure D-5-7. Tehama Levees Approach..... D-5-17

Figure D-5-8. Grimes Levee Approach D-5-19

Figure D-5-9. Butte City Levees Approach D-5-21

Figure D-5-10. Mendota Levees Approach..... D-5-23

Figure D-6-1. Dos Palos Levees Approach..... D-6-2

Figure D-6-2. Upper Lake Levees Approach D-6-4

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Appendix D

1.0 Introduction

This appendix documents the conceptual design and cost estimates for providing 100-year level of flood protection for small communities within the Systemwide Planning Area through physical modifications to the flood protection system (remediation of existing levees or new levees). Engineering solutions adopted for each community implement physical modifications based on information from the Non-Urban Levee Evaluation Program (Attachment 8J, Appendix C) and most recent floodplain inundation modeling data available. These engineering solutions were not generated through detailed alternative analysis that considers site-specific details, and should only be considered as one potential option for community flood protection. It should also be noted that the cost estimates for providing 100-year level of protection do not consider interior drainage. It is expected that more detailed analyses for community flood protection with local guidance and input will be conducted through regional planning and project-specific feasibility studies following the 2012 CVFPP. Conceptual cost estimates for small-community protection are incorporated into the cost estimates of Protect High Risk Communities, Enhance Flood System Capacity, and the State Systemwide Investment approaches (refer to Attachment 8J, Appendix A).

1.1 Background

Small communities were defined as developed areas with fewer than 10,000 residents. Because small communities do not fall in the category of urban or urbanizing areas (10,000 or more residents, currently or within the next 10 years), they are not required to meet the State-mandated 200-year level of protection requirements for urban areas. However, they are required to continue to meet the Federal Emergency Management Agency (FEMA) standard 100-year level (1 percent Annual Exceedence Probability (AEP)) of protection for property located within the flood hazard zone.

As a part of the Protect High Risk Communities Approach, small communities were identified using the following data sources:

- California Department of Finance

- Census-Designated Places (CDP)
- California List of Places (U.S. Geological Survey Topographic Quadrangle)

Flood threats to small communities were characterized using attributes related to flood frequency, potential flood depth, and proximity to the nearest river. These characterizations were then used to prioritize the small communities into four categories:

- **Group A (High Hazard) –** Communities subject to high flooding frequency (greater than 1 percent per year) and also subject to deep flooding conditions (potential flood depths exceeding 3 feet on average).
- **Group B (Moderate to High Hazard) –** Communities subject to high flooding frequency (greater than 1 percent per year), subject to sheet flooding conditions (potential flood depths of less than 3 feet on average), and less than two miles from a major flooding source.
- **Group C (Low to Moderate) –** Communities subject to high flooding frequency (greater than 1 percent per year), subject to sheet flooding conditions (potential flood depths of less than 3 feet on average), and more than two miles from a major flooding source.
- **Group D (Low Hazard) –** Communities that are not subject to high flooding frequency (less than 1 percent per year).

Improving protection facilities is one option to mitigate flood threats to small communities. This can be accomplished by strengthening (reconstruction-in-place) existing levees, raising existing levees, and/or constructing new levees. The following sections describe the process of developing designs and cost estimates for the improvements needed to protect each small community. Small communities considered are depicted in Figures D-1 and D-2.

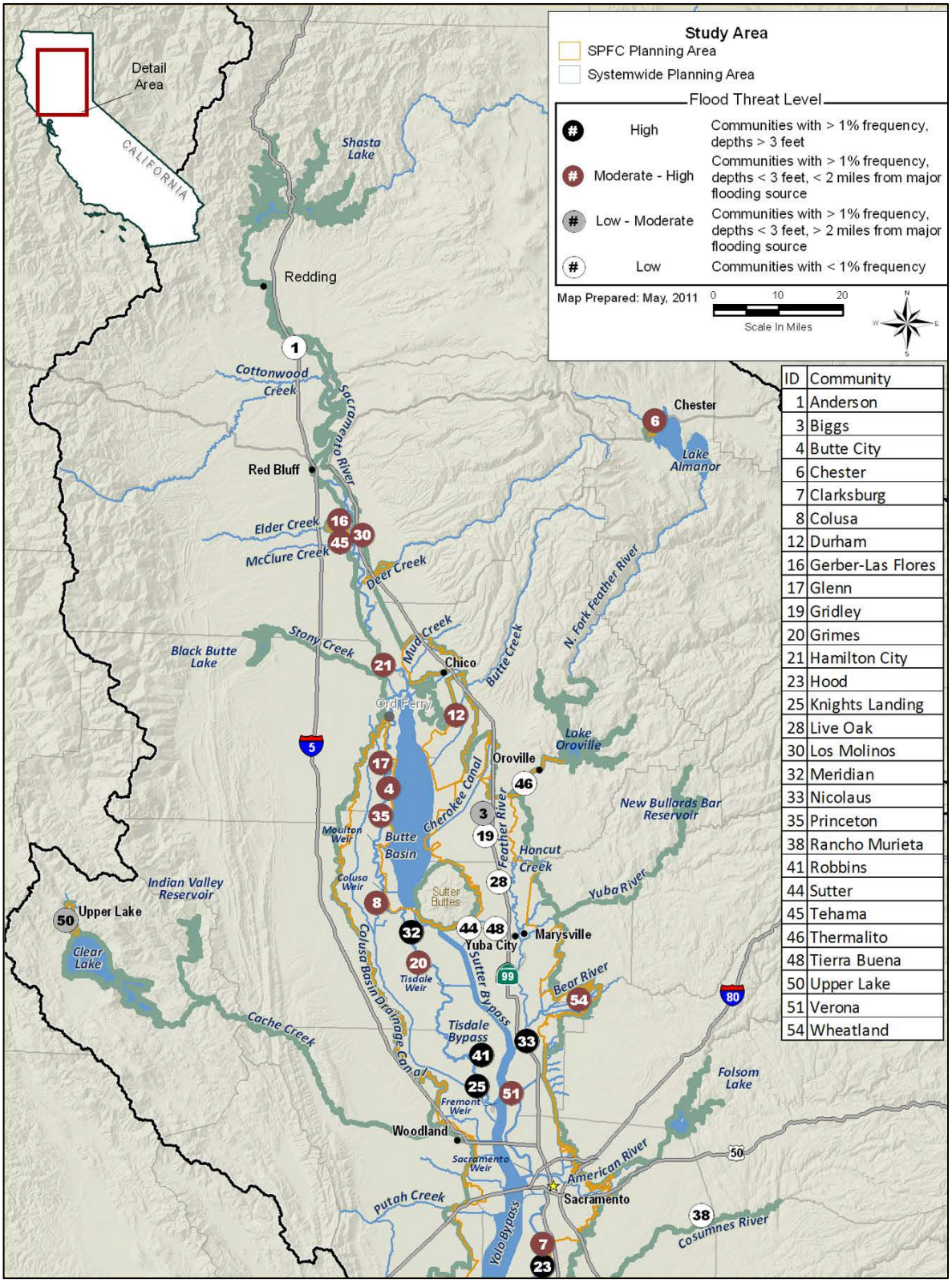

Figure D-1-1. Small Communities Within Sacramento River Basin

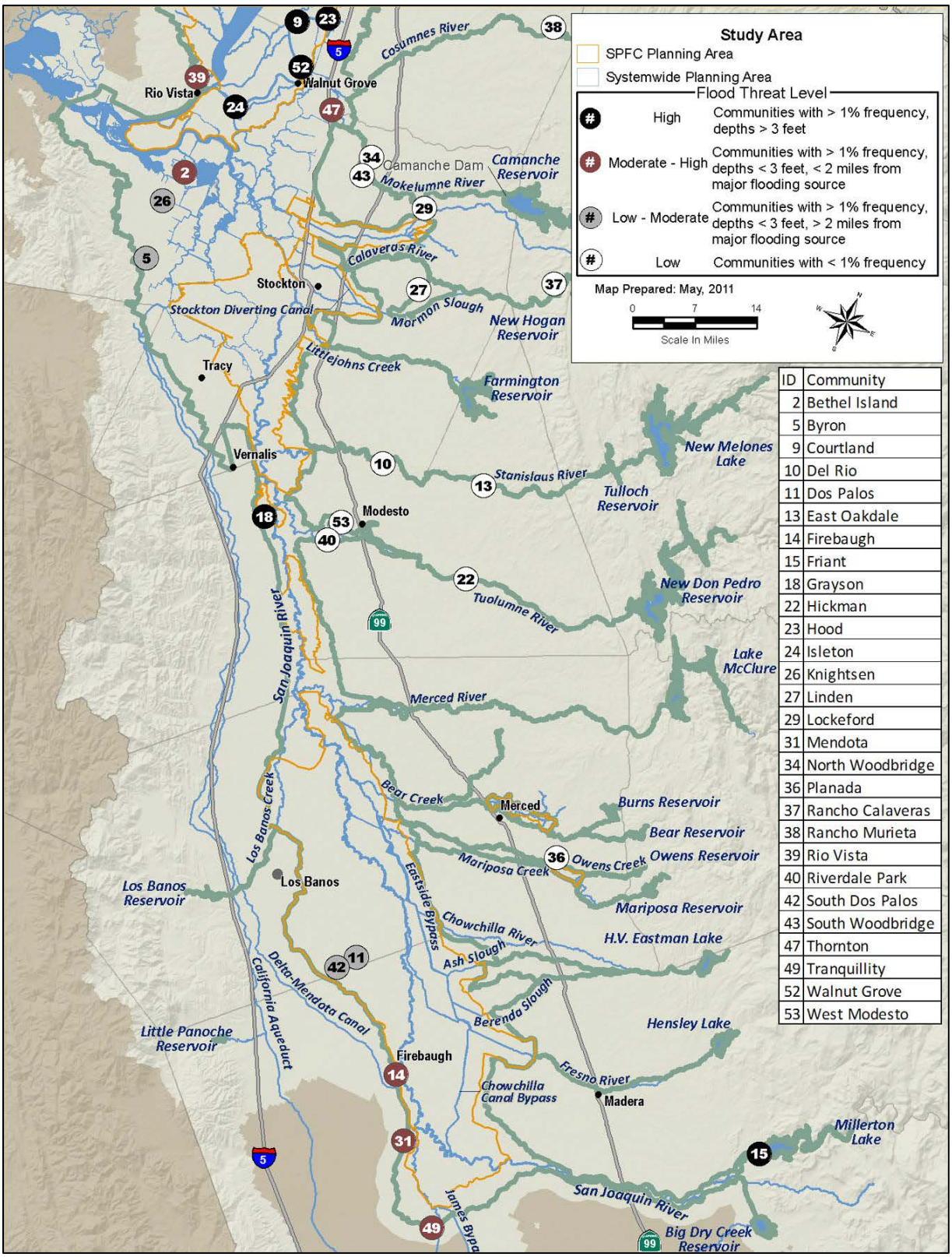

Figure D-1-2. Small Communities Within San Joaquin River Basin

2.0 Conceptual Design Approach

A combination of data sources was used to determine a conceptual design for structural fixes needed to provide 1 percent AEP flood level protection to each small community. The first step was to identify existing project and non-project levee sections surrounding the community identified in Geotechnical Assessmeent Reports (GAR) for the South and North Non-Urban Levee Evaluations (NULE) Project study areas (April 2010). The NULE GARs evaluated existing levees and recommended remediation needed to restore them to the 1955/57 design criteria. Additional non-project levees not covered in the NULE GARs were identified in existing geographic information system (GIS) mapping. The levees covered by the NULE GARs were further evaluated to determine if the 1955/57 level remediation would provide the required 3 feet of freeboard for 1 percent AEP water levels by comparing top-of-levee and 1 percent AEP water-level elevations from the hydraulic routing analysis (using a UNET model). If adequate freeboard was not available, a levee raise was recommended for the existing levee.

Updated floodplain depths and extents were not available for use in developing the 2012 CVFPP. To identify small communities at risk, a combination of *Sacramento and San Joaquin River Basins Comprehensive Study* (Comprehensive Study) 1 percent floodplains (FLO-2D) and FEMA 1 percent floodplain mapping was used (USACE, 2002). For communities identified using the FEMA floodplain data, it was not certain whether the source of flooding was SPFC facilities or local drainages; local drainages would be outside the scope of the CVFPP. Consequently, future analyses will be needed to refine the potential State of California (State) interest in improving the level of protection for these communities as part of CVFPP implementation.

Using the best hydraulic data available, each small community was also examined to determine if new levees were needed to provide protection either in addition to fixing existing levees in place, or in lieu of a reconstruction-in-place alternative. The new levee category also included existing levees not covered in the NULE GARs; these levees were recommended to be replaced because no information was available to determine a reconstruction-in-place alternative. For “new” and “replaced existing” levees, required levee height was calculated as the depth of flood inundation found on the FLO-2D inundation maps plus 3 feet of freeboard. FLO-2D inundation maps were created in GIS using 1 percent AEP flood

inundation depths created using levee performance curves from the Comprehensive Study.

2.1 Levee Design Criteria

The DWR Urban Levee Design Criteria (ULDC)[1] was used, as appropriate to levee location and function, in the conceptual design of new levees for this study. Conceptual levee designs include a waterside slope of 3H: 1V and a landside slope of 2H: 1V. For inspection and emergency vehicle access, a 12-foot-wide crown would be constructed with a 10-foot-wide by 6-inch-deep layer of aggregate base material along an entire alignment. Crowns 20 feet wide were used for levees greater than 15 feet in height. Easements would include a permanent, 20-foot-wide right-of-way (ROW) on each side of training, tieback, and ring levees for inspection and maintenance, plus an additional temporary 5 feet on each side of the levees for construction. Easements for new levees along existing channels would include a 20-foot-wide ROW, plus an additional temporary 5 feet on the landside, only. To help prevent erosion, all areas except the 10-foot-wide gravel roadway along the crown would receive a hydroseed application after construction.

2.2 Cost Estimating

Cost estimates for each small community were based on two sources:

- Reconstruction-in-place cost extracted from the DWR South and North NULE Project Remediation Alternatives and Cost Estimate Reports (RACER) (June 2011).
- New levee cost developed based on the Parametric Cost Estimating Tool (PCET), which was used in the RACERs.

A description of how these sources were used to provide cost information is included in the following sections.

2.3 Common Elements

A consistent cost approach was applied to the direct and indirect costs (Tables D-2-1 and D-2-2). The common elements were based on the same criteria used in the Sacramento and San Joaquin river watersheds for Urban

[1] The ULDC are under development at the time of this report.

Levee Evaluations (ULE) Project and NULE cost estimating to have comparable costs for establishing the State's priorities and allocations.

Table D-2-1. Common Elements – Direct Unit Costs

Item	Unit/sum	Unit Cost/Percentage
Excavation	cubic yard	$5
Clearing and Grubbing	acre	$5,000
Stripping	acre	$3,000
Waste Material	cubic yard	$4
Embankment Fill	cubic yard	$16
Fill	cubic yard	$4
Aggregate Road Base	ton	$35
Hydroseeding	acre	$2,000
Permanent Right-of-Way	acre	$10,000 – $300,000
Temporary Easement	acre	$5,000
Unallocated Items	lump sum	5%
Mobilization and Demobilization	lump sum	5%
Environmental Mitigation	lump sum	25%

Table D-2-2. Common Elements – Indirect Costs

Item	Cost Percentage
Escalation (to October 2011)	3%
Contingency	30%
Engineering and Design	15%
Permitting and Legal	5%
Engineering Services During Construction	2%
Construction Management	15%

2.4 Reconstruction-in-Place Cost

Costs were extracted from the NULE RACERs according to the levee segment identified in the NULE GARs and the adverse conditions being remediated. If an entire levee segment was recommended for repair, the least-cost alternative identified in the NULE RACERs was used. If only a portion of the levee segment was recommended for repair, there were two options for associating costs based on the length of the levee portion:

1. If the length of the portion of the levee was greater than the length being remediated in the associated cost option for the entire levee segment, then the cost as described in the RACER to repair the entire levee segment was used.

2. If the length of the portion of the levee was less than the length being remediated in the associated cost option for the entire levee segment, then the cost of remediation was assigned to the alternative on a cost-per-length basis.

For both options, performance events were used to define the most prevalent levee hazard condition in the portion. The cost of remediation for that levee condition issue was used to determine cost. If no performance event was identified, the least-cost alternative was used.

2.5 New Levee Cost

The process for estimating costs for new levees began with creating an average levee cross section along a proposed alignment. From FLO-2D hydraulic modeling results, the proposed horizontal and vertical alignments were initially determined. Horizontal alignments for conceptual levees were typically chosen along boundaries of the most densely populated regions of the community. However, proposed horizontal alignments can vary, depending on the layout of a community, existing topography, whether the origin of simulated flood flows can reliably be determined, or a combination of all three.

Vertical alignments for new levees were based on either an average height method or, more conservatively, the uppermost limit of inundation from simulated water depths. The average height method considered the level of inundation from simulated FLO-2D modeling for various lengths of the proposed horizontal alignments and averaged them. Both methods for determining vertical alignments included an additional 3 feet of freeboard. After an average levee cross section was established, areas and volumes were then calculated along the proposed alignments.

From these calculated volumes and areas, the following quantities were then produced: clearing, stripping, and grubbing; waste material; embankment fill; aggregate road base for levee crowns; hydroseeding; and easement acquisitions. To create more thorough cost estimates, and to be consistent with the cost-estimating analysis for reconstruction-in-place repairs, additional line items for construction and indirect costs were added. These line items include (as a percentage of civil construction costs) unallocated items, mobilization and demobilization, environmental

mitigation (and as a percentage of total costs), escalation, contingency, engineering design, permitting and legal, engineering services during construction, and construction management.

3.0 Small Community Characteristics and Cost

Table D-3-1 summarizes the characteristics and cost estimates developed for the Group A, B, and C communities. The table includes communities that receive protection from the SPFC and those outside the SPFC Planning Area. It should be noted that ranges reflecting cost uncertainties are not shown in this table. Cost uncertainty ranges are developed in Appendix A.

Table D-3-1. Summary of Small Community Characteristics and Cost Estimates

	Community Name	2007 Total Population	Flood Threat Level[1]	First Cost	Total Owners Cost	Total Levee Miles	Type of Levee Improvement		
							Fix Existing Levee	New Levee	Cost Curve Applied[2]
Protected by SPFC	Knights Landing	1,776	A	$30,689,566	$7,408,413	2.81	☐	■	☐
	Grayson	1,172	A	$2,929,545	$792,909	0.70	■	■	☐
	Isleton	831	A	$45,893,744	$16,136,223	5.06	☐	■	☐
	Walnut Grove	811	A	$69,176,968	$23,085,452	10.40	☐	■	☐
	Meridian	756	A	$18,790,261	$6,711,266	1.85	■	■	☐
	Courtland	695	A	$13,572,900	$4,678,733	8.62	■	■	☐
	Robbins	367	A	$30,768,589	$12,669,419	2.25	☐	■	☐
	Hood	212	A	$30,169,271	$11,427,562	1.77	☐	■	☐
	Firebaugh	6,178	B	$30,918,288	$9,302,383	7.73	■	■	☐
	Colusa	5,574	B	$54,053,821	$12,044,135	5.25	■	■	☐
	Durham	5,445	B	$50,000,000	$30,355,093	13.69	■	☐	☐
	Rio Vista	5,255	B	$32,730,207	$8,569,092	-	☐	☐	■
	Wheatland	2,476	B	$173,483,949	$33,658,506	15.95	■	☐	☐
	Gerber-Las Flores	1,524	B	$23,420,910	$2,449,337	3.95	■	☐	☐
	Glenn	1,436	B	$11,575,248	$4,766,279	1.92	☐	■	☐
	Clarksburg	1,401	B	$33,583,420	$8,493,592	3.36	☐	■	☐
	Tranquility	849	B	$32,730,207	$8,569,092	-	☐	☐	■
	Verona	585	B	$32,730,207	$8,569,092	-	☐	☐	■
	Grimes	516	B	$6,259,914	$1,120,875	1.38	■	■	☐
	Princeton	489	B	$42,476,797	$10,157,545	-	☐	☐	■
	Butte City	291	B	$6,217,933	$1,811,935	1.47	■	■	☐
	Dos Palos/ South Dos Palos	6,706	C	$89,885,219	$19,889,529	22.95	■	☐	☐

Table D-3-1. Summary of Small Community Characteristics and Cost Estimates (contd.)

	Community Name	2007 Total Population	Flood Threat Level[1]	First Cost	Total Owners Cost	Total Levee Miles	Type of Levee Improvement		
							Fix Existing Levee	New Levee	Cost Curve Applied[2]
Protected by SPFC	Biggs	1,959	C	$90,323,215	$21,252,521	9.22	■	□	□
	Upper Lake	963	C	$75,217,182	$15,027,239	5.28	■	□	□
Not Protected by SPFC[3]	Nicolaus	211	A	$46,537,135	$14,035,214	4.29	■	■	□
	Friant	530	A	$41,373,898	$17,036,311	1.38	□	■	□
	Mendota	8,558	B	$38,382,737	$15,804,656	6.45	□	■	□
	Bethel Island	2,624	B	$32,730,207	$8,569,092	-	□	□	■
	Chester	2,366	B	$32,730,207	$8,569,092	-	□	□	■
	Los Molinos	2,068	B	$32,730,207	$8,569,092	-	□	□	■
	Hamilton City	1,885	B	$58,407,219	$24,050,031	3.15	□	■	□
	Thornton	1,467	B	$32,730,207	$8,569,092	-	□	□	■
	Tehama	443	B	$20,597,310	$3,048,821	3.86	■	□	□
	Byron	1,040	C	$32,730,207	$8,569,092	-	□	□	■
	Knightsen	913	C	$32,730,207	$8,569,092	-	□	□	■

Notes:
1 A = flood frequency > 1% per year, flooding depths > 3 feet.; B = flood frequency > 1% per year, flooding depths < 3 feet, < 2 miles from flood source; C = flood frequency > 1% per year, flooding depths < 3 feet, > 2 miles from flood source.
2 Costs for communities lacking specific flood location and flood depth data were estimated parametrically based on communities of similar size and threat level.
3 Non-SPFC costs are not included in the SSIA of the CVFMP. Communities were assessed 100-year protection costs, but are not part of the proposed SPFC total costs.
Key:
Shading =
□= No
■ = Yes
- =
SPFC = State Plan of Flood Control

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4.0 Group A Communities

This section describes the conceptual design and cost estimate for each Group A community. The following is a list of the communities covered in this section:

- Knights Landing
- Grayson
- Isleton
- Walnut Grove
- Meridian
- Nicolaus
- Courtland
- Robbins
- Hood
- Friant

4.1 Knights Landing

Knights Landing is an unincorporated community in Yolo County that sits at the confluence of the Colusa Basin Drainage Canal, Knights Landing Ridge Cut, and Sacramento River, which border the north, west, and southern portions of the community, respectively. FLO-2D hydraulic modeling results overlaid on an aerial photo of Knights Landing (Figure D-4-1) showed that the water depth from a simulated 1 percent AEP flood would range from 0 to 15 feet in the community.

Two options were identified to protect Knights Landing. Option 1 is a reconstruction-in-place alternative repairing all of Levee Segments 162, 172, and 217, as described in the NULE GAR, with the addition of a 1.4-foot levee raise to the entire length of Segment 162 based on the 1 percent AEP water levels from the UNET model. This option would provide protection to an area beyond the community south, toward the Yolo Bypass. The least-cost alternative, as shown in the RACER, was used for each segment. Refer to Table D-3-1 for cost estimates for this community.

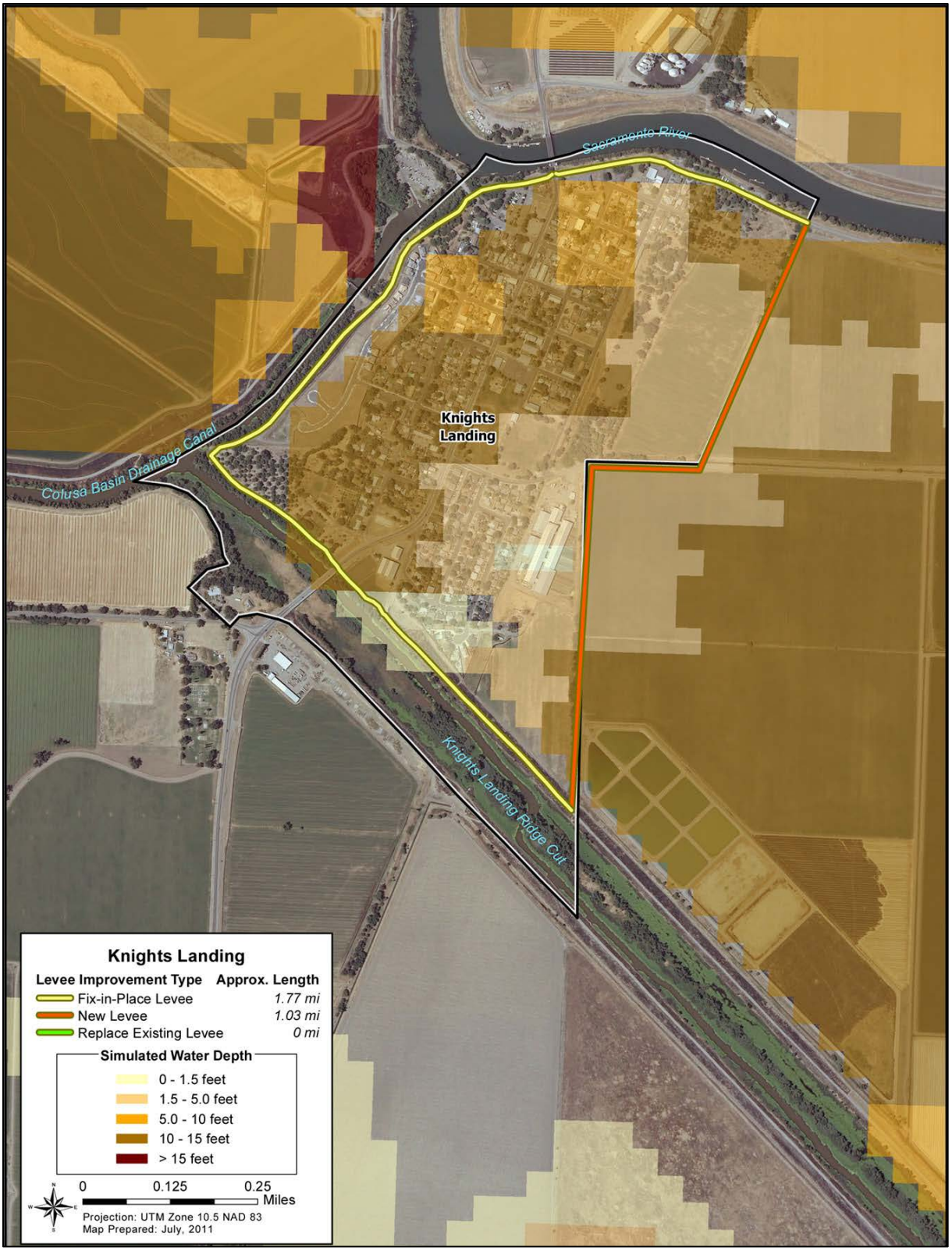

Figure D-4-1. Knights Landing Levees Approach

Option 2 is a combination alternative that would provide a ring levee system. It would involve reconstruction-in-place repairs to portions of Segments 217 and 162, with the addition of a 1.4-foot levee raise to the portion of Segment 162, as well as construction of a new levee on the south between existing Levee Segments 217 and 162. The new levee would have a 12-foot crown, with an average height of 18 feet, spanning about 1.04 miles. This option would provide protection only to the area within the Knights Landing community (Figure D-4-1). Cost for portions of Segments 217 and 162 were selected based on the performance events listed for each segment in the segment summaries of the NULE GAR. No performance events were shown for the portion of Segment 217, and the length of the portion was more than the total length of repair for the least-cost alternative for the entire segment; therefore, the least-cost alternative, as shown in the RACER, was used. Segment 162 showed under-seepage issues in the area, and the length of the portion was less than the total length for the cost of remediation that included under-seepage; therefore, the cost per length of the under-seepage alternative was applied to a portion of Segment 162. The new levee cost was assessed using the developed methodology. Refer to Table D-3-1 for cost estimates for this community.

4.2 Grayson

Grayson is an unincorporated community in Stanislaus County located directly adjacent to the left bank of the San Joaquin River. FLO-2D hydraulic modeling results referenced over aerial photography of Grayson (Figure D-4-2) revealed that a water depth from a simulated 1 percent AEP storm would be in the range of 1.5 to 10 feet in the areas closest to the San Joaquin River. In addition, GAR and RACER information was reviewed for the type and cost of remediation necessary to repair the existing levee next to Grayson. After analyzing the available data, it was determined that reconstruction-in-place repairs along the left bank of the San Joaquin River, in combination with constructing a new training levee on the northern edge of town, would protect Grayson from a 1 percent AEP storm (Figure D-4-2).

The recommended repairs along the left bank of the San Joaquin River include remediation for under-seepage, through-seepage, and nonseepage-related stability. The cost to repair the entire 1.8-mile levee segment, identified in the GAR as Segment 207, is estimated at $8.4 million, which calculates to about $4.7 million per mile. The cost per mile was then applied to only a 0.50-mile portion of Segment 207 (Figure D-4-2), to estimate the reconstruction-in-place costs.

To complete the conceptual layout, a training levee would be constructed beginning at the left bank of the San Joaquin River and extending about 0.2 miles westward along the northern edge of Grayson. The training levee has been conservatively designed with an average height of 5.73 feet. The average height was calculated by using a weighted average of 8 feet (5 feet plus an additional 3 feet of freeboard) for a portion of the alignment, and 4.5 feet (1.5 feet plus an additional 3 feet of freeboard) for the remaining portion. Refer to Table D-3-1 for cost estimates for this community.

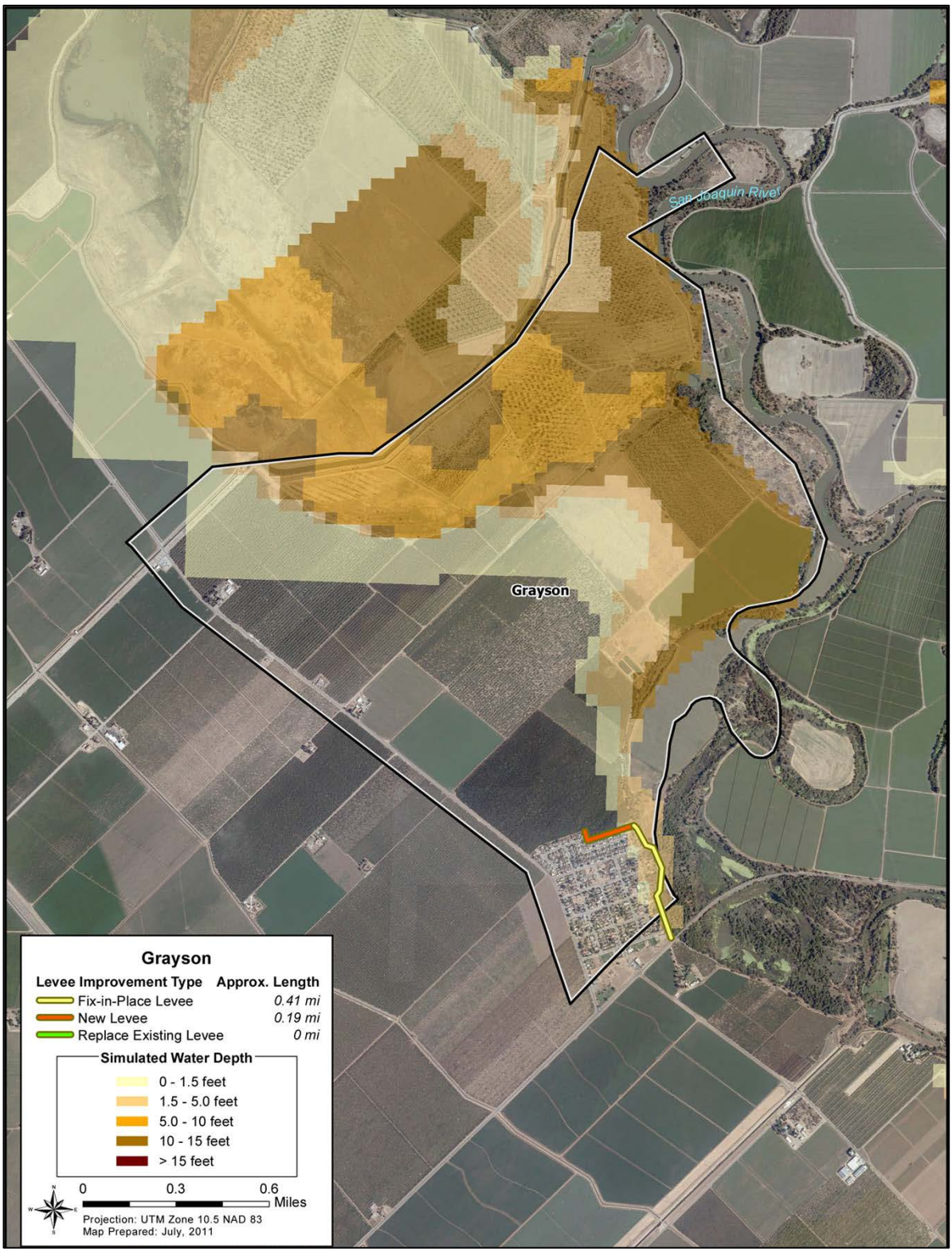

Figure D-4-2. Grayson Levees Approach

4.3 Isleton

Isleton is a city in Sacramento County located on Andrus Island in the Delta. It sits on the left bank of the Sacramento River along California State Route 160. A small portion of the city stretches south to the Georgiana Slough, just east of the oxbow. FLO-2D hydraulic modeling results overlaid on an aerial photograph of Isleton showed that the water depth from a simulated 1 percent AEP flood would range from 5 to 15 feet in the city (Figure D-4-3).

The conceptual design for Isleton is a combination alternative that would provide a ring levee system. It would involve reconstruction-in-place repairs to portions of Segments 40 and 378, with the addition of a 0.7-foot levee raise to a portion of Segment 378, as well as construction of two new levees on the east and west between existing Levee Segments 40 and 378. The new levees would have a 12-foot crown, with an average height of 18 feet, spanning about 2.8 miles in total. This option would provide protection beyond the city limits (Figure D-4-3). Cost for the portions of Segments 40 and 378 were selected based on the performance events listed for each segment in the segment summaries of the NULE GAR (DWR, 2010). Segment 40 showed under-seepage issues in the area, and the length of the portion was more than the total length of repair for the cost of remediation that included under-seepage; therefore, the under-seepage cost alternative for the entire segment was used, as shown in the RACER (DWR, 2011). Segment 378 showed stability issues in the area, and the length of the portion was less than the total length for the cost of remediation that included stability; therefore, the cost per length of the stability alternative was applied to a portion of Segment 378. The new levee cost was assessed using the developed methodology. Refer to Table D-3-1 for cost estimates for this community.

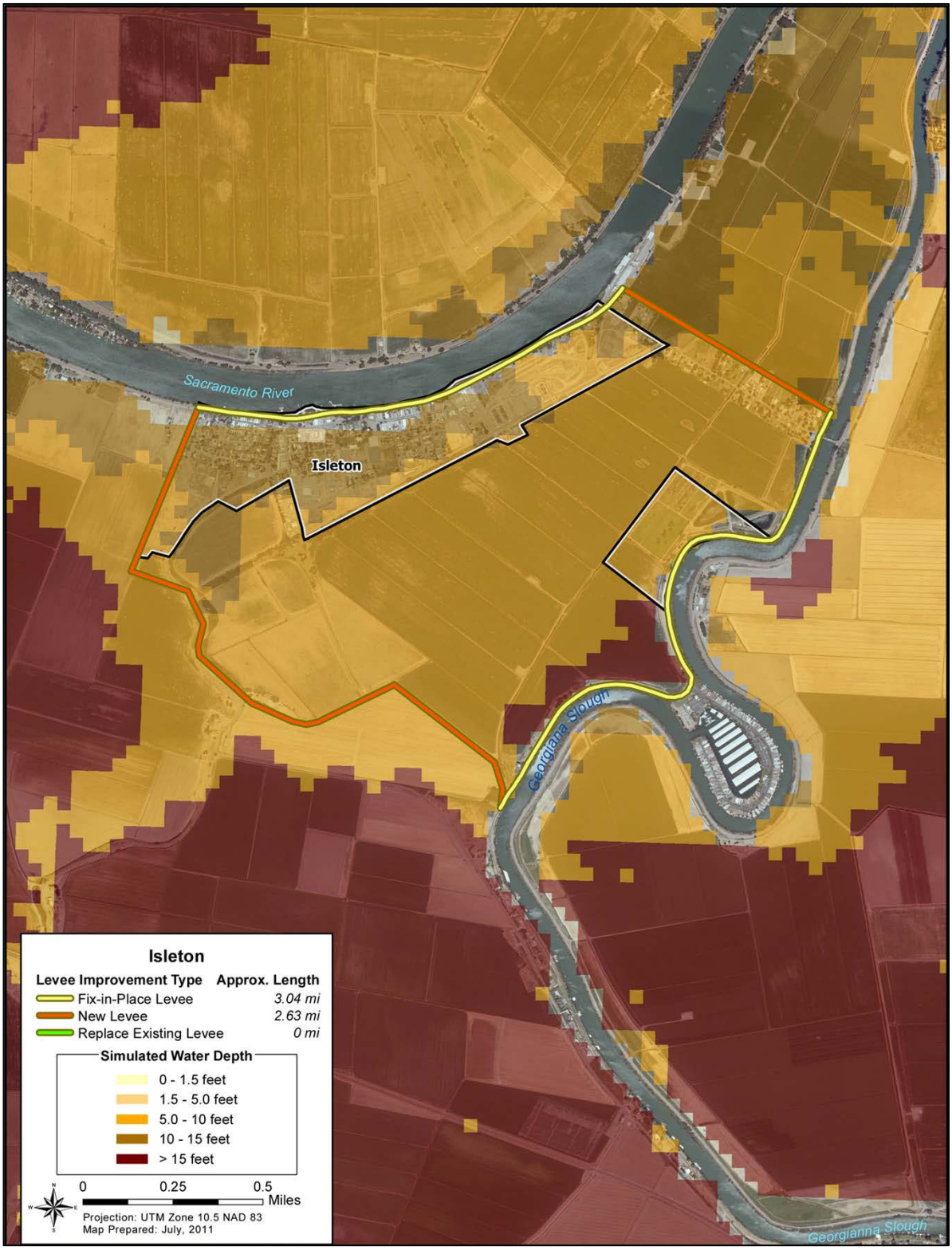

Figure D-4-3. Isleton Levees Approach

4.4 Walnut Grove

Walnut Grove is a Census Designated Place (CDP) in Sacramento County located on portions of Grand and Tyler islands at the confluence of the Sacramento River, Georgiana Slough, Delta Cross Canal, and Snodgrass Slough. FLO-2D hydraulic modeling results overlaid on an aerial photograph of Walnut Grove showed that the water depth from a simulated 1 percent AEP flood would range from 0 to 15 feet in the CDP (Figure D-4-4).

The conceptual design for Walnut Grove is a combination alternative that would provide a ring levee system. It would involve reconstruction-in-place repairs to portions of Levee Segments 384, 1040, 121, 127, and 128, with the addition of an 0.8-foot levee raise to the portion of Segment 384 based on 1 percent AEP water levels from the UNET model, as well as construction of three new levees and replacing seven existing levees with new levees. The new levees would have a 12-foot crown with an average height of 18 feet, spanning about 1.5 miles in total. This option would provide protection beyond the city limits (Figure D-4-4). No performance events where shown for the portion of Segments 384 and 1040, and the lengths of the portions were more than the total lengths of repair for the least-cost alternative for the entire segments, respectively; therefore, the least-cost alternatives, as shown in the RACER (DWR, 2011), were used. Segments 121, 127, and 128 were categorized as low for all levee condition categories, meaning no repairs were recommended. Therefore, no remediation costs were associated with these segments. The new levee cost was assessed using the developed methodology. Refer to Table D-3-1 for cost estimates for this community. These costs do not include costs associated with raising the portion of Levee Segment 384 or other levee raises.

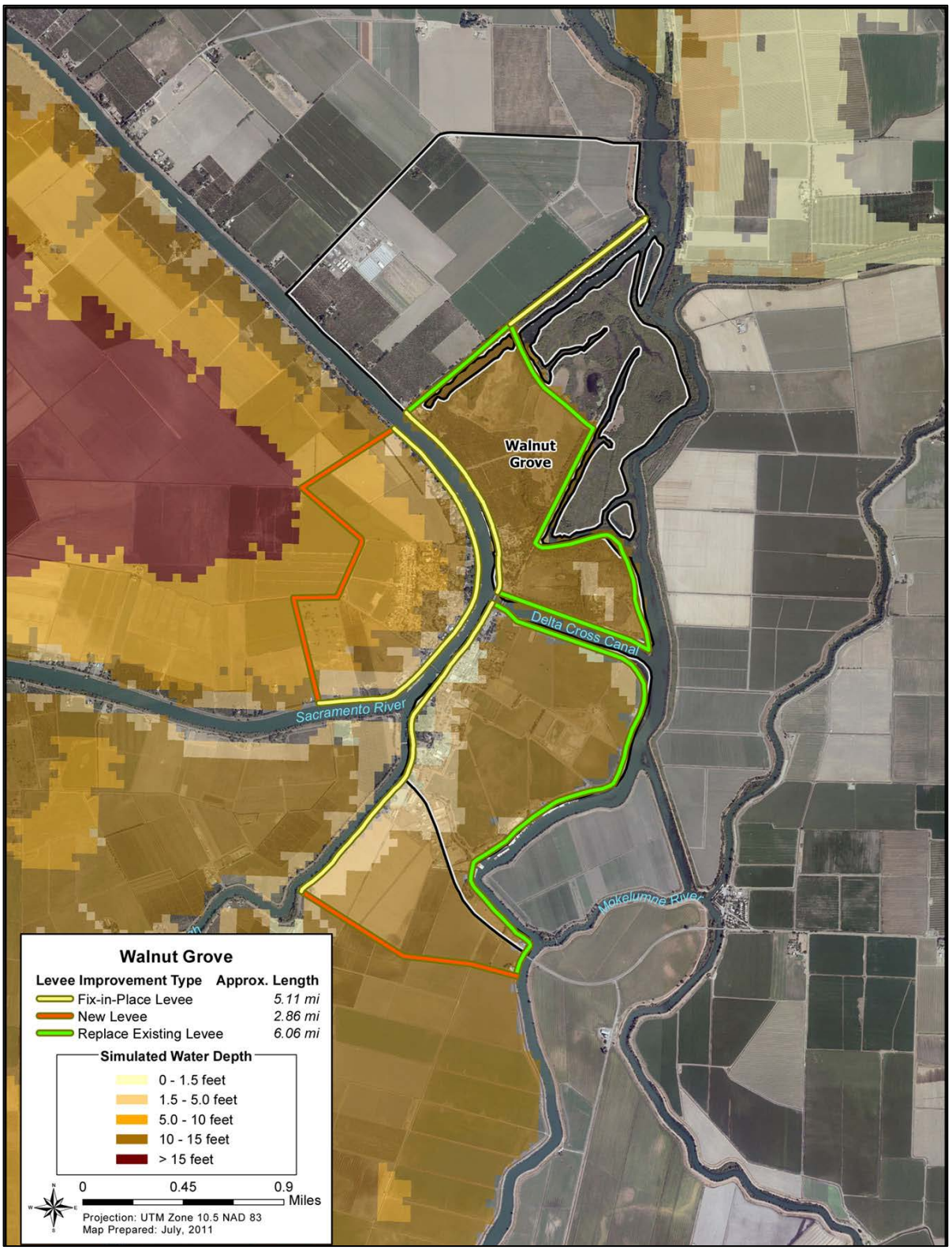

Figure D-4-4. Walnut Grove Levees Approach

4.5 Meridian

Meridian is an unincorporated community located along the left bank of the Sacramento River in Sutter County. FLO-2D hydraulic modeling results referenced over aerial photography of Meridian (Figure D-4-5) showed that the water depth from a simulated 1 percent AEP flood would be in the range of 0 to 15 feet. In addition, GAR (DWR, 2010) and RACER (DWR, 2011) information was reviewed for the type and cost of remediation necessary to repair the existing levee adjacent to Meridian. After analyzing the available data, it was determined that reconstruction-in-place repairs along the left bank levee of the Sacramento River, in combination with construction of a ring levee around Meridian, would protect the community from a 1 percent AEP flood (Figure D-4-5).

The recommended repairs along the left bank of the Sacramento River include remediation for under-seepage, through-seepage, and nonseepage-related stability. The cost to repair a 3.1-mile portion of the levee segment, identified in the GAR as Segment 115, is estimated at $34.3 million, which calculates to about $11.1 million per mile. The cost per mile was then applied to only the 0.34-mile portion of Segment 115 (Figure D-4-5) to estimate the reconstruction-in-place costs. Although areas of inadequate freeboard related to 1957 design elevations were not identified along Segment 115, more data are needed to determine whether the levee segment has the minimum 3 feet of freeboard for a 1 percent AEP level of protection. Additional costs to increase the crown elevation and overall size of the levee prism may apply.

To complete the conceptual layout, a new ring levee would be constructed to encircle Meridian. The 1.51-mile ring levee would begin and end at the left bank of the Sacramento River, encapsulating the portion of the existing levee to receive reconstruction-in-place repairs. The average height of 12.88 feet was calculated using a weighted average of 18 feet (15 feet plus an additional 3 feet of freeboard), 13 feet (10 feet plus an additional 3 feet of freeboard), 8 feet (5 feet plus an additional 3 feet of freeboard), and 4.5 feet (1.5 feet plus an additional 3 feet of freeboard) for different portions of the ring levee alignment, depending on the simulated water depth from hydraulic modeling. Refer to Table D-3-1 for cost estimates for this community.

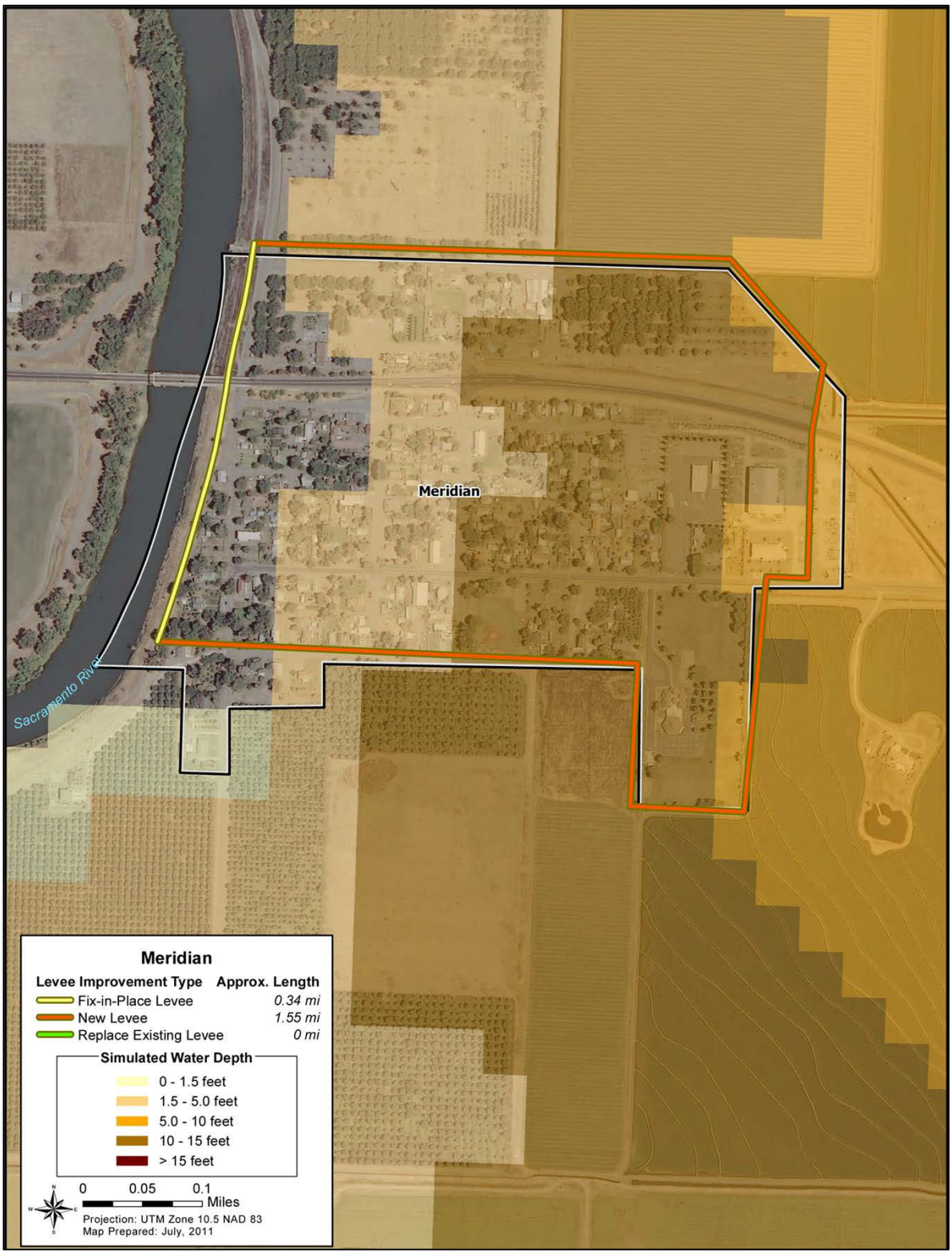

Figure D-4-5. Meridian Levees Approach

4.6 Nicolaus

Nicolaus is an unincorporated town and area in Sutter County along California State Route 99, about 0.1 miles south of the Feather River. Floodplain inundation maps from the Comprehensive Study (USACE, 2002) did not include a 1 percent AEP flood inundation map for the areas around Nicolaus (see Figure D-4-6).

Estimates for potential inundation depths were developed using information from lower AEP flood events. Figure D-4-6 shows the adopted engineering solution for Nicolaus., which consists of fix-in-place of exiting SPFC levee and new levee. The conceptual design consists of a reconstruction-in-place alternative repairing a portion of Levee Segment 247, as described in the NULE GAR (DWR, 2010) with a new ring levee. Refer to Table D-3-1 for cost estimates for this community.

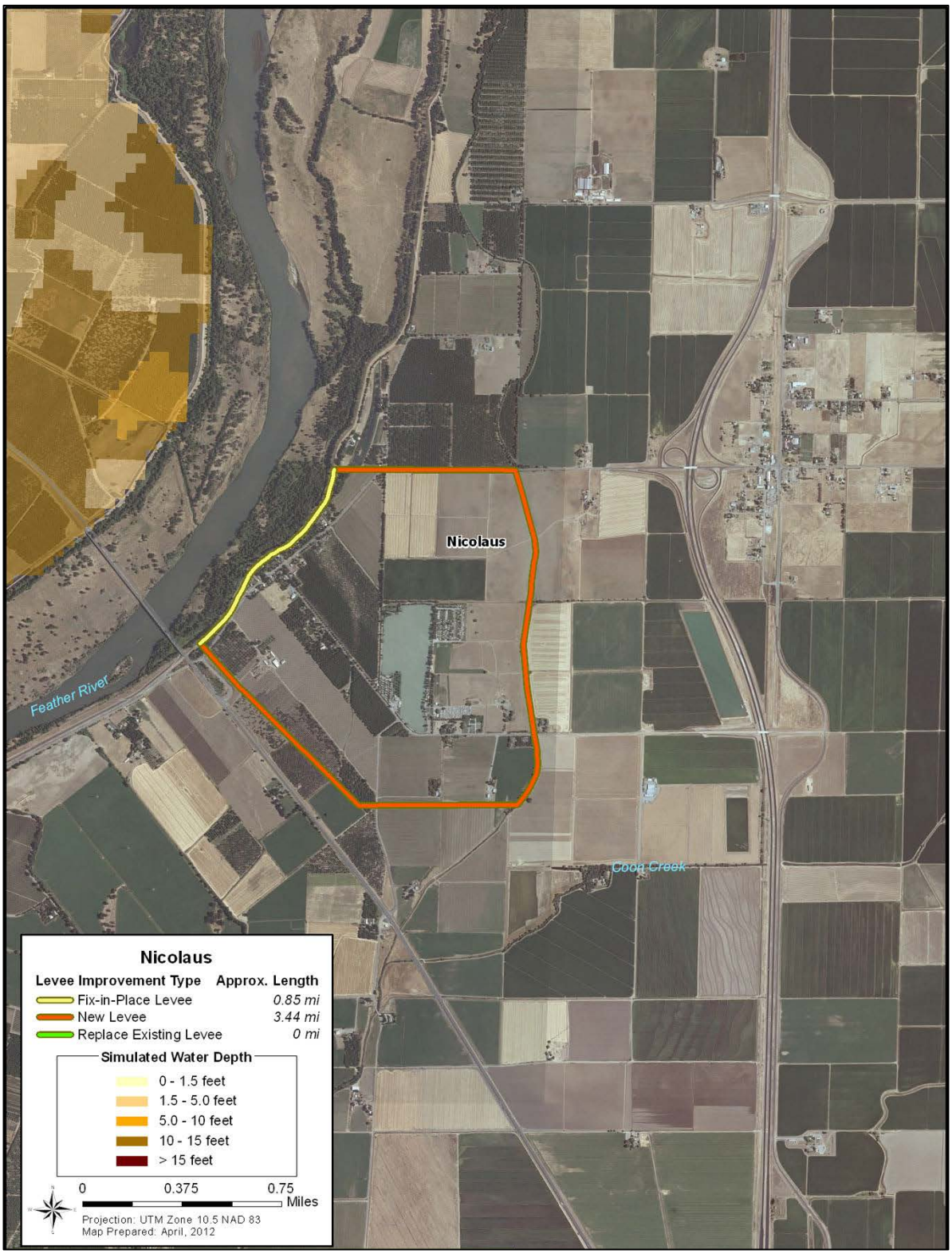

Figure D-4-6. Nicolaus Levees Approach

4.7 Courtland

Courtland is an unincorporated community in Sacramento County located along the left bank of the Sacramento River along California State Route 160, 17 miles south-southwest of Sacramento. Floodplain inundation maps from the Comprehensive Study (USACE, 2002) did not include a 1 percent AEP flood inundation map for the areas around Courtland (see Figure D-4-7).

Estimates for potential inundation depths were developed using information from lower AEP flood events. Figure D-4-6 shows the adopted engineering solution for Cortland, which consists of fix-in-place of existing SPFC levee and new ring levee. The fix in-place component includes reconstruction in place of a portion of Levee Segment 131, as described in the NULE GAR (DWR, 2010). Refer to Table D-3-1 for cost estimates for this community.

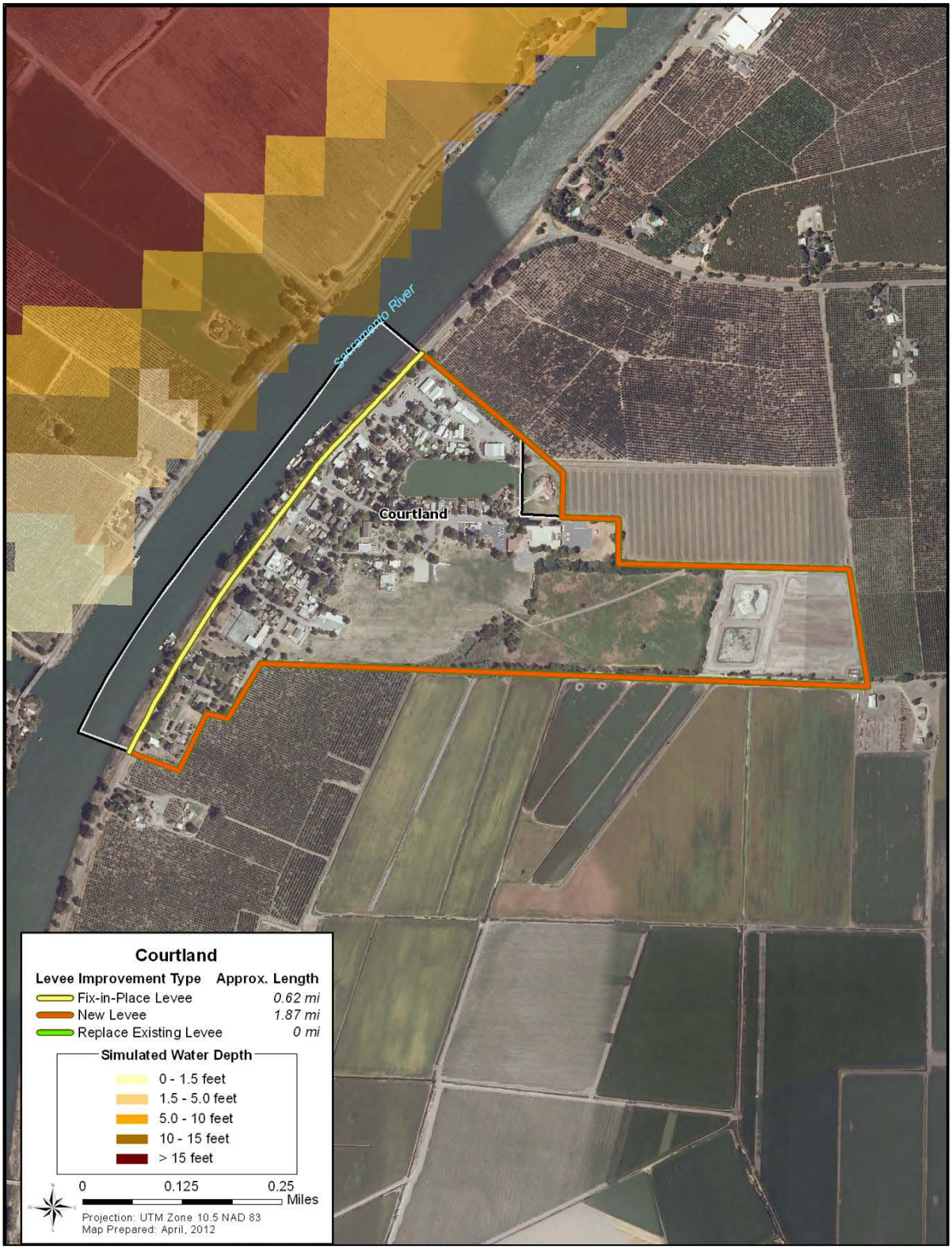

Figure D-4-7. Courtland Levees Approach

4.8 Robbins

Robbins is an unincorporated town in Sutter County situated about 1.5 to two miles from the left bank of the Sacramento River to the west and about 2.5 to three miles from the right bank of the Sutter Bypass to the east. FLO-2D hydraulic modeling results referenced over aerial photography of Robbins (Figure D-4-8) showed that a water depth from a simulated 1 percent AEP flood would be a minimum of 5 to 10 feet over the entire area, with as much as 10 to 15 feet of inundation in some lower-lying areas. In addition, the GAR (DWR, 2010) and RACER (DWR, 2011) information was reviewed for the type and cost of remediation necessary to repair existing levees in the Robbins area. Reconstruction-in-place options were ultimately eliminated because of the considerable distance between the existing levees along the Sacramento River and the Sutter Bypass and the town of Robbins. To reliably protect Robbins with reconstruction-in-place options, several miles of existing levees nearest to and upstream from Robbins would require a significant amount of remediation related to under-seepage, through-seepage, and nonseepage-related stability. After considering the geographical size and layout of Robbins, as well as its proximity to existing levees, constructing a ring levee around the town was chosen as the most practical approach to protect Robbins from a 1 percent AEP flood (Figure D-4-8).

A conceptual ring levee has been conservatively designed with an average height of 13.91 feet. The average height was calculated using a weighted average of 13 feet (10 feet plus an additional 3 feet of freeboard) for most of the ring levee, and 18 feet (15 feet plus an additional 3 feet of freeboard) for the areas with the deepest inundation. The length of levee needed to encircle Robbins was approximated at 2.25 miles. Refer to Table D-3-1 for cost estimates for this community.

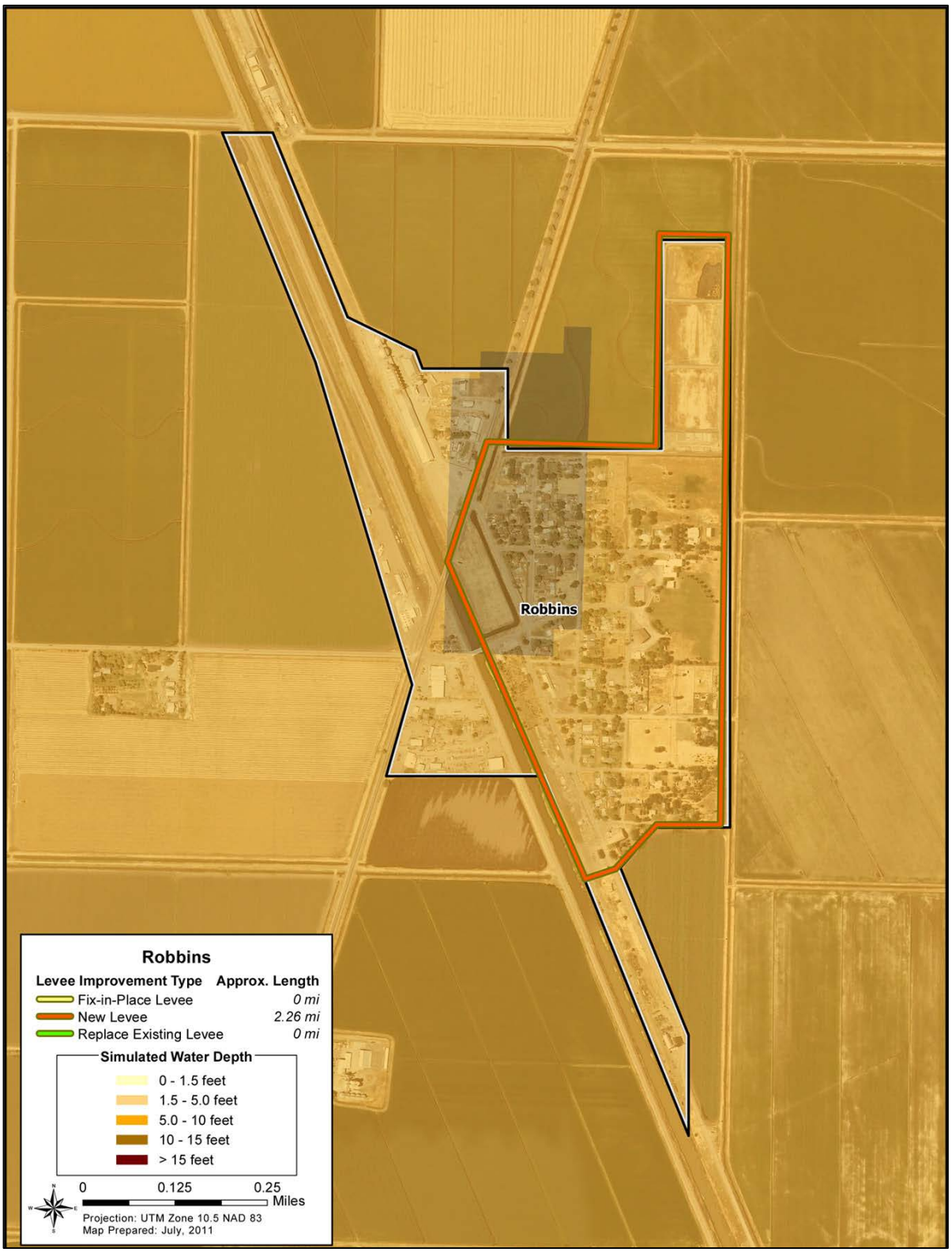

Figure D-4-8. Robbins Levee Approach

4.9 Hood

Hood is an unincorporated community in Sacramento County located on the left bank of the Sacramento River along California State Route 160, 15 miles south of downtown Sacramento. FLO-2D hydraulic modeling results overlaid on an aerial photograph of Hood showed that the simulated water depth from a simulated 1 percent AEP flood would range from 0 to 15 feet (Figure D-4-9).

The conceptual design for Hood is a combination alternative that would provide a ring levee system. It would involve reconstruction-in-place repairs to portions of Levee Segment 106, as well as construction of new levee on the north and replacement of existing levees with new levees on the east and south. The new levees would have a 12-foot crown, with an average height of 18 feet, spanning about 1.5 miles in total. This option would provide protection beyond the city limits (Figure D-4-9). Cost for the portions of Segment 106 was selected based on the performance events listed for each segment in the segment summaries of the NULE GAR (DWR, 2010). Segment 106 showed under-seepage issues in the area, and the length of the portion was less than the total length for the cost of remediation, which included under-seepage; therefore, the cost per length of the under-seepage alternative was applied to a portion of Segment 160. The new levee cost was assessed using the developed methodology. Refer to Table D-3-1 for cost estimates for this community.

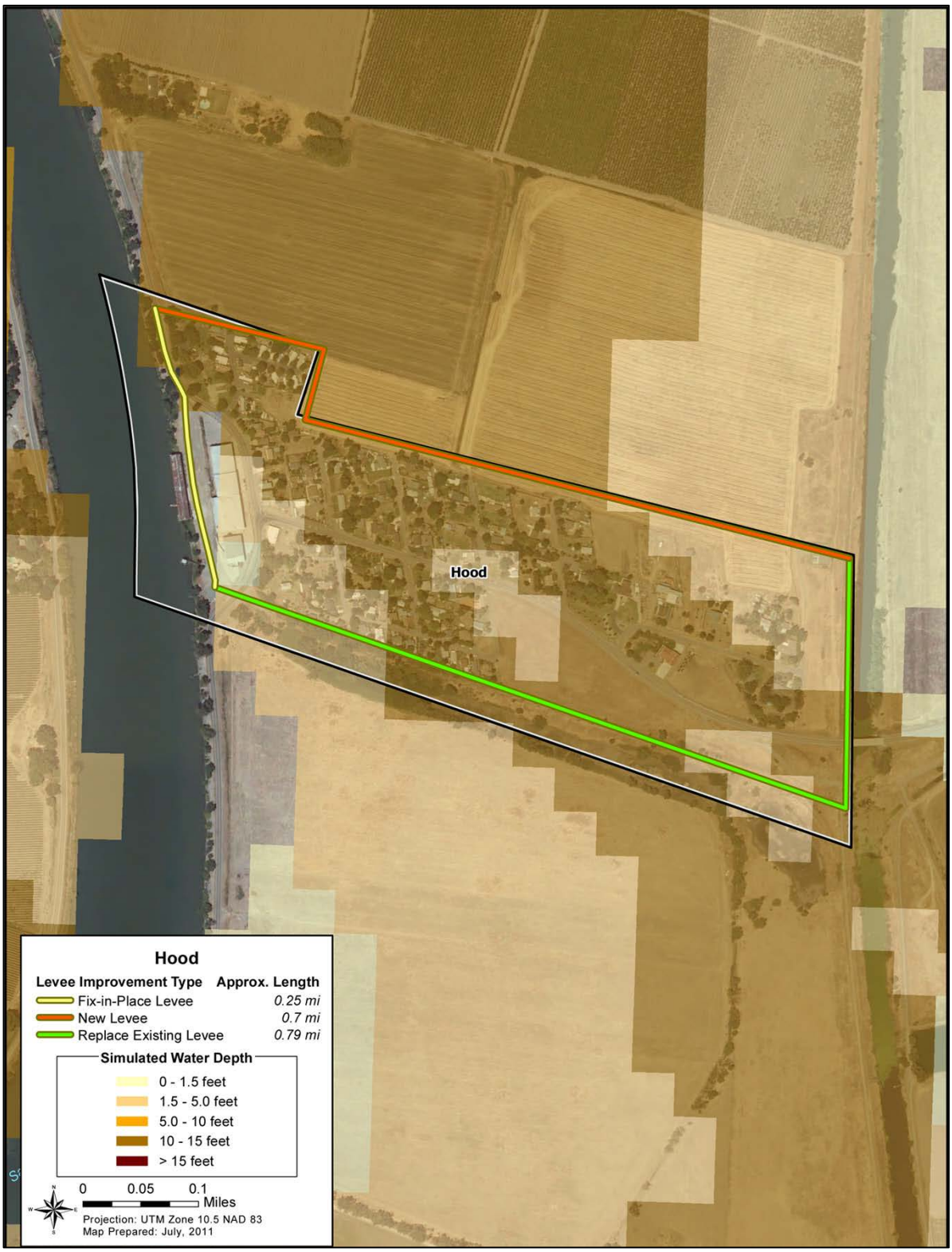

Figure D-4-9. Hood Levees Approach

4.10 Friant

Friant is an unincorporated community in Fresno County located along the left bank of the San Joaquin River, just below Friant Dam and Millerton Lake. FLO-2D hydraulic modeling results referenced over aerial photography of Friant (Figure D-4-10) revealed that simulated water depth from a simulated 1 percent AEP flood would be greater than 15 feet in areas closest to the San Joaquin River, decreasing farther south into Friant. GAR (DWR, 2010) and RACER (DWR, 2011) information does not apply because there is no existing levee along the left bank of the San Joaquin River adjacent to Friant. As a result, the conceptual levee layout to protect Friant from a 1 percent AEP flood includes a new, substantial levee along the left bank of the San Joaquin River as well as a less robust tieback levee to the west.

The conceptual left bank levee was designed with a height of 23 feet. Because hydraulic modeling results closest to the river showed the range of water depths to be greater than 15 feet, with no explicit maximum upper limit, the conceptual left bank levee was conservatively designed with a height of 23 feet (20 feet plus an additional 3 feet of freeboard).

The conceptual tieback levee was conservatively designed with an average height of 13 feet. The average height was calculated using a weighted average of 23 feet (20 feet plus an additional 3 feet of freeboard) for the portion of the alignment closest to the left bank levee, and 4.5 feet (1.5 feet plus an additional 3 feet of freeboard) for the remaining portion. Refer to Table D-3-1 for cost estimates for this community.

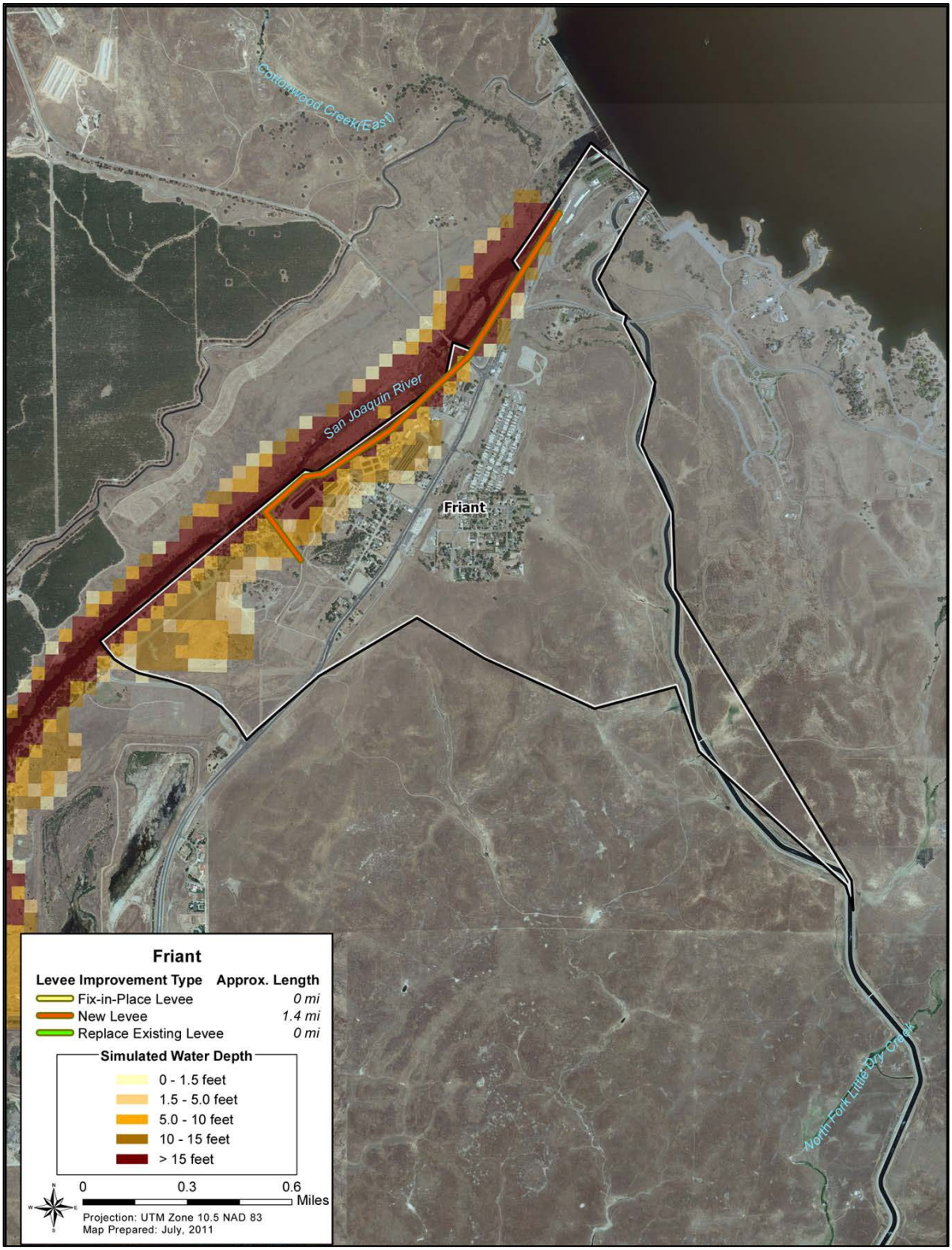

Figure D-4-10. Friant Levees Approach

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5.0 Group B Communities

This section describes the conceptual design and cost estimate for each Group B community. The following is a list of the communities covered in this section:

- Firebaugh
- Colusa
- Durham
- Rio Vista
- Wheatland
- Gerber-Las Flores
- Glenn
- Clarksburg
- Verona
- Grimes
- Princeton
- Palermo
- Butte City
- Mendota
- Bethel Island
- Chester
- Los Molinos
- Hamilton City
- Thornton
- Tranquility
- Tehama

5.1 Firebaugh

The City of Firebaugh is located along the San Joaquin River in Fresno County. Most of the community lies along the left bank of the San Joaquin River; however, two small subdivisions and a water treatment facility are located on the other side of the San Joaquin River, along the right bank. FLO-2D hydraulic modeling results referenced over aerial photography of Firebaugh (Figure D-5-1) showed that the water depth from a simulated 1 percent AEP flood would be in the range of 0 to 15 feet. In addition, the NULE GAR (DWR, 2010) and RACER (DWR, 2011) information was reviewed for the type and cost of remediation necessary to repair the left and right banks of the San Joaquin River adjacent to Firebaugh. After analyzing the available data, it was determined that reconstruction-in-place repairs along the left bank levee of the San Joaquin River, in combination with the construction of training levees to the north and south, would protect the community west of the San Joaquin River (left bank) from a 1 percent AEP flood (Figure D-5-1). In addition, construction of two separate ring levees to protect the water treatment facility and the larger of the two subdivisions along the right bank of the San Joaquin River would protect most of the community east of the San Joaquin River from a 1 percent AEP flood. The smaller of the two subdivisions to the east, which contains 11 homes, would be difficult to protect through the use of levees because of its proximity to a canal on one side. To protect the smaller subdivision, costly repairs along the right bank of the San Joaquin River or the construction of a levee/floodwall combination would need to be considered.

The recommended repairs along the left bank of the San Joaquin River include remediation for freeboard and geometry only. About 1.94 miles of the levee segment, identified in the GAR as Segment 5030, were identified as having inadequate freeboard and geometry, with no reference to location. Also, hydraulic modeling results from a 1 percent AEP flood appear to simulate areas of overtopping adjacent to Firebaugh. In the interest of being conservative, the entire cost to fix freeboard and geometry was applied to the 3.64-mile portion of the levee segment identified in the conceptual layout for Firebaugh (Figure D-5-1) to estimate reconstruction-in-place costs. Although the cost to repair freeboard along Segment 5030 to 1955 design elevations was applied to the current cost estimate, more data are needed to determine if the levee segment has the minimum 3 feet of freeboard for a 1 percent AEP level of protection. Additional costs to increase the crown elevation and overall size of the levee prism may apply.

In addition to reconstruction-in-place repairs along the left bank of the San Joaquin River, two training levees would be constructed, both north and south of Firebaugh, to complete the conceptual layout west of the river.

The northern training levee, which would extend 1.37 miles, would begin at the left bank of the San Joaquin River and stretch along the edge of the city to cut off floodflows from the north. The northern training levee was conservatively designed with an average height of 4.65 feet. The average height was calculated by using a weighted average of 8 feet (5 feet plus an additional 3 feet of freeboard) for the portion of the alignment closest to the river, and 4.5 feet (1.5 feet plus an additional 3 feet of freeboard) for the remaining portion.

The southern training levee would begin at the left bank of the San Joaquin River and stretch 0.96 miles along the edge of the city, cutting off encroaching floodflows from the south. The southern training levee was conservatively designed with an average height of 4.72 feet. The average height was calculated by using a weighted average of 8 feet (5 feet plus an additional 3 feet of freeboard) for the portion of the alignment closest to the river, and 4.5 feet (1.5 feet plus an additional 3 feet of freeboard) for the remaining portion.

The conceptual layout east of the San Joaquin River (right bank) consists of two ring levees. The first ring levee would encircle a housing subdivision consisting of about 70 residences and one commercial business. The ring levee totals approximately 1.32 miles, and was conservatively designed with an average height of 4.63 feet. The average height was calculated by using a weighted average of 8 feet (5 feet plus an additional 3 feet of freeboard) for a small portion of the ring levee to the southeast and 4.5 feet (1.5 feet plus an additional 3 feet of freeboard) for the remaining portion.

The second ring levee to the east surrounds a water treatment facility directly adjacent to the right bank of the San Joaquin River. The ring levee extends 0.32 miles, and has been conservatively designed with an average height of 6.83 feet. The average height was calculated by using a weighted average of 8 feet (5 feet plus an additional 3 feet of freeboard) for most of the alignment, and 4.5 feet (1.5 feet plus an additional 3 feet of freeboard) for the remaining portion. Refer to Table D-3-1 for cost estimates for this community.

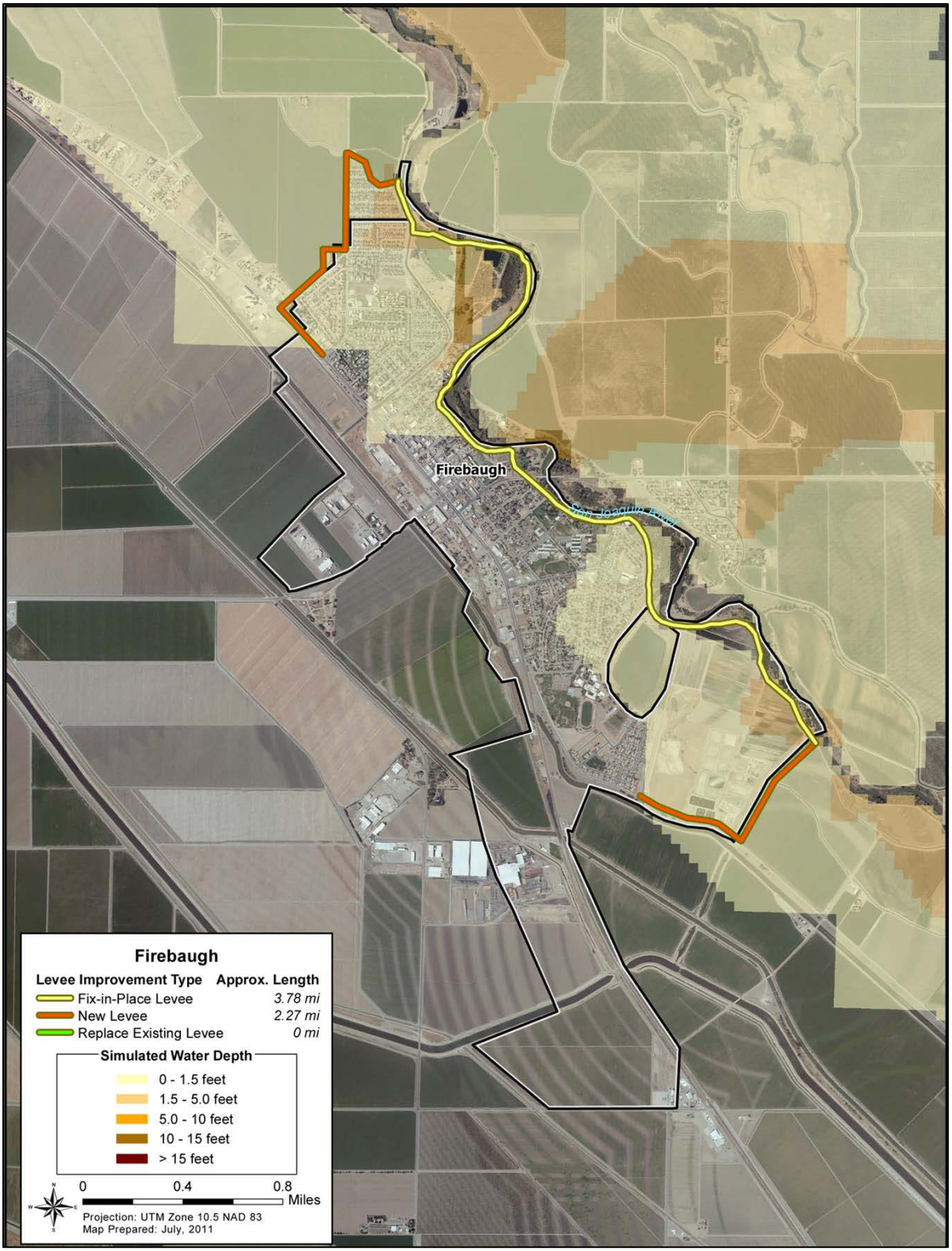

Figure D-5-1. Firebaugh Levees Approach

5.2 Colusa

The City of Colusa is located along the right bank of the Sacramento River in Colusa County. FLO-2D hydraulic modeling results referenced over aerial photography of Colusa (Figure D-5-2) showed that the water depth from a simulated 1 percent AEP flood would be in the range of 0 to 15 feet. In addition, GAR (DWR, 2010) and RACER (DWR, 2011) information was reviewed for the type and cost of remediation necessary to repair the existing levee adjacent to Colusa. After analyzing the available data, it was determined that reconstruction-in-place repairs along the right bank levee of the Sacramento River, in combination with construction of a training levee extending along the north and west of Colusa, would protect the community from a 1 percent AEP flood (Figure D-5-2).

The recommended repairs along the right bank of the Sacramento River include remediation for under-seepage, through-seepage, and freeboard and geometry for the first levee segment, and under-seepage, through-seepage, and erosion for the second segment. More costly repair alternatives were chosen for both levee segments based on previous seepage issues along the segments, and because of sharp meander in the Sacramento River as it approaches Colusa. The cost to repair a 0.63-mile portion of the first levee segment, identified in the GAR as Segment 100, was estimated at $7 million, which calculates to about $9.9 million per mile. The cost to repair the second 4.0-mile levee segment, identified in the GAR as Segment 287, was estimated at $53.5 million, which calculates to about $13.4 million per mile. The cost per mile was then applied to the entire 0.63-mile portion of Segment 100 and a 2.26-mile portion of Segment 287 (Figure D-5-2) to estimate the total reconstruction-in-place costs. The more expensive repair alternative for Levee Segment 100 was selected because it addresses under-seepage, which has proven to be a problem for Colusa during periods of high water in the Sacramento River. The more expensive repair alternative for Levee Segment 287 was also chosen, because it addresses under-seepage and erosion; boils have been observed in the past, and erosion has occurred. In addition, there are sharp meanders along the Sacramento River upstream and adjacent to Colusa, where the channel is against the levee (no setback). Although the cost to restore freeboard along Segment 100 to 1957 design elevations was applied to the current cost estimate, more data are needed to determine if both Segment 100 and Segment 287 have the minimum 3 feet of freeboard for a 1 percent AEP level of protection. Additional costs to increase the crown elevation and the overall size of the levee prism may apply.

To complete the conceptual layout, a training levee would be constructed beginning from the right bank of the Sacramento River, just north of Colusa. From the right bank of the Sacramento River, the training levee

would first extend about 0.53 miles westward, then run south for an additional 1.83 miles (approximately). The training levee was conservatively designed with an average height of 6.13 feet. The average height was calculated by using a weighted average of 18 feet (15 feet plus an additional 3 feet of freeboard), 8 feet (5 feet plus an additional 3 feet of freeboard), and 4.5 feet (1.5 feet plus an additional 3 feet of freeboard) for different portions of the training levee alignment, depending on the simulated water depth from hydraulic modeling. Refer to Table D-3-1 for cost estimates for this community.

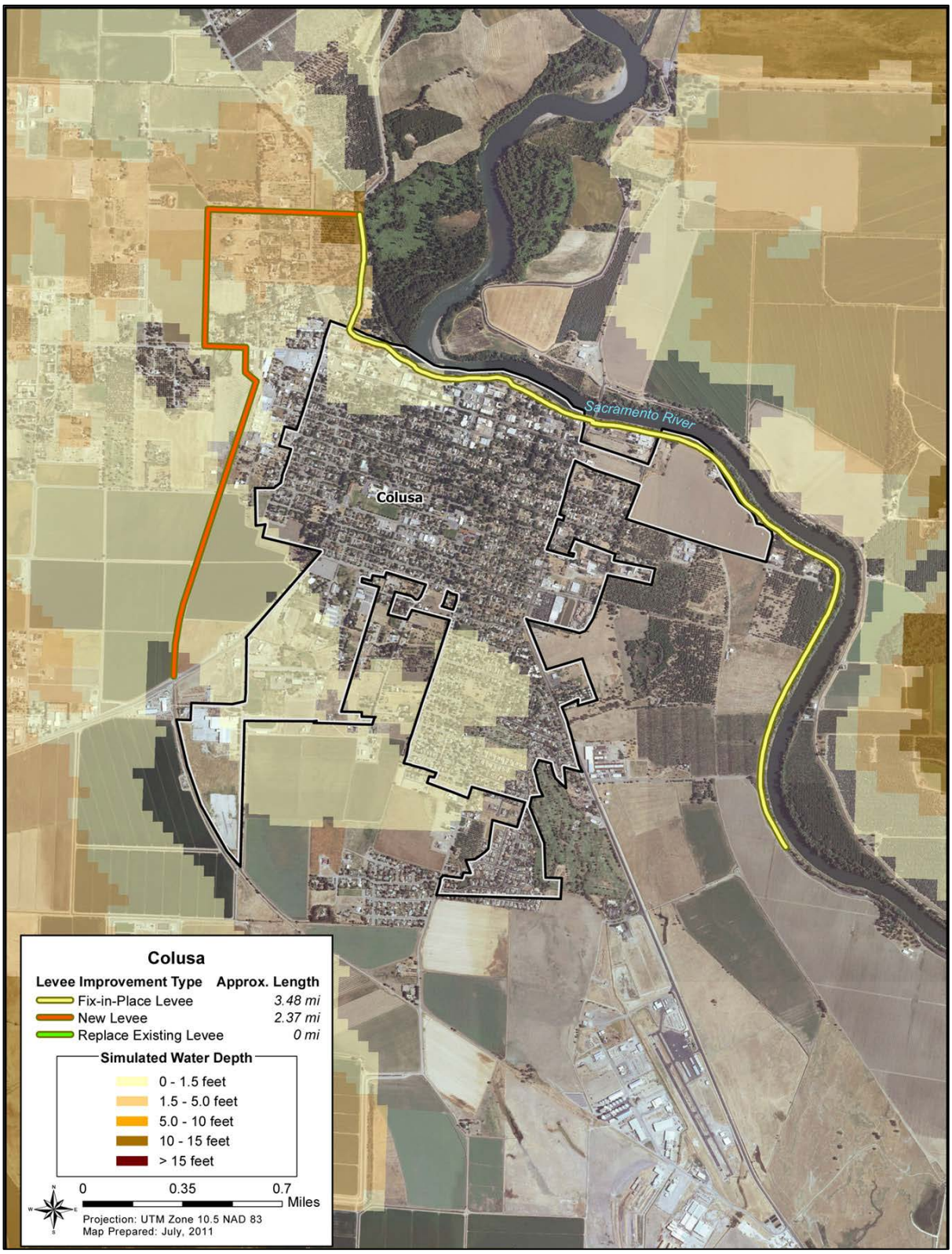

Figure D-5-2. Colusa Levees Approach

5.3 Durham

Durham is a Census-Designated Place (CDP) in Butte County about five miles southeast from Chico and about one mile west from Butte Creek. Because of its close proximity to Chico, Durham may need to be considered when addressing protection for that area. FLO-2D hydraulic modeling results overlaid on an aerial photograph of Durham showed no inundation during a 1 percent AEP flood in the community (Figure D-5-3).

Because no inundation was shown, constructing a new levee was not an option. Therefore, the conceptual design is a reconstruction-in-place alternative repairing all of Levee Segments 263 and 381, as described in the NULE GAR (DWR, 2010). This option would provide protection to an area beyond the community (Figure D-5-3). The least-cost alternative, as shown in the RACER (DWR, 2011), was used for each segment. Refer to Table D-3-1 for cost estimates for this community.

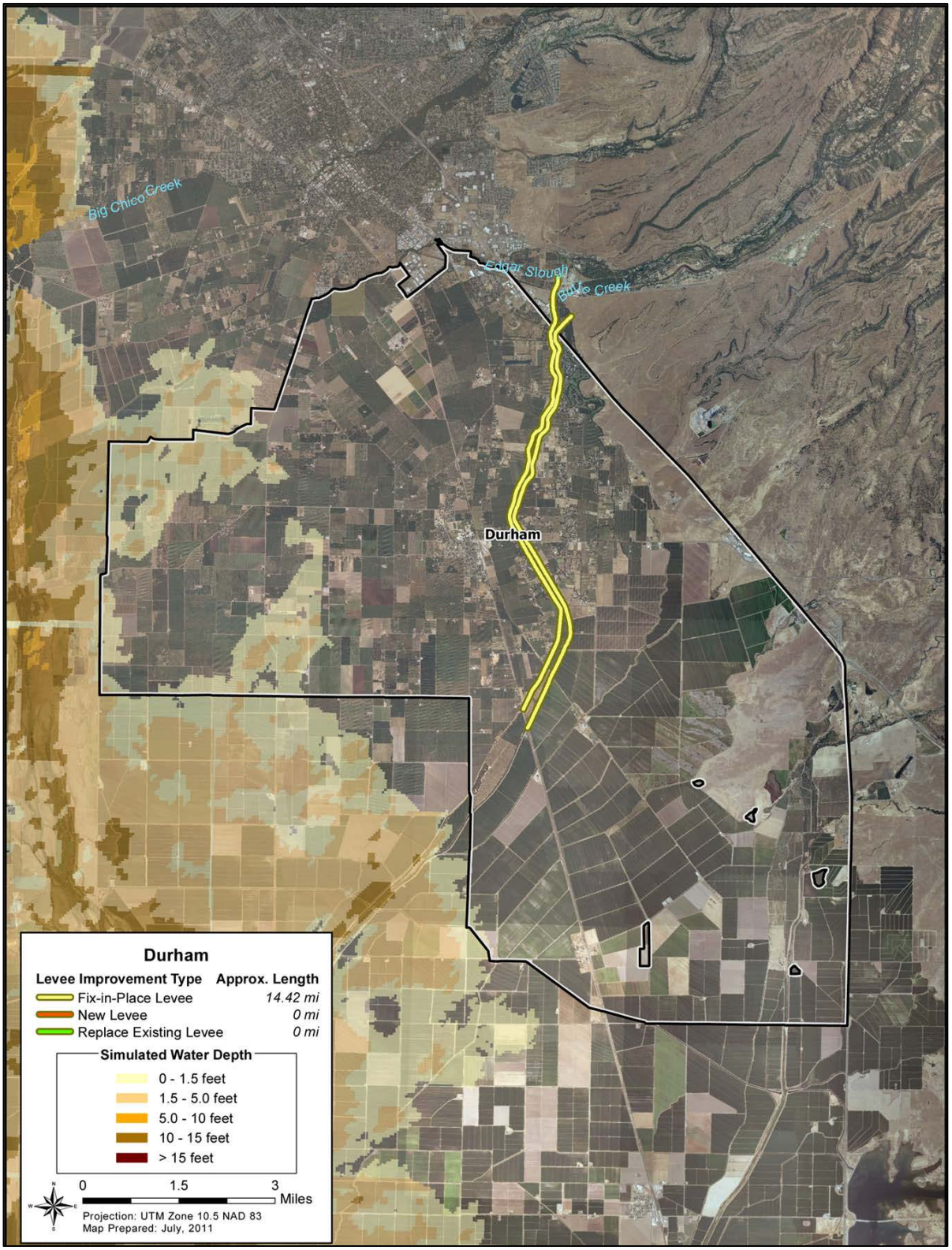

Figure D-5-3. Durham Levees Approach

5.4 Wheatland

The City of Wheatland is a community situated between the left bank of Dry Creek and the right bank of the Bear River in Yuba County. FLO-2D hydraulic modeling results did not show flooding from a simulated 1 percent AEP flood, although Wheatland is identified by FEMA as being in a 1 percent AEP floodplain. GAR (DWR, 2010) and RACER (DWR, 2011) information was reviewed for the type and cost of remediation necessary to repair the existing levees affecting Wheatland. After analyzing the available data, it was determined that reconstruction-in-place repairs along the entire length of the left bank levee of Dry Creek adjacent to Wheatland would address flooding potential until more data become available (Figure D-5-4). Flooding potential from the right bank of the Bear River was not considered significant enough in the GAR to merit a cost analysis for reconstruction-in-place repairs at this time.

The recommended repairs along the left bank of Dry Creek include remediation only for freeboard and geometry. Given that FLO-2D hydraulic modeling results were unable to confirm areas of inundation, the least-cost alternatives were selected to repair the entire length of both levee segments adjacent to Wheatland. The GAR identified deficiencies in Segments 138 and 154 to repair the left bank of Dry Creek. Refer to Table D-3-1 for cost estimates for this community. Although the cost to restore freeboard along Segments 138 and 154 to 1957 design elevations was applied to the current cost estimate, more data are needed to determine if both Segments 138 and 154 have the minimum 3 feet of freeboard for a 1 percent AEP level of protection. Additional costs to increase the crown elevation and the overall size of the levee prism may apply.

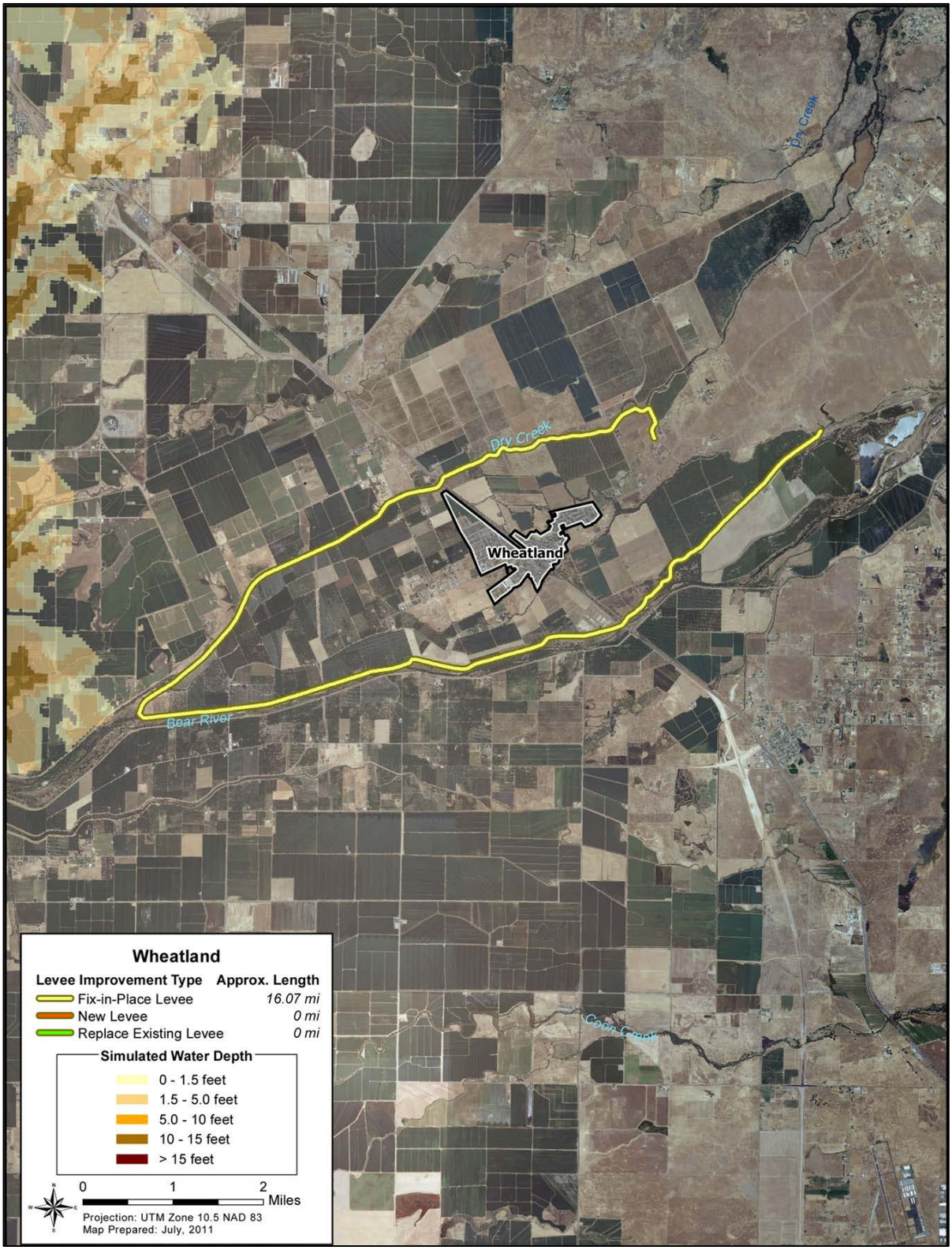

Figure D-5-4. Wheatland Levees Approach

5.5 Glenn

Glenn is an unincorporated community in Glenn County located about one mile west of the Sacramento River, at the intersection of State Route 45 and State Route 162, about 10 miles east of Interstate 5 (I-5). FLO-2D hydraulic modeling results overlaid on an aerial photo of Glenn showed that the water depth from a simulated 1 percent AEP flood would range from 0 to 1.5 feet in the community.

The conceptual design for Glenn would provide a ring levee system. It would involve constructing a new levee on the north, west, and south and replacing a portion of an existing levee along the Sacramento River east of the community with a new levee. The new levees would have a 12-foot crown, with an average height of 4.5 feet, spanning about 1.9 miles in total. This option would provide protection to only the area within the Glenn community (Figure D-5-5). The new levee cost was assessed using the developed methodology. Refer to Table D-3-1 for cost estimates for this community.

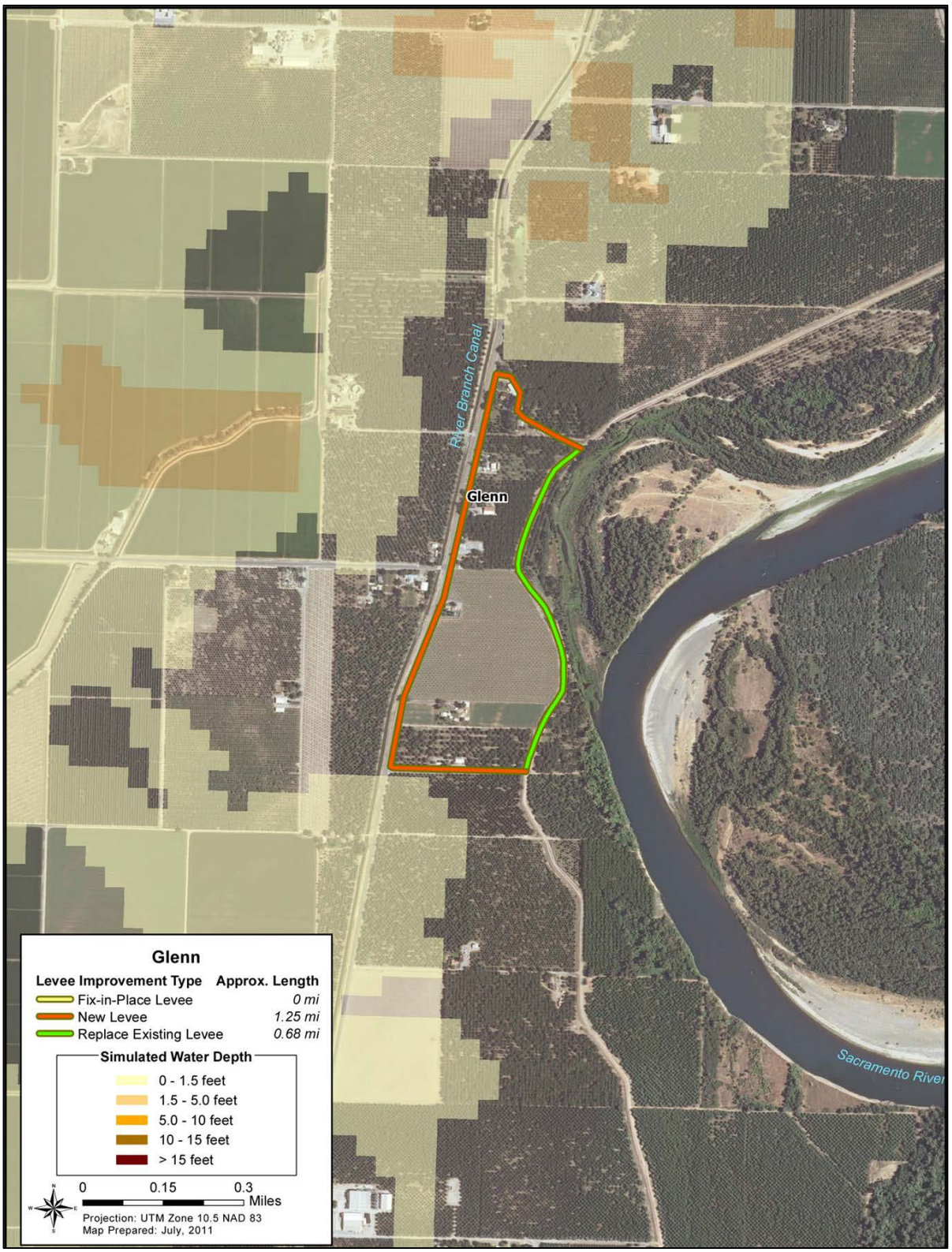

Figure D-5-5. Glenn Levees Approach

5.6 Clarksburg

Clarksburg is an unincorporated community in Yolo County along the right bank of the Sacramento River and Elk Slough. FLO-2D hydraulic modeling results overlaid on an aerial photo of Clarksburg showed that the water depth during a simulated 1 percent AEP flood would range from 0 to 5 feet (Figure D-5-6).

The conceptual design for Clarksburg is a combination alternative that would provide a ring levee system. It would involve reconstruction-in-place repairs to portions of Levee Segments 303 and 244, as well as construction of new levees on the north and west. The new levees would have a 12-foot crown, with an average height of 8 feet, spanning about 1.6 miles in total. This option would provide protection to only the area within the Clarksburg community (Figure D-5-6). No performance events were shown for the portions of Segments 303 and 244, and the length of the portions was more than the total lengths of repair for the least-cost alternative for the entire segments respectively; therefore, the least-cost alternatives, as shown in the RACER, were used. The new levee cost was assessed using the developed methodology. Refer to Table D-3-1 for cost estimates for this community.

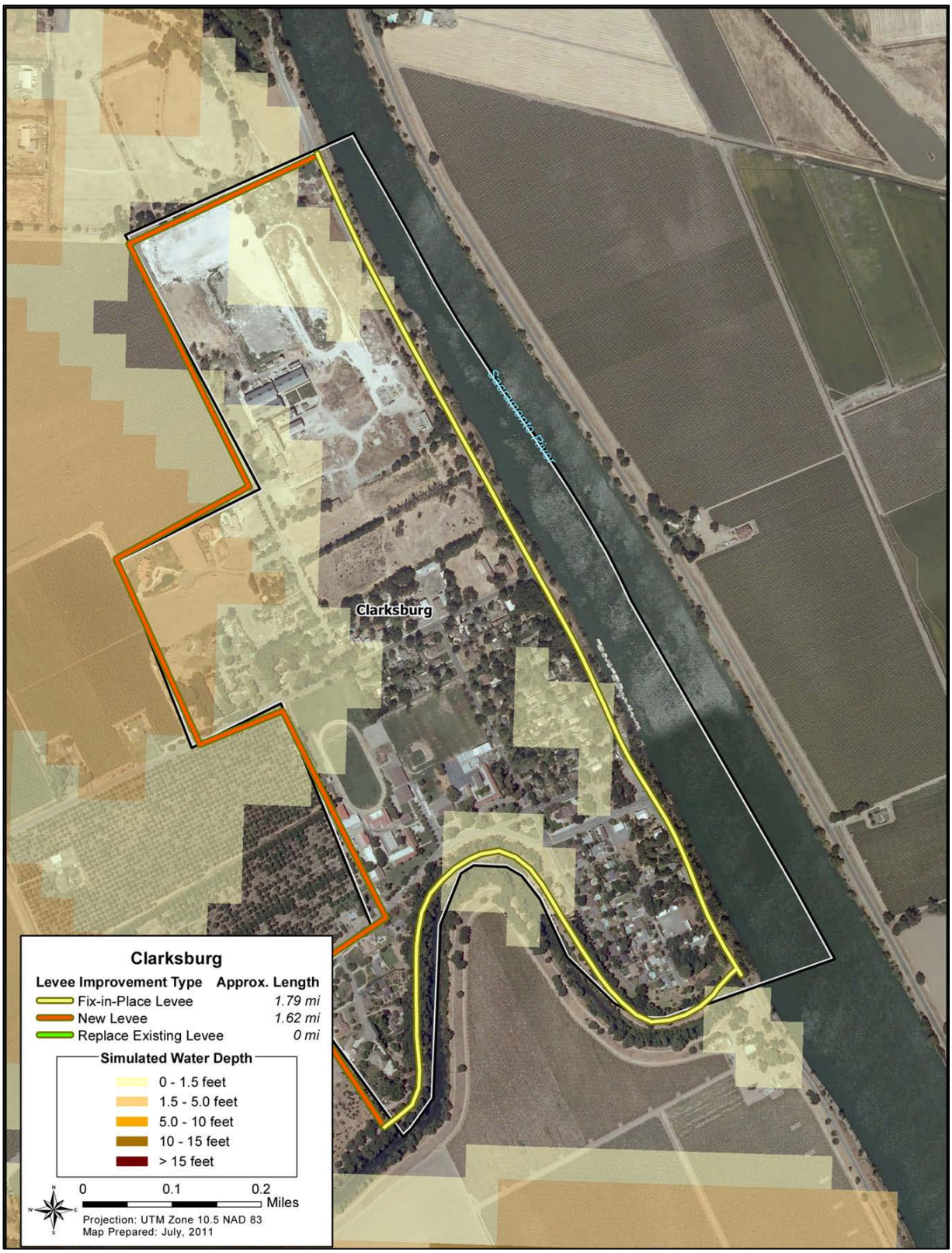

Figure D-5-6. Clarksburg Levees Approach

5.7 Tehama

The City of Tehama is located along the right bank of the Sacramento River in Tehama County. FLO-2D hydraulic modeling results did not show flooding from a simulated 1 percent AEP flood, although Tehama is identified by FEMA as being in a 1 percent AEP floodplain. GAR (DWR, 2010) and RACER (DWR, 2011) information was reviewed for the type and cost of remediation necessary to repair the existing levees affecting Tehama. After analyzing the available data, it was determined that reconstruction-in-place repairs along the entire length of the right bank levee of Elder Creek adjacent to Tehama would address flooding potential until more data become available. Flooding potential along the right bank of the Sacramento River adjacent to Tehama was not addressed in the GAR because no levees appear to exist (Figure D-5-7).

Recommended repairs along the right bank of Elder Creek include remediation only for freeboard and geometry. Given that FLO-2D hydraulic modeling results were unable to confirm areas of inundation, the least-cost alternative was selected to repair the entire length of the levee segment adjacent to Tehama. The right bank of Elder Creek is identified in the GAR as Segment 59. Refer to Table D-3-1 for cost estimates for this community. Although the cost to repair freeboard along Segment 59 to 1957 design elevations was applied to the current cost estimate, more data are needed to determine if Segment 59 would have the minimum 3 feet of freeboard for a 1 percent AEP level of protection. Additional costs to increase the crown elevation and overall size of the levee prism may apply.

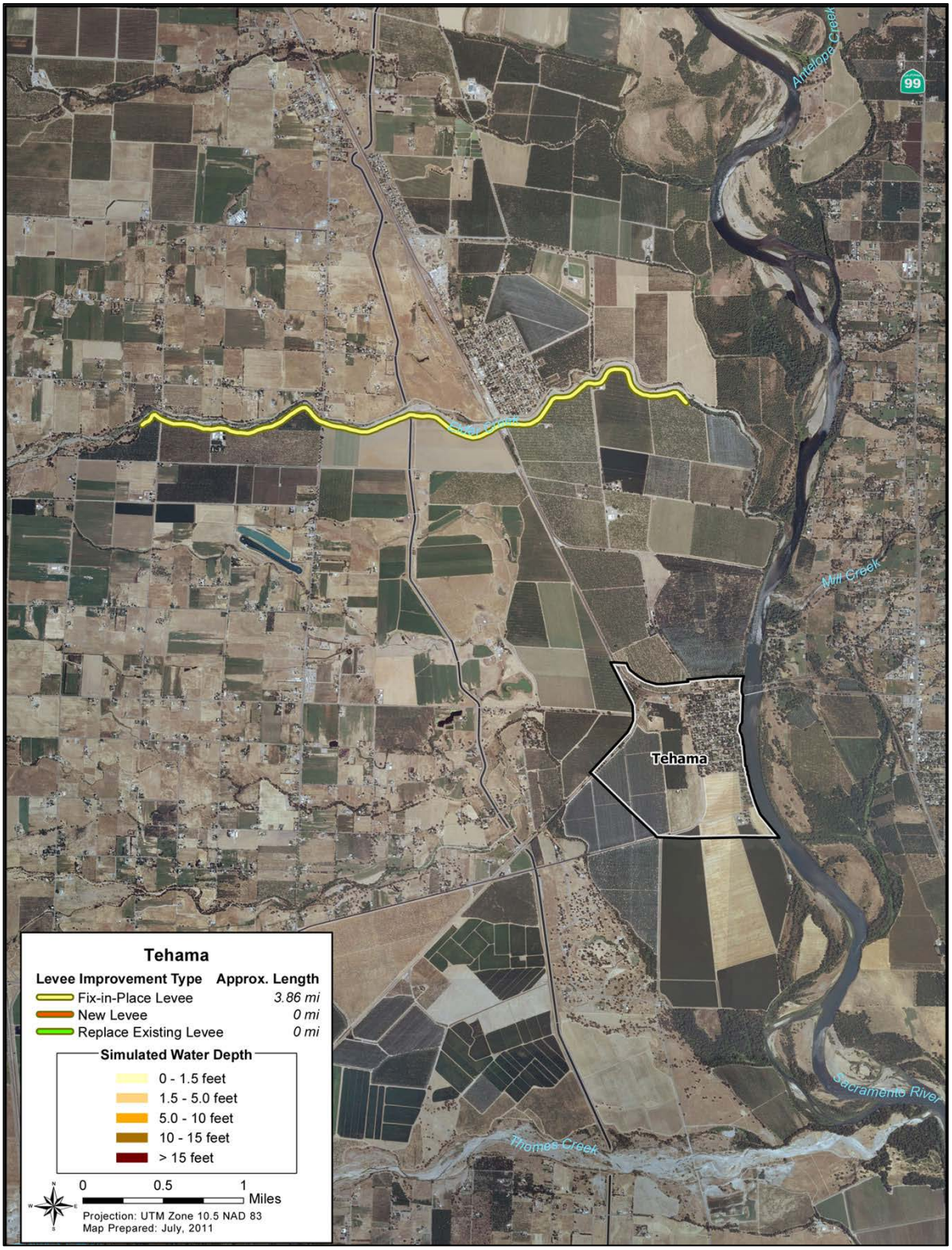

Figure D-5-7. Tehama Levees Approach

5.8 Grimes

Grimes is an unincorporated community located along the right bank of the Sacramento River in Colusa County. FLO-2D hydraulic modeling results referenced over aerial photography of Grimes (Figure D-5-8) showed that water depth from a simulated 1 percent AEP flood would be 0 to 1.5 feet. In addition, GAR (DWR, 2010) and RACER (DWR, 2011) information was reviewed for the type and cost of remediation necessary to repair the existing levee adjacent to Grimes. After analyzing the available data, it was determined that reconstruction-in-place repairs along the right bank levee of the Sacramento River, in combination with construction of a training levee south of Grimes, would protect the community from a 1 percent AEP flood (Figure D-5-8).

Recommended repairs along the right bank of the Sacramento River include remediation for under-seepage, through-seepage, nonseepage-related stability, erosion, and freeboard. The most thorough approach to repairs was chosen because of past performance issues along the levee segment associated with under-seepage, erosion, and possibly through-seepage. The cost to repair a 3.53-mile portion of the levee segment, identified in the GAR as Segment 288, was estimated to be $41.9 million, which calculates to about $11.9 million per mile. The cost per mile was then applied to only the 0.50-mile portion of Segment 288 (Figure D-5-8) to estimate the reconstruction-in-place costs. Although the cost to repair freeboard along Segment 288 to 1957 design elevations was applied to the current cost estimate, more data are needed to determine if the levee segment has the minimum 3 feet of freeboard for a 1 percent AEP level of protection. Additional costs to increase the crown elevation and overall size of the levee prism may apply.

To complete the conceptual layout, a training levee would be constructed beginning from the right bank of the Sacramento River, just south of Grimes. From the right bank of the Sacramento River, the training levee would extend westward along the edge of the community. The training levee was conservatively designed with a height of 4.5 feet (1.5 feet plus an additional 3 feet of freeboard) along the entire alignment. Refer to Table D-3-1 for cost estimates for this community.

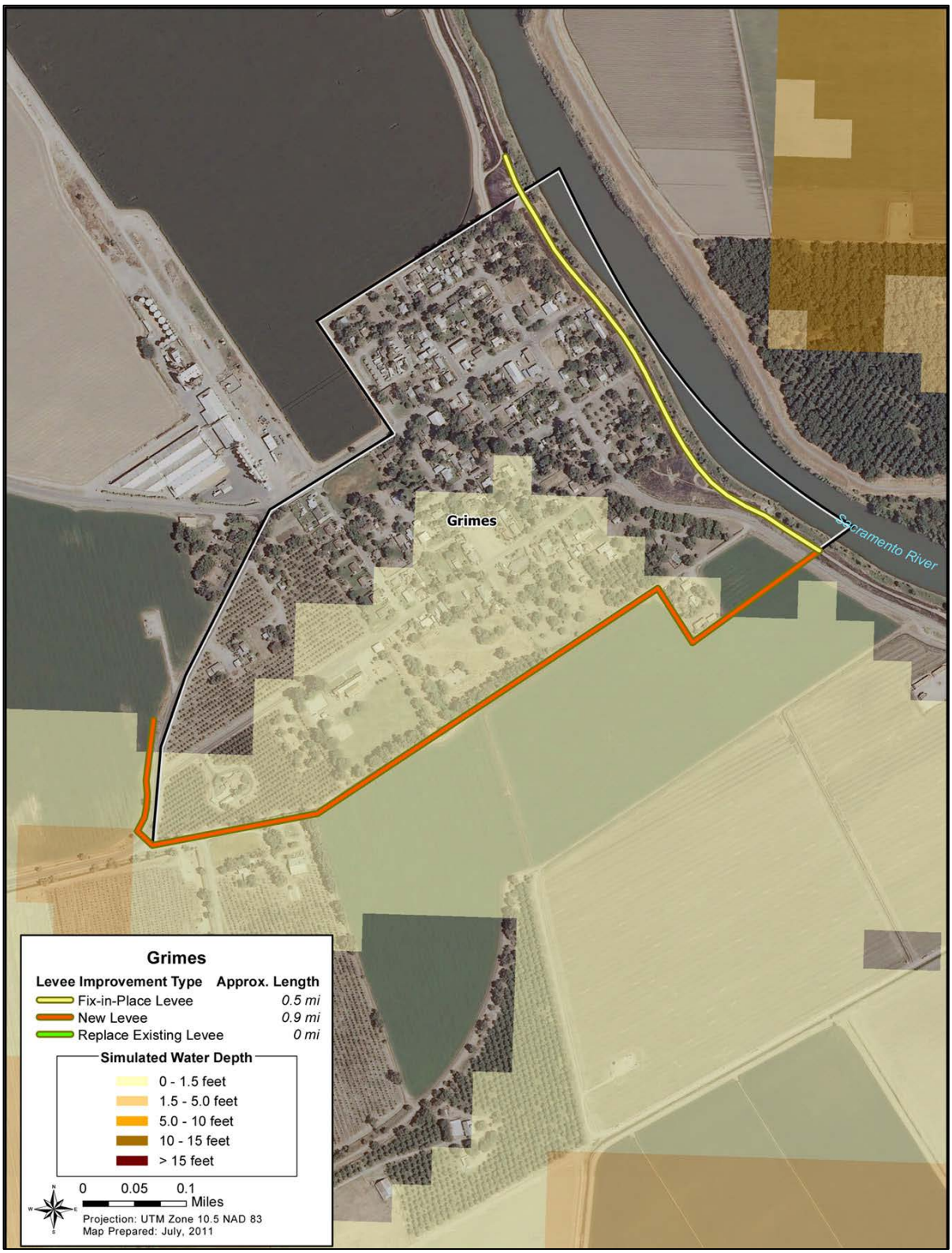

Figure D-5-8. Grimes Levee Approach

5.9 Butte City

Butte City is an unincorporated community located along the left bank of the Sacramento River in Glenn County. FLO-2D hydraulic modeling results referenced over aerial photography of Butte City (Figure D-5-9) showed that a water depth from a simulated 1 percent AEP flood would be in the range of 0 to 5 feet. In addition, GAR (DWR, 2010) and RACER (DWR, 2011) information was reviewed for the type and cost of remediation necessary to repair the existing levee adjacent to Butte City. After analyzing the available data, it was determined that reconstruction-in-place repairs along the left bank levee of the Sacramento River, in combination with the construction of a ring levee around Butte City, would protect the community from a 1 percent AEP flood (Figure D-5-9).

Recommended repairs along the left bank of the Sacramento River include remediation for under-seepage, through-seepage, seepage-related stability, erosion, and freeboard. Costs for erosion, freeboard, and geometry have been included, given previous observations of water backing up at the Highway 162 bridge just downstream from Butte City and The river channel is next to the left-bank levee with no setback. The cost to repair a 4.2-mile portion of the levee segment, identified in the GAR as Segment 68, was estimated to be $33 million, which calculates to about $7.9 million per mile. The cost per mile was then applied to only the 0.34-mile portion of Segment 68 (Figure D-5-9) to estimate the reconstruction-in-place costs. Although the cost to repair freeboard along Segment 68 to 1957 design elevations was applied to the current cost estimate, more data are needed to determine if the levee segment has the minimum 3 feet of freeboard for a 1 percent AEP level of protection. Additional costs to increase the crown elevation and overall size of the levee prism may apply.

To complete the conceptual layout, a new ring levee would be constructed, completely encircling Butte City. The 0.94-mile ring levee would begin and end at the left bank of the Sacramento River, encapsulating the portion of the existing levee to receive reconstruction-in-place repairs. The average height of 6.25 feet was calculated using a weighted average of 8 feet (5 feet plus an additional 3 feet of freeboard) for part of the alignment, and 4.5 feet (1.5 feet plus an additional 3 feet of freeboard) for the remaining sections. Refer to Table D-3-1 for cost estimates for this community.

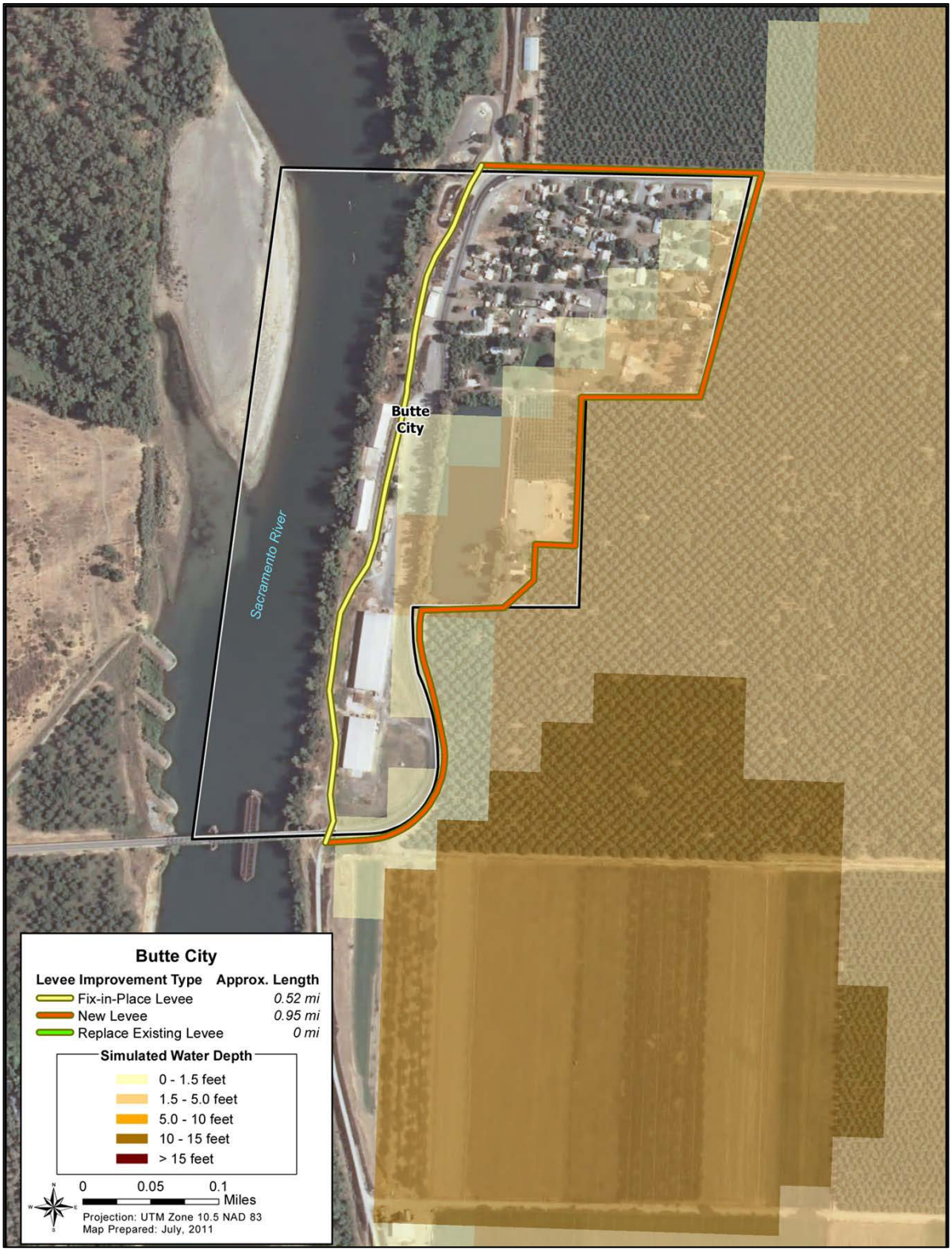

Figure D-5-9. Butte City Levees Approach

5.10 Mendota

Mendota is a city in Fresno County located 8.5 miles south-southeast of Firebaugh and about one mile west of Fresno Slough. FLO-2D hydraulic modeling results overlaid on an aerial photograph of Mendota showed that water depth during a simulated 1 percent AEP flood would range from 0 to 10 feet.

The conceptual design for Mendota would provide a ring levee system. It would involve constructing a new levee on the west, east, and south, and replacing a portion of an existing levee along the canal on the north of the city with new levees. The new levees would have 12-foot crowns, with an average height of 4.5 feet for the new levees, spanning approximately 6.5 miles in total. This option would provide protection to an area beyond the city limits (see Figure D-5-10). The new levee cost was assessed using the developed methodology. Refer to Table D-3-1 for cost estimates for this community.

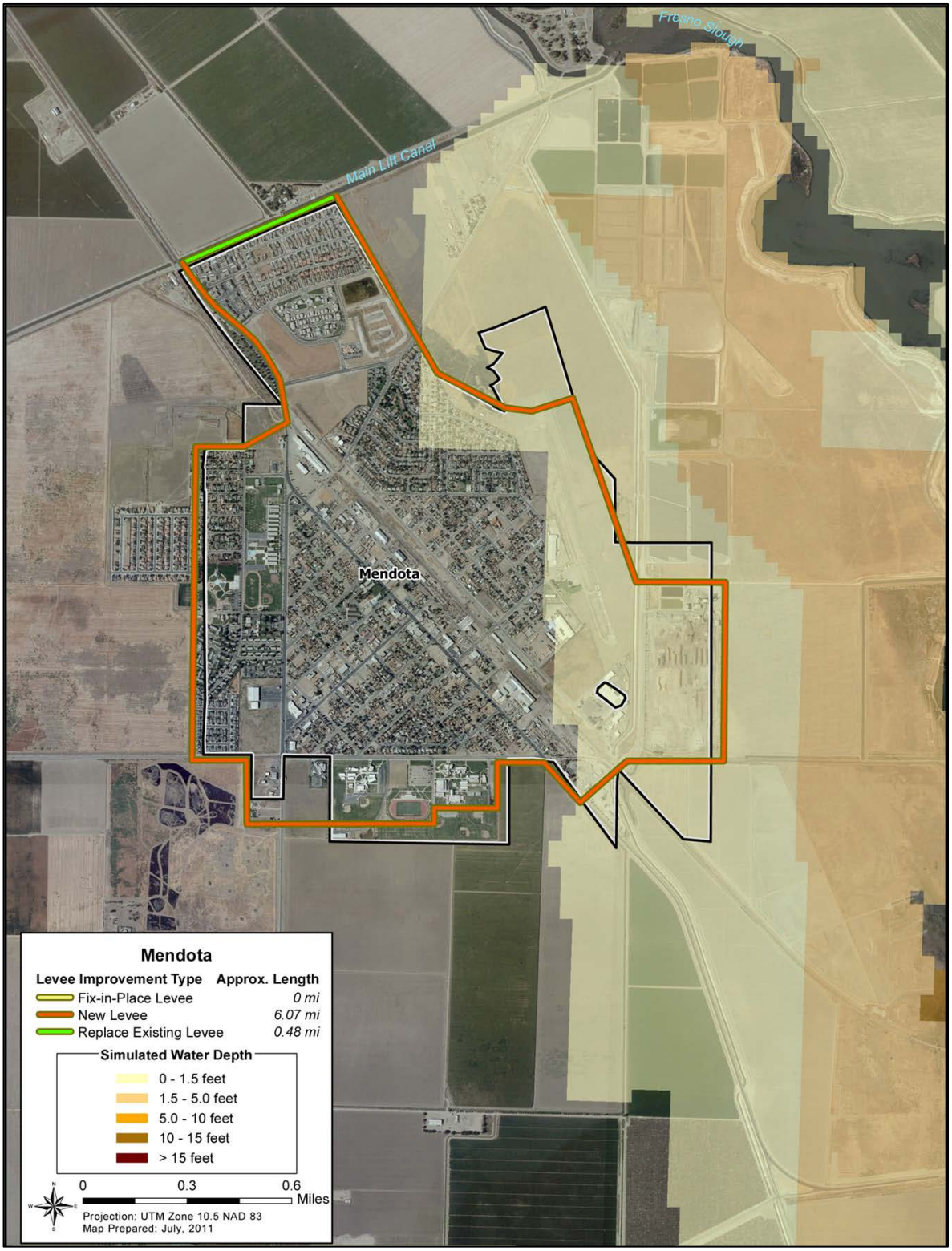

Figure D-5-10. Mendota Levees Approach

5.11 Communities Not Assessed

The communities in this section have been identified by FEMA as being in the 1 percent AEP floodplain. However, the FLO-2D hydraulic data overlaid on the aerial photography did not show 1 percent AEP inundation, and either partial or no data in the NULE GARs (DWR, 2010) were available. Because of the lack of input data, the following communities were not assessed: Palermo, Princeton, Bethel Island, Verona, Thornton, Chester, Los Molinos, Rio Vista, Tranquility, and Gerber-Las Flores. Costs for these communities were estimated parametrically based on communities of similar sizes and flood threat level. Refer to Table D-3-1 for cost estimates for this community.

6.0 Group C Communities

This section describes the conceptual design and cost estimate for each Group C community. The following is a list of the communities covered in this section:

- Dos Palos/South Dos Palos
- Biggs
- Upper Lake
- Byron
- Knightsen

6.1 Dos Palos/South Dos Palos

Dos Palos is a city in Merced County located 23 miles south-southwest of Merced. South Dos Palos is a Census-Designated Place (CDP) in Merced County located two miles southwest of Dos Palos. Because these communities are in such close proximity to each other, they were assessed as one area. FLO-2D hydraulic modeling results overlaid on an aerial photograph of Dos Palos/South Dos Palos showed no inundation during a simulated 1 percent AEP flood (Figure D-6-1).

Because no inundation was shown, constructing a new levee was not an option. Therefore, the conceptual design would be a reconstruction-in-place alternative repairing all of Levee Segments 5028 and 5029, as described in the NULE GAR (DWR, 2010). This option would provide protection to an area beyond the city (Figure D-6-1). The least-cost alternative, as shown in the RACER (DWR, 2011), was used for each segment, giving a total capital cost estimate of $2.4 million. This cost does not include expenses associated with levee raises, which were not assessed at this time because data from the UNET model are pending.

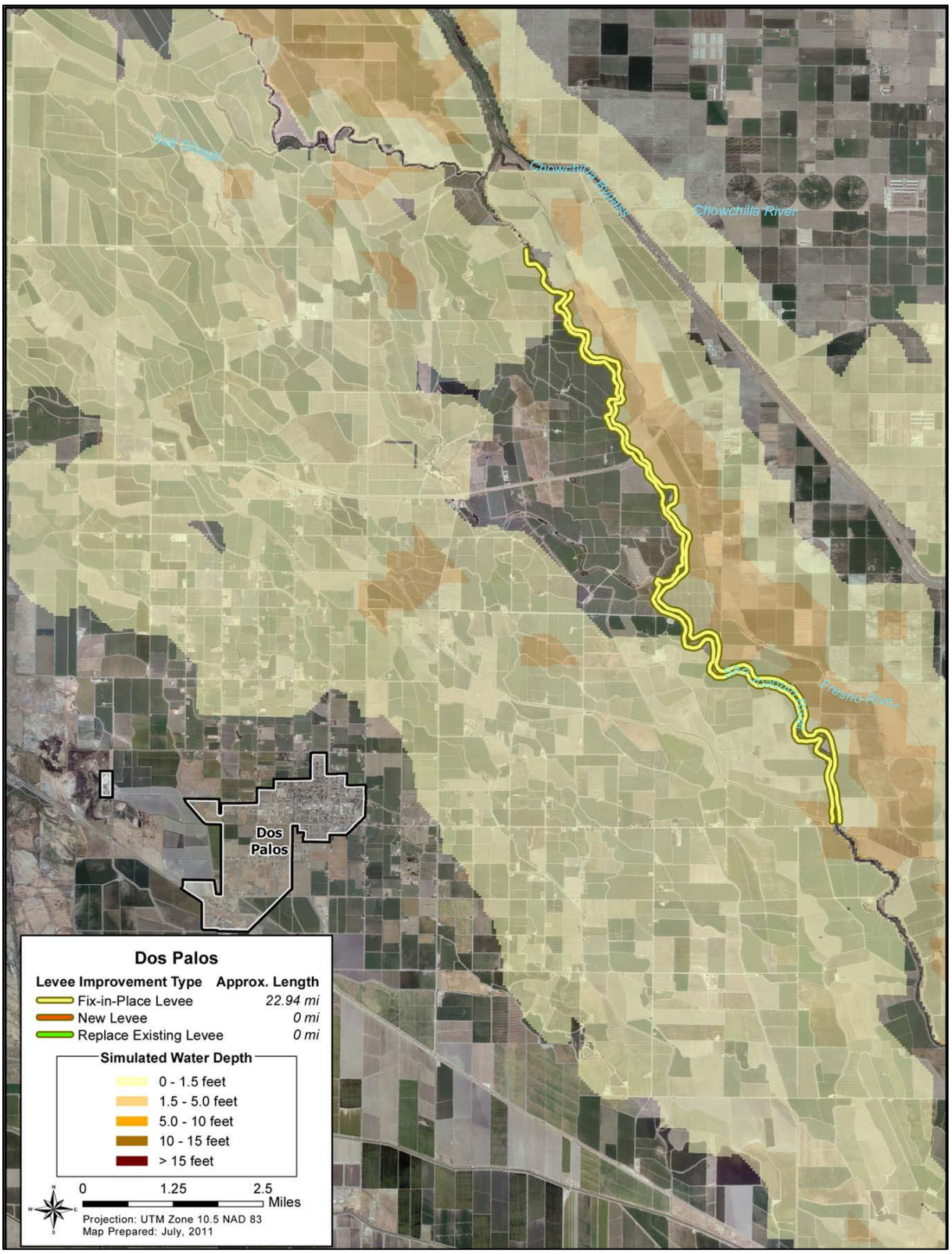

Figure D-6-1. Dos Palos Levees Approach

6.2 Biggs

Biggs is a city in Butte County about one mile west of State Route 99 and three miles north of Gridley. FLO-2D hydraulic modeling results overlaid on an aerial photograph of Biggs showed no inundation during a simulated 1 percent AEP flood.

Because no inundation was shown, constructing a new levee was not an option. A reconstruction-in-place alternative repairing the entire Levee Segment 110, as described in NULE GAR (DWR, 2010), was then considered. Cost estimates for this community is included in Table D-3-1.

6.3 Upper Lake

Upper Lake is an unincorporated community situated between the left bank of Middle Creek and the left bank of Alley Creek in Lake County. FLO-2D hydraulic modeling results overlaid on aerial photograph of Upper Lake did not show flooding from a simulated 1 percent AEP flood, although Upper Lake is identified by FEMA as being in a 1 percent AEP floodplain. GAR (DWR, 2010) and RACER (DWR, 2011) information was reviewed for the type and cost of remediation necessary to repair the existing levees adjacent to Upper Lake. After analyzing the available data, it was determined that reconstruction-in-place repairs along the entire lengths of the left bank levee of Middle Creek and the left bank levee of Alley Creek adjacent to Upper Lake would address flooding potential until more data become available.

The recommended repairs along the left bank of Middle Creek and the left bank of Alley Creek include only remediation for freeboard and geometry. Given that FLO-2D hydraulic modeling results were unable to confirm areas of inundation, the least-cost alternatives were selected to repair the entire length of both levee segments (Figure D-6-2). The left bank of Middle Creek (Reaches 1 and 2) is identified in the GAR as Segment 81. The left bank of Alley Creek is identified in the GAR as Segment 267. Refer to Table D-3-1 for cost estimates for this community. Although the cost to restore freeboard along Segment 100 to 1957 design elevations was applied to the current cost estimate, more data are needed to determine if both Segment 81 and Segment 267 have the minimum 3 feet of freeboard for a 1 percent AEP level of protection. Additional costs to increase the crown elevation and the overall size of the levee prism may apply.

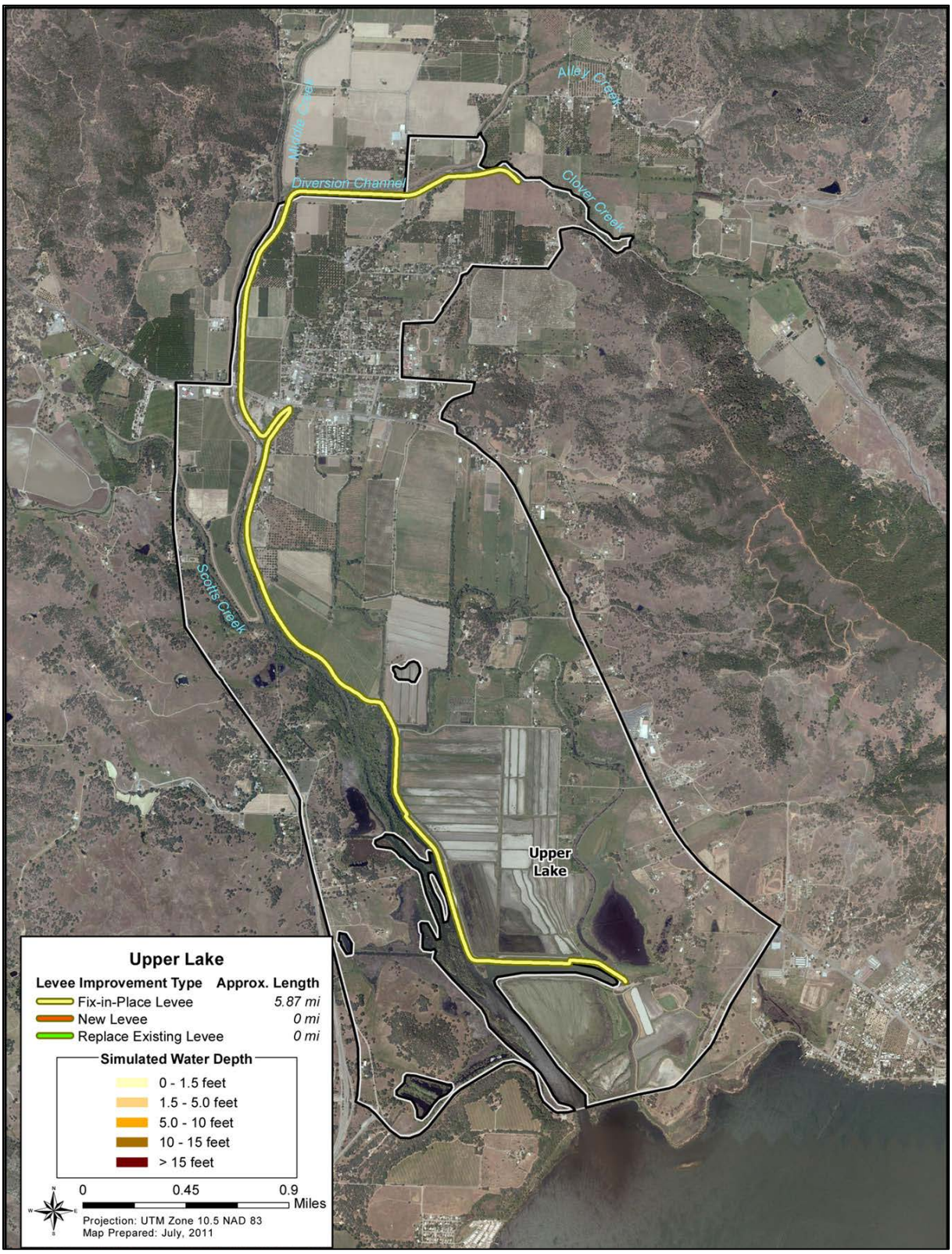

Figure D-6-2. Upper Lake Levees Approach

6.4 Communities Not Assessed

The communities in this section have been identified by FEMA as being in the 1 percent AEP floodplain. However, the FLO-2D hydraulic data overlaid on the aerial photography did not show 1 percent AEP inundation, and either partial or no data in the NULE GARs (DWR, 2010) were available. Due to the lack of input data, the communities of Byron and Knightsen were not assessed. Costs for these communities were estimated parametrically based on communities of similar sizes and flood threat level. Refer to Table D-3-1 for cost estimates for this community.

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7.0 References

California Department of Water Resources (DWR). 2011. South Non-Urban Levee Evaluation (NULE) Project Remediation Alternatives and Cost Estimate Report (RACER). June.

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_____. 2011. Flood Control System Status Report (FCSSR) Conceptual Cost Estimating Memorandum-DRAFT.

DWR. *See* California Department of Water Resources.

USACE. *See* U.S. Army Corps of Engineers.

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8.0 Acronyms and Abbreviations

AACE ..... Association for the Advancement of Cost Engineering

AF ..... acre-feet

Annual Report ..... Local Agency Annual Report

Board ..... Central Valley Flood Protection Board

CDP ..... Census-Designated Places

CFR..... Code of Federal Regulations

cfs ..... cubic feet per second

CVFPP ..... Central Valley Flood Protection Plan

Delta..... Sacramento-San Joaquin Delta

DWR ..... California Department of Water Resources

FCSSR..... Flood Control System Status Report

GAR ..... Geotechnical Assessment Reports

NULE ..... Non-urban Levee Evaluations

O&M..... operations and maintenance

PCE..... Parametric Cost Estimation

PCET ..... Parametric Cost Estimating Tool

RACER ..... Remedial Alternatives and Cost Estimate Report

RD..... Reclamation District

SPFC ..... State Plan of Flood Control

TRLIA..... Three Rivers Levee Improvement Authority

ULDC ..... Urban Levee Design Criteria

ULE..... Urban Levee Evaluations

USACE..... U.S. Army Corps of Engineers

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CENTRAL VALLEY
FLOOD MANAGEMENT
PLANNING PROGRAM

FloodSAFE
CALIFORNIA

2012 Central Valley Flood Protection Plan

Attachment 8J: Cost Estimates
Appendix E – Flood Corridor Expansion

June 2012

STATE OF CALIFORNIA
THE NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

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Table of Contents

1.0 Introduction E-1-1
1.1 Promote Ecosystem Functions E-1-2
1.2 Improve Operations and Maintenance E-1-2
1.3 Promote Multi-Benefit Projects E-1-2
1.4 Improve Institutional Support E-1-2

2.0 Conceptual Design Approach E-2-1

3.0 Costs Basis and Development E-3-1

4.0 References E-4-1

5.0 Acronyms and Abbreviations E-5-1

List of Appendix Tables

Table E-3-1. Cost Assumptions for Setback Levees E-3-1

Table E-3-2. Conceptual Setback Levee Projects and Quantities E-3-2

Table E-3-3. Summary of Conceptual Setback Levee Costs E-3-3

List of Appendix Figures

Figure E-2-1. Generalized Map of 1.5-Year and 2-Year Spring Flow Floodplain Inundation Potential – Sacramento River E-2-2

Figure E-2-2. Hypothetical Cross Section with Boundary Water Surfaces of Floodplain Inundation Potential Categories E-2-3

Figure E-2-3. Preliminary Setback Levee Conceptual Projects Included In Enhance Flood System Capacity Approach, Sacramento River E-2-4

Figure E-2-4. Preliminary Setback Levee Conceptual Projects Included in Enhance Flood System Capacity Approach, San Joaquin River E-2-5

Figure E-3-1. MSAC1 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, Sacramento River E-3-4

Figure E-3-2. MSAC2 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, Sacramento River E-3-5

Figure E-3-3. MSAC3 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, Sacramento River E-3-6

Figure E-3-4. FTR1 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, Feather River E-3-7

Figure E-3-5. LSJ1 & LSJ2 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, San Joaquin River E-3-8

Figure E-3-6. MSJ1 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, San Joaquin River E-3-9

Figure E-3-7. USJ1 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, San Joaquin River E-3-10

Figure E-3-8. USJ2 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, San Joaquin River E-3-11

Appendix E

1.0 Introduction

This appendix documents conceptual design and cost estimates for flood corridor expansion features, including levee setbacks. As shown in the Draft 2012 CVFPP Attachment 8J, Table 3-3, the levee setback features described in this appendix are included as part of the Enhance Flood System Capacity Approach, one of the three preliminary approaches considered. However, they are not included in the other preliminary approaches or the preferred State Systemwide Investment Approach.

The CVFPP goals include the primary goal of Improving Flood Risk Management. Widening sections of the Sacramento and San Joaquin rivers by setting levees back from their existing locations would appear to create additional capacity during floods. However, hydraulic modeling of widened river channels has shown little systemwide hydraulic benefit. This is because flooding potential under the larger hydrologic events is still possible if channel capacity upstream and downstream from the widened section remains constricted, thus creating flood stage levels high enough to threaten existing levee integrity. The limited hydraulic impact of levee setbacks illustrates the need for systemwide analysis when addressing flood risk. However, setback levees can be applied to a comprehensive strategy and even provide benefits outside direct flood stage reduction.

The CVFPP goals also include the following supporting goals:

- Improve Operations and Maintenance
- Promote Ecosystem Functions
- Improve Institutional Support
- Promote Multi-Benefit Projects

Levee setback opportunities that do not create significant additional flow capacity can still provide benefits to many of the CVFPP supporting goals.

1.1 Promote Ecosystem Functions

If setbacks are created in areas with strong potential for frequent high water inundation, those areas may create improved riparian habitat for many species.

1.2 Improve Operations and Maintenance

A primary cost element in levee maintenance is the repair of erosion areas after high flow events. In other words, the more often a levee is used to contain high flow events, the more likely it is to lose material and its preferred geometry. Levees that are frequently challenged by high flow events and are left unmaintained or unrepaired for erosion issues have a higher probability of a structural failure. Setting back levees in such areas can reduce the average flow cycles of wetting and erosion, thereby reducing the long-term erosion repair costs.

The simplest reduction in Operations and Maintenance (O&M) effort and costs comes from the reduction of levee length. Levees that are set back and no longer follow the historical meander of the river can be straightened, thus shortening the length of the levee asset. The river channel would be allowed to meander within the levee boundaries, but the setback levees would not constrain the river's path in a direct way for lower flow.

1.3 Promote Multi-Benefit Projects

Setback levees created in the right areas can reconnect a river system to historical floodplain areas, oxbow lakes and ponds, as well as native tree groves. In the future, these areas can be developed into habitat restoration areas or used to foster recreation opportunities.

1.4 Improve Institutional Support

As setback levee locations are identified, and modern levees are built to replace older levees, flood risk management improves because of the greater structural reliability of levees built to current standards. In this way, setback levees can gain additional local support. Additional support can be obtained for improved flood risk management based on the natural synergy between levee setback projects and nongovernment organizations (NGO) advocating plant and wildlife restoration. Also, recent projects have been able to demonstrate additional economic benefits from new or

preserved wildlife habitats created by levee setbacks. Projects that may have previously had participation only from a local agency or government entities such as DWR or USACE now have participation from the California Department of Fish and Game (DFG) and the U.S. Fish and Wildlife Service (USFWS).

Additional stakeholder and institutional support increases a project's potential for success. As projects are increasingly assessed for not only their economic benefits, but also for their social and environmental benefits, additional institutional support becomes helpful, and in some cases, necessary for project completion.

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2.0 Conceptual Design Approach

As part of the CVFPP, hydrologic and hydraulic analyses were combined with detailed topographic information from Light Detection and Ranging (LiDAR) data to identify areas adjacent to existing levees in the Sacramento and San Joaquin river watersheds that were likely to inundate with spring wet-weather river flow in 1.5-year and two-year recurrence intervals. A map demonstrating this inundation potential modeling is shown in Figure E-2-1.

Ecosystem restoration is a key component of the CVFPP, and management actions related to habitat restoration have been drafted as part of the CVFPP planning process. Further refinement of these management actions will be formed by an understanding of habitat restoration opportunities, in terms of the location, acreage, and expected ecosystem benefits of each management action, that are possible within the context of the SPFC. Specifically, identifying suitable setback area locations, defining the extent of the work, and developing a preliminary cost can advance the habitat restoration component of the CVFPP.

The basis for a preliminary assessment of setback levee locations was output from the floodplain restoration opportunities analysis (FROA). Attachment 2: Conservation Framework and its supporting documentation contain detailed descriptions of the ecosystem restoration opportunities analysis. Figure E-2-2 shows the conceptual intent of setback levees for restoration opportunities and the hydraulic connectivity that can be achieved seasonally.

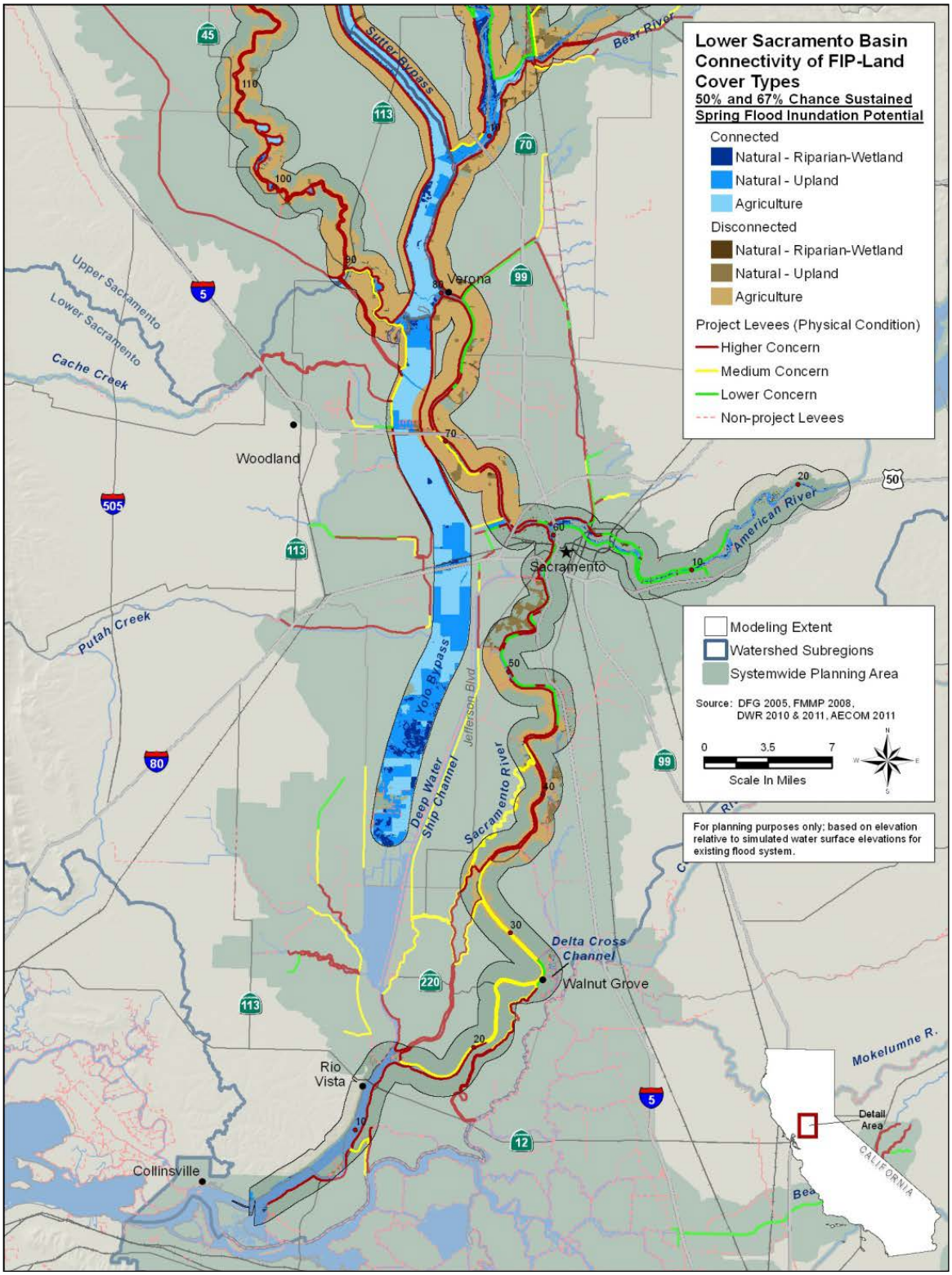


Figure E-2-1. Generalized Map of 1.5-Year and 2-Year Spring Flow Floodplain Inundation Potential – Sacramento River

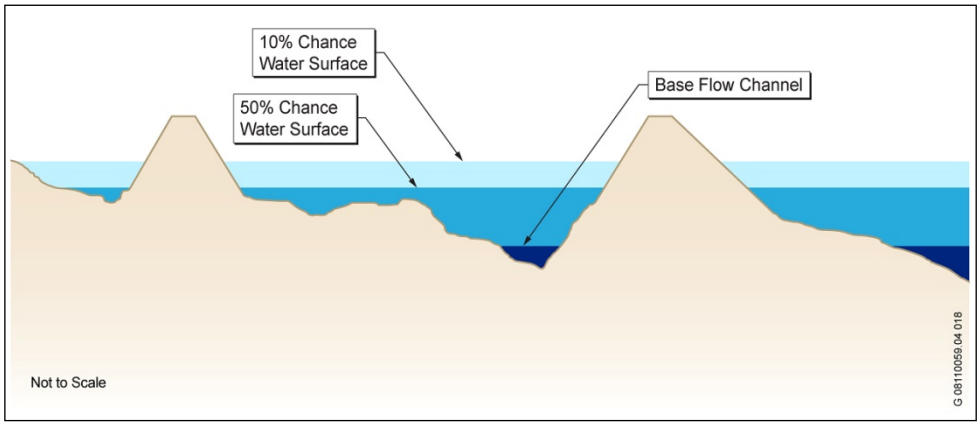


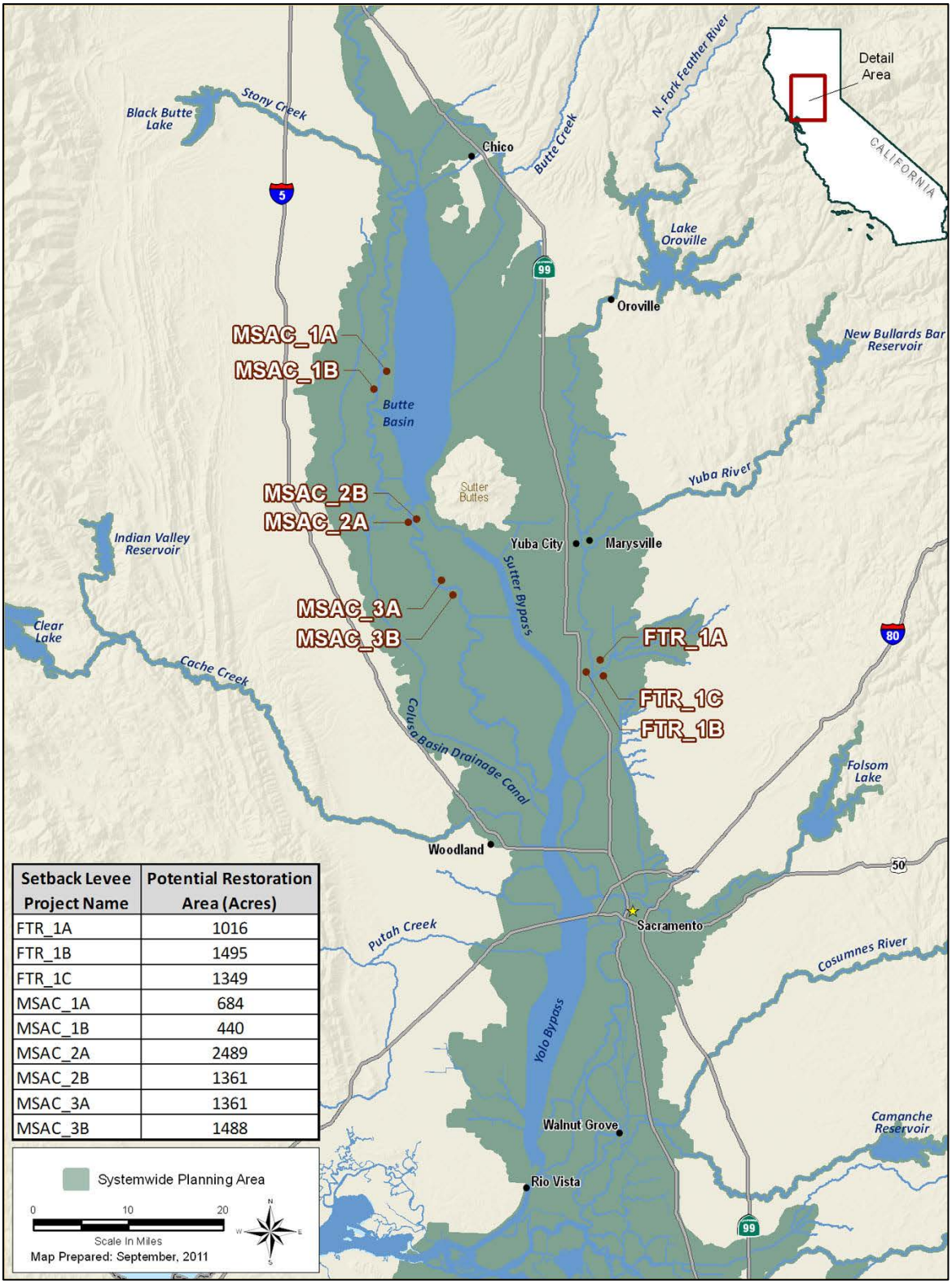
Figure E-2-2. Hypothetical Cross Section with Boundary Water Surfaces of Floodplain Inundation Potential Categories

Results of the FROA support identification, prioritization, and further development of specific restoration opportunities. Opportunities are identified and prioritized on the basis of their potential ecological, flood management, and other benefits (e.g., reduced maintenance and regulatory compliance costs); cost; and regulatory, institutional, technological, and operational feasibility.

The cost component of the restoration opportunities should come from some level of specific analysis of restoration potential and conceptual design of the setback levees themselves. In this way, specific project impacts and quantities can be estimated, and accepted cost principles applied.

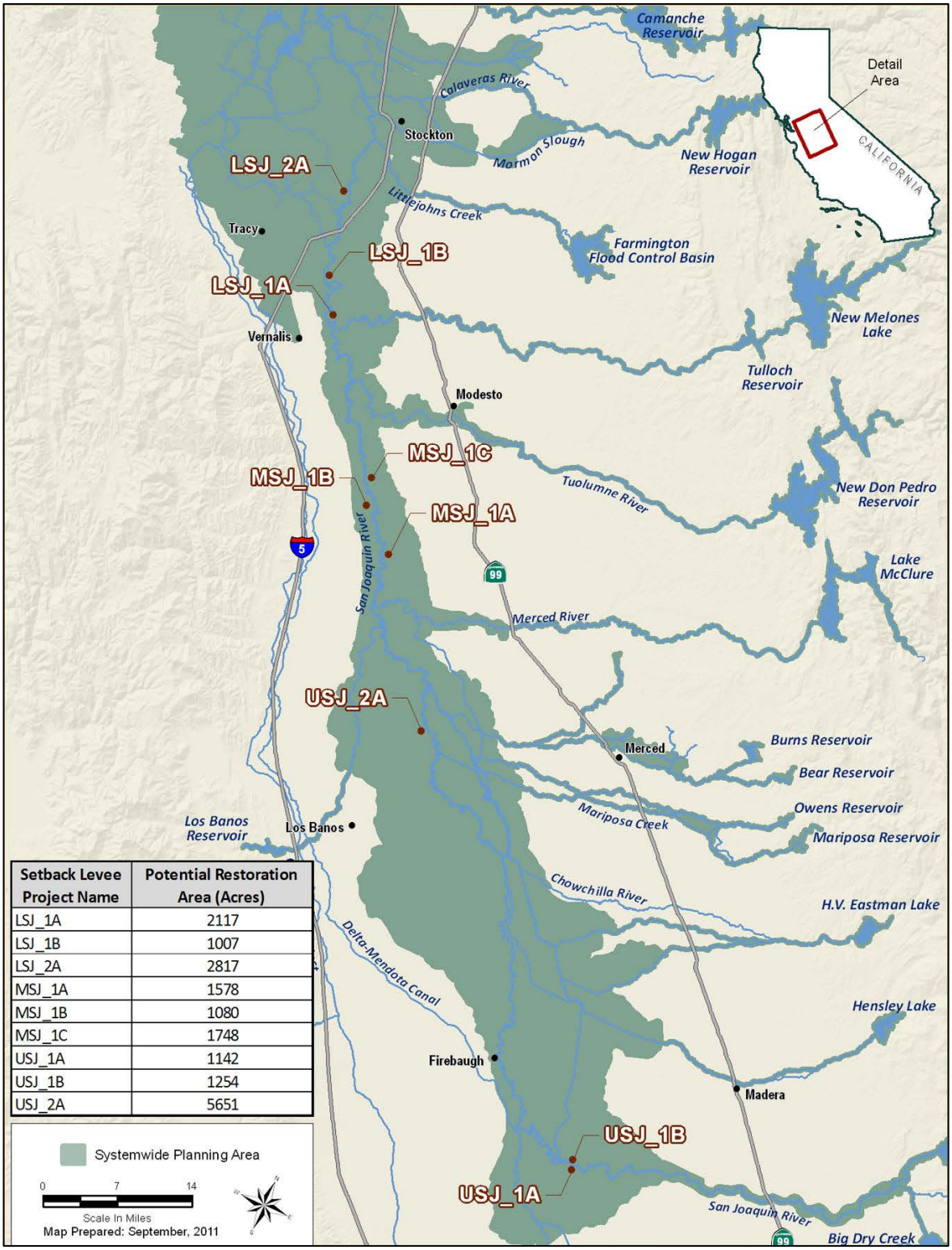
Using the Flood Inundation Potential (FIP) maps, setback levees were located to follow existing contours and avoid removing and replacing major infrastructure such as roads, canals, bridges, and residential and agricultural/industrial developments. Preliminary locations were identified and design concepts developed for setback levees for the purpose of developing a cost component for the Enhance Flood System Capacity Approach, one of the three preliminary approaches considered for the CVFPP. The preliminary setback levee locations are shown in Figures E-2-3 and E-2-4.

It should be noted that rural setback levees are not included in the preferred State Systemwide Investment Approach. However, if these features are recommended for implementation in the future, setback levee locations would be subject to change based on additional information about geotechnical conditions, existing utilities, and other factors that have not yet been evaluated or considered.



Setback Levee Project Name	Potential Restoration Area (Acres)
FTR_1A	1016
FTR_1B	1495
FTR_1C	1349
MSAC_1A	684
MSAC_1B	440
MSAC_2A	2489
MSAC_2B	1361
MSAC_3A	1361
MSAC_3B	1488

Figure E-2-3. Preliminary Setback Levee Conceptual Projects Included In Enhance Flood System Capacity Approach, Sacramento River



Setback Levee Project Name	Potential Restoration Area (Acres)
LSJ_1A	2117
LSJ_1B	1007
LSJ_2A	2817
MSJ_1A	1578
MSJ_1B	1080
MSJ_1C	1748
USJ_1A	1142
USJ_1B	1254
USJ_2A	5651

Figure E-2-4. Preliminary Setback Levee Conceptual Projects Included in Enhance Flood System Capacity Approach, San Joaquin River

Conceptual setback levee opportunities were used for the purpose of estimating preliminary costs for the State Systemwide Investment Approach, and are described in Section 3.0. These conceptual setback levee projects provided representative information on levee lengths (for new and removed levees), land areas, and other quantities needed to estimate preliminary costs. However, further studies are needed to identify specific setback levee locations and projects for consideration in future CVFPP updates.

3.0 Costs Basis and Development

Costs were generated for setback levees parametrically. Unit costs were developed based on land type and levee function from other representative studies and construction projects for setback levees. Table E-3-1 lists cost development assumptions.

Table E-3-1. Cost Assumptions for Setback Levees

Element	Cost or Percentage
Environmental, Permitting, Engineering, and Feasibility	25%
ROW Cost	$22,000 per acre
New Setback Levee Cost	$20 – $25 million/mile
Levee Removal Cost	$5 – $10 million/mile
Fix-in-Place Levee Cost	$15 – $20 million/mile

Key:
ROW = right-of-way

Setback projects and data are listed in Table E-3-2. Four conceptual setback levee projects were identified in the Sacramento River, and five conceptual setback levee projects were identified in the San Joaquin River.

Table E-3-2. Conceptual Setback Levee Projects and Quantities

Project	Basin	Region	New Levee Length (miles)	Removed Levee Length (miles)	Fix-in-Place Levee Length (miles)	Restored Area (acres)
FTR1	Sacramento	Feather	5.6	8.4	9.3	4,000
MSAC1	Sacramento	Mid-Sac	4.3	5.7	4.3	1,000
MSAC2	Sacramento	Mid-Sac	8.4	15.2	5.2	3,000
MSAC3	Sacramento	Mid-Sac	7.8	10.7	6.2	2,000
LSJ1	San Joaquin	Lower SJ	5.6	12.8	7.7	3,000
LSJ2	San Joaquin	Lower SJ	5.6	8.4	9.3	2,000
MSJ1	San Joaquin	Middle SJ	10.6	11.6	2.5	4,000
USJ1	San Joaquin	Upper SJ	7.1	8.5	2.6	2,000
USJ2	San Joaquin	Upper SJ	10.4	11.3	12.5	5,000
Totals			**65.4**	**92.6**	**59.4**	**26,000**

Key:
Sac = Sacramento
SJ = San Joaquin

The conceptual setback projects would create 26,000 acres of potential riparian habitat. The habitat created may bring additional institutional support and financial benefits to the CVFPP. Setback projects would also reduce monitored and maintained levee length by 27 miles. This would save a significant amount of money in annual maintenance.

Rural setback levees are not included in the State Systemwide Investment Approach. However, if these projects were to move forward toward implementation, they would require a feasibility-level analysis of alternatives. The analysis would need to further assess the impacts to existing agricultural uses, local infrastructure, and river and levee access. Additional detail for the conceptual setback levee approach is shown for each project in Figures E-3-1 through E-3-8.

The high and low range of conceptual construction costs are listed in Table E-3-3. The nine projects would cost between $3.2 billion and $4.5 billion to construct. This cost does not include long-term maintenance and restoration costs (tree, shrub, grass plantings, temporary irrigation) for the restoration acreage.

Table E-3-3. Summary of Conceptual Setback Levee Costs

Project	Total Construction Cost (low)	Total Construction Cost (high)
FTR1	$381,408,500	$519,854,050
MSAC1	$201,276,950	$294,718,650
MSAC2	$386,807,260	$552,329,180
MSAC3	$345,190,150	$490,166,950
LSJ1	$356,844,340	$509,253,520
LSJ2	$337,408,500	$475,854,050
MSJ1	$395,038,150	$540,414,650
USJ1	$268,030,710	$381,322,830
USJ2	$562,191,900	$755,309,700
Totals	**$3,234,196,460**	**$4,519,223,580**

Note:
The cost components in this table are included in only one CVFPP approach: the Enhance Flood System Capacity Approach, one of three preliminary approaches considered but not recommended for implementation.

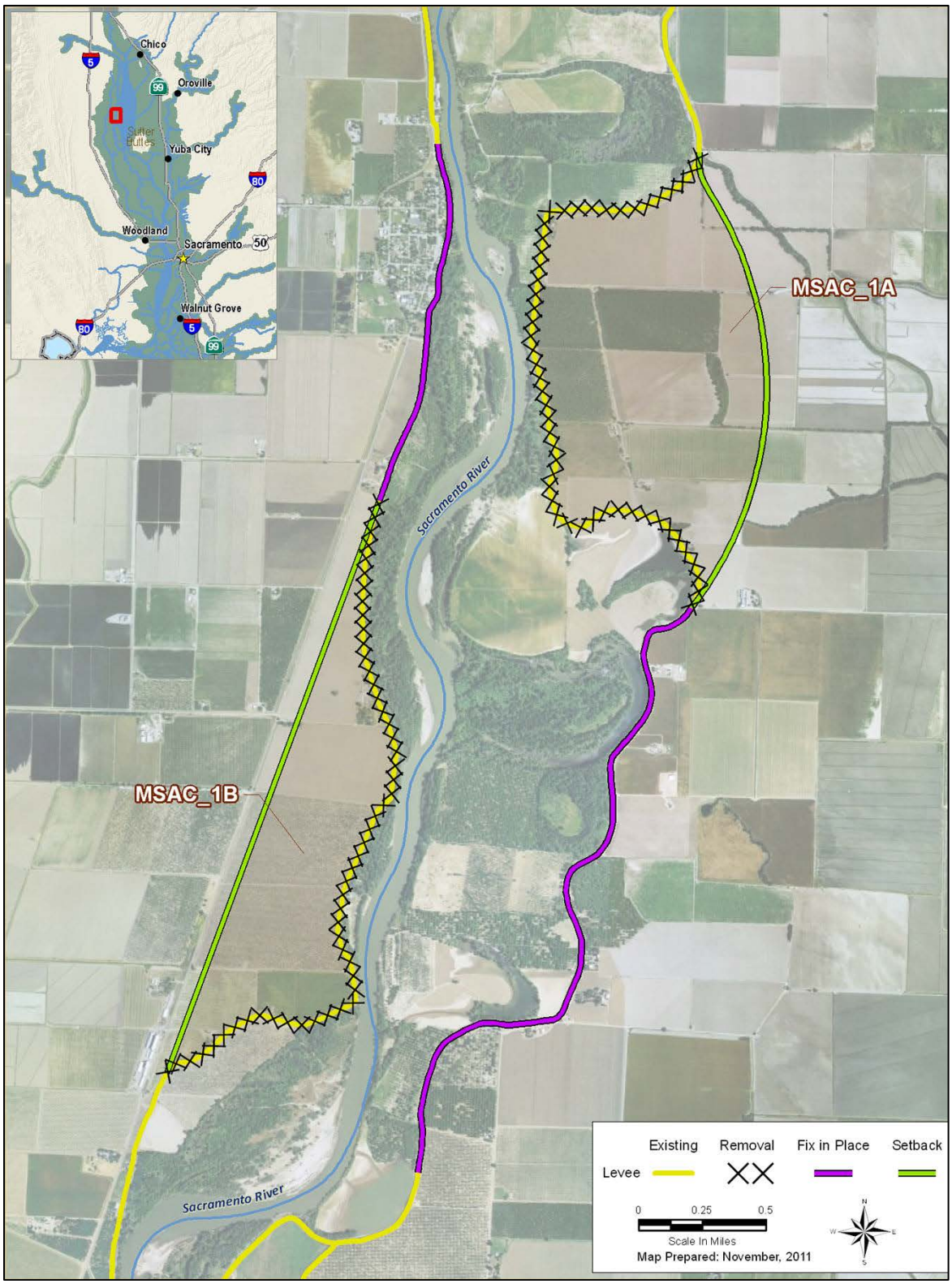


Figure E-3-1. MSAC1 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, Sacramento River

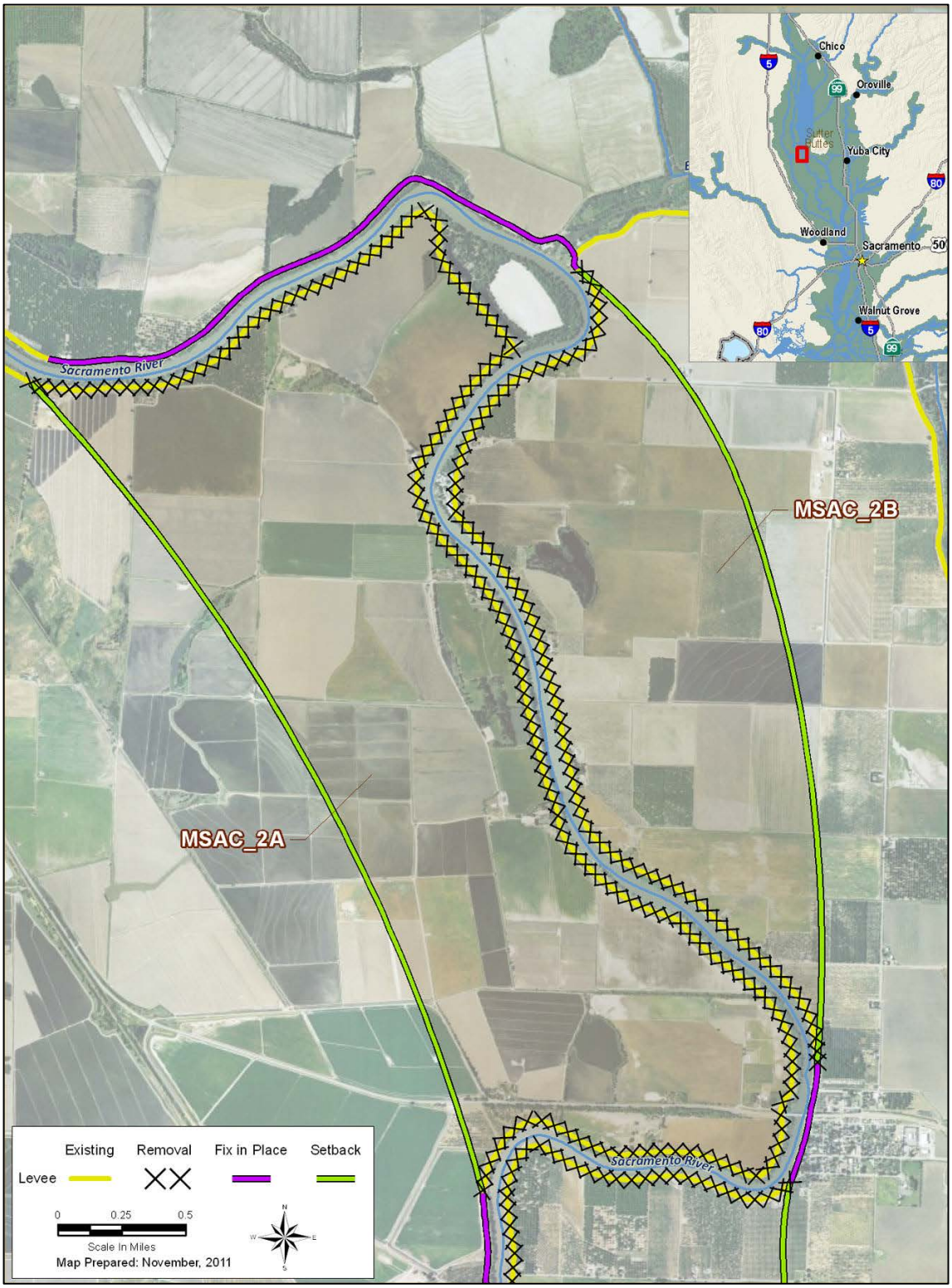


Figure E-3-2. MSAC2 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, Sacramento River

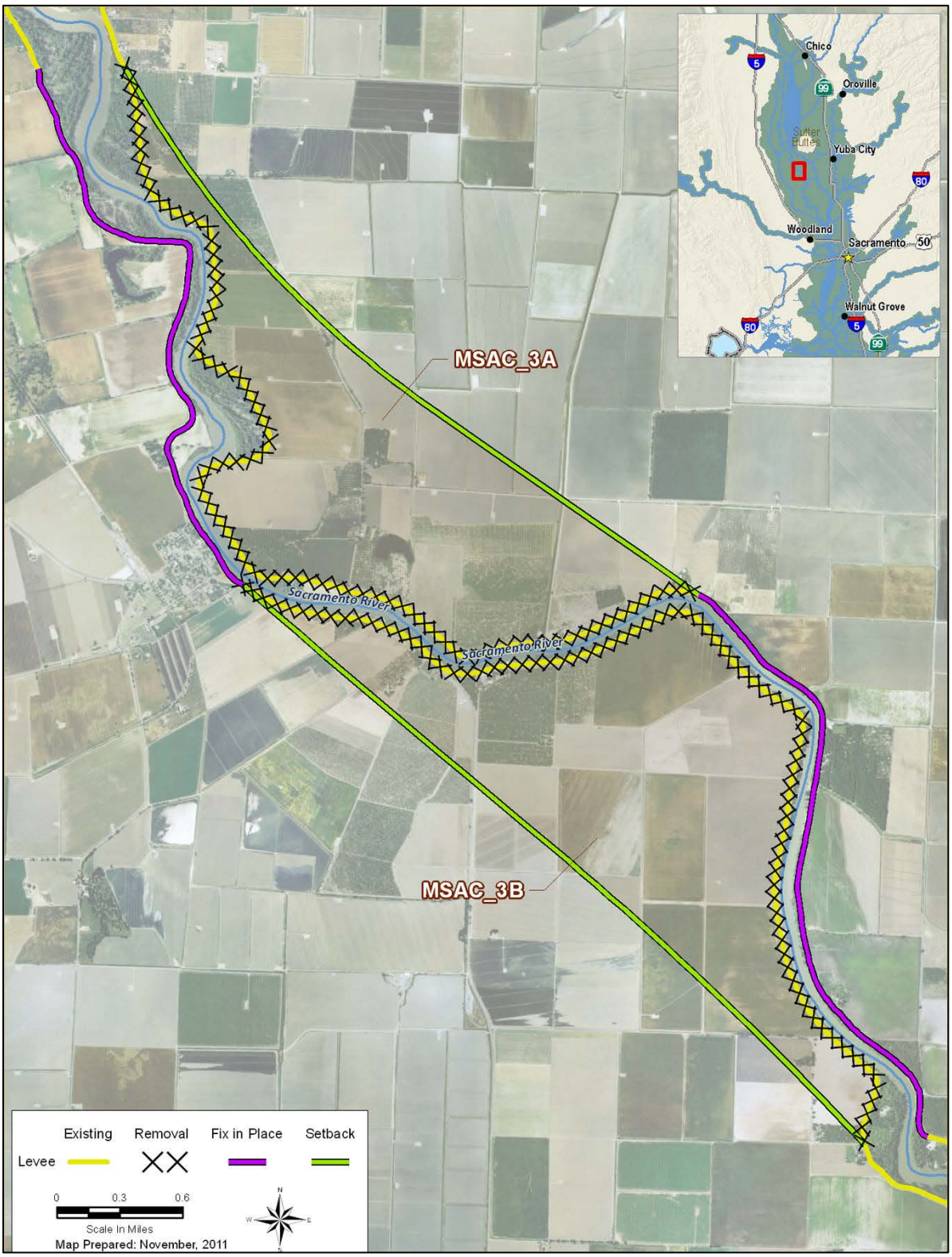


Figure E-3-3. MSAC3 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, Sacramento River

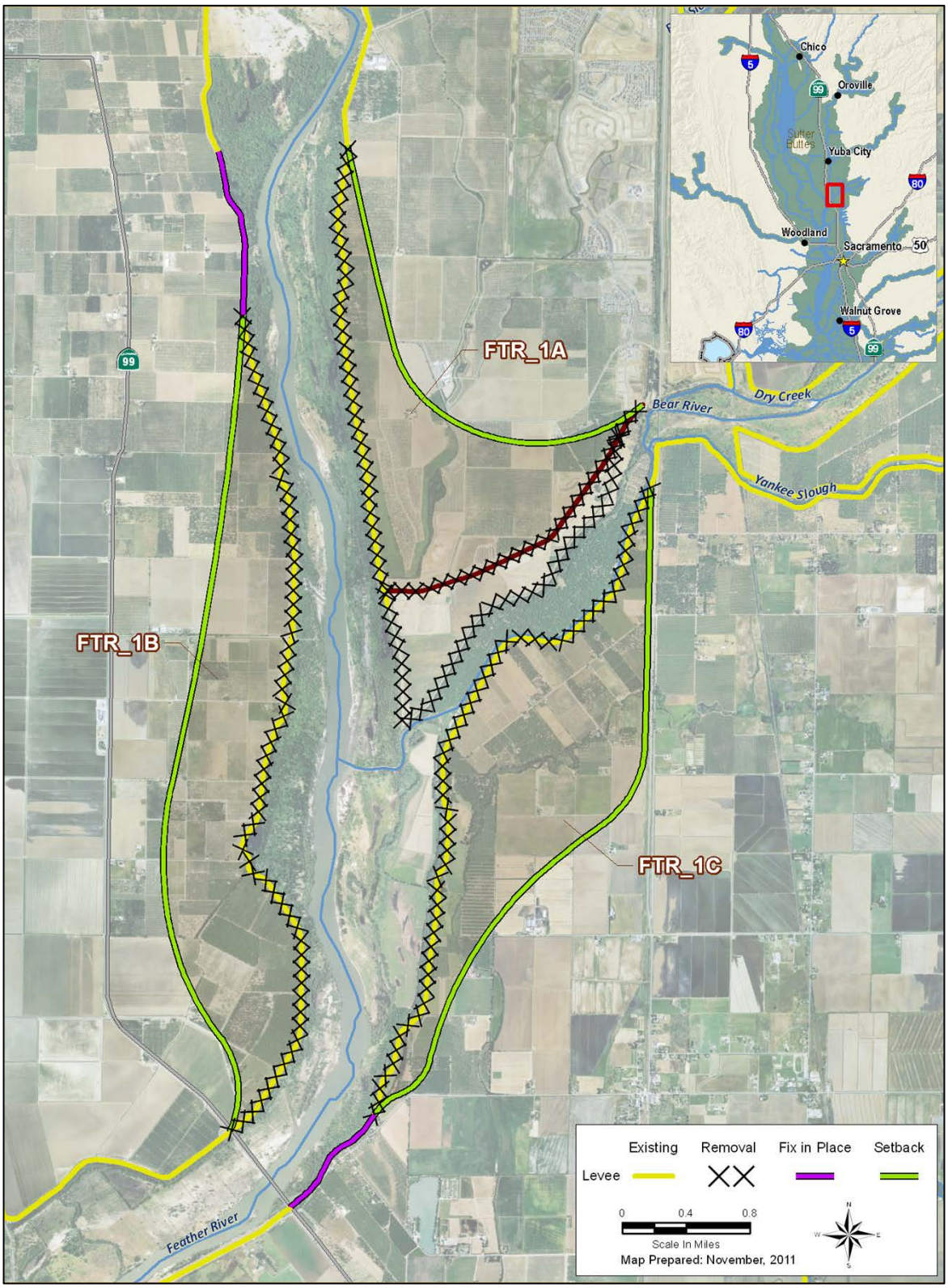


Figure E-3-4. FTR1 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, Feather River

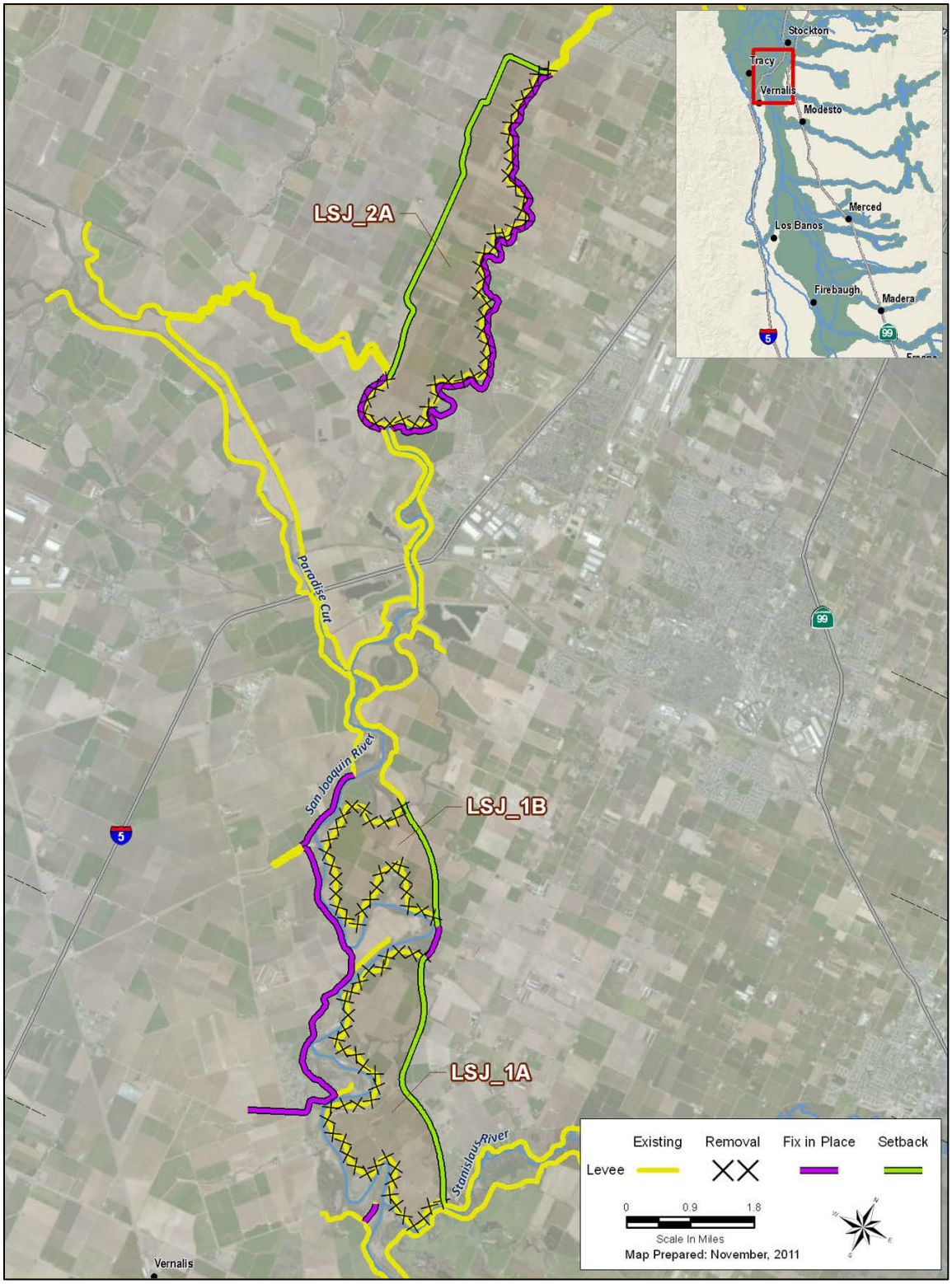


Figure E-3-5. LSJ1 & LSJ2 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, San Joaquin River

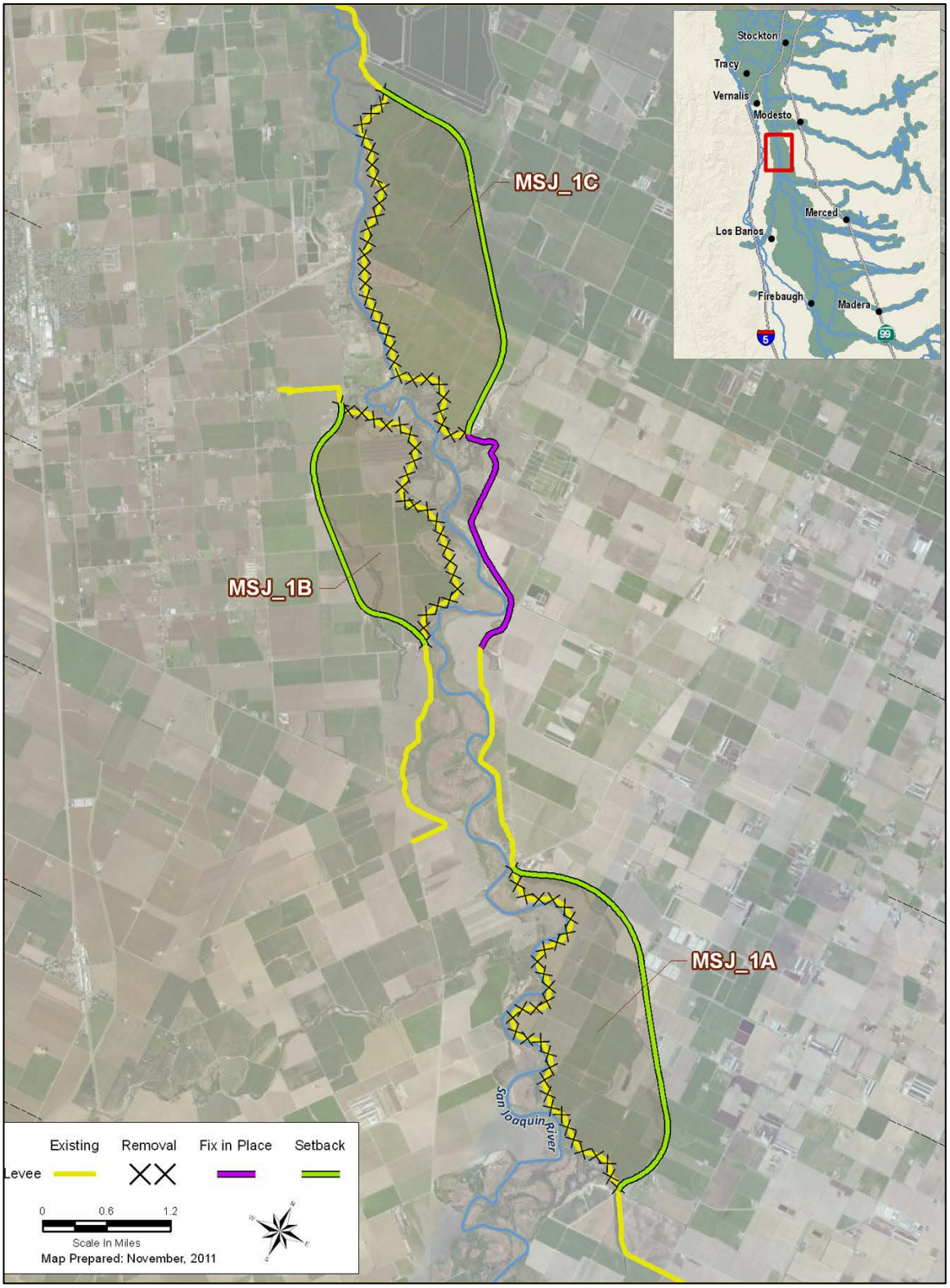


Figure E-3-6. MSJ1 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, San Joaquin River

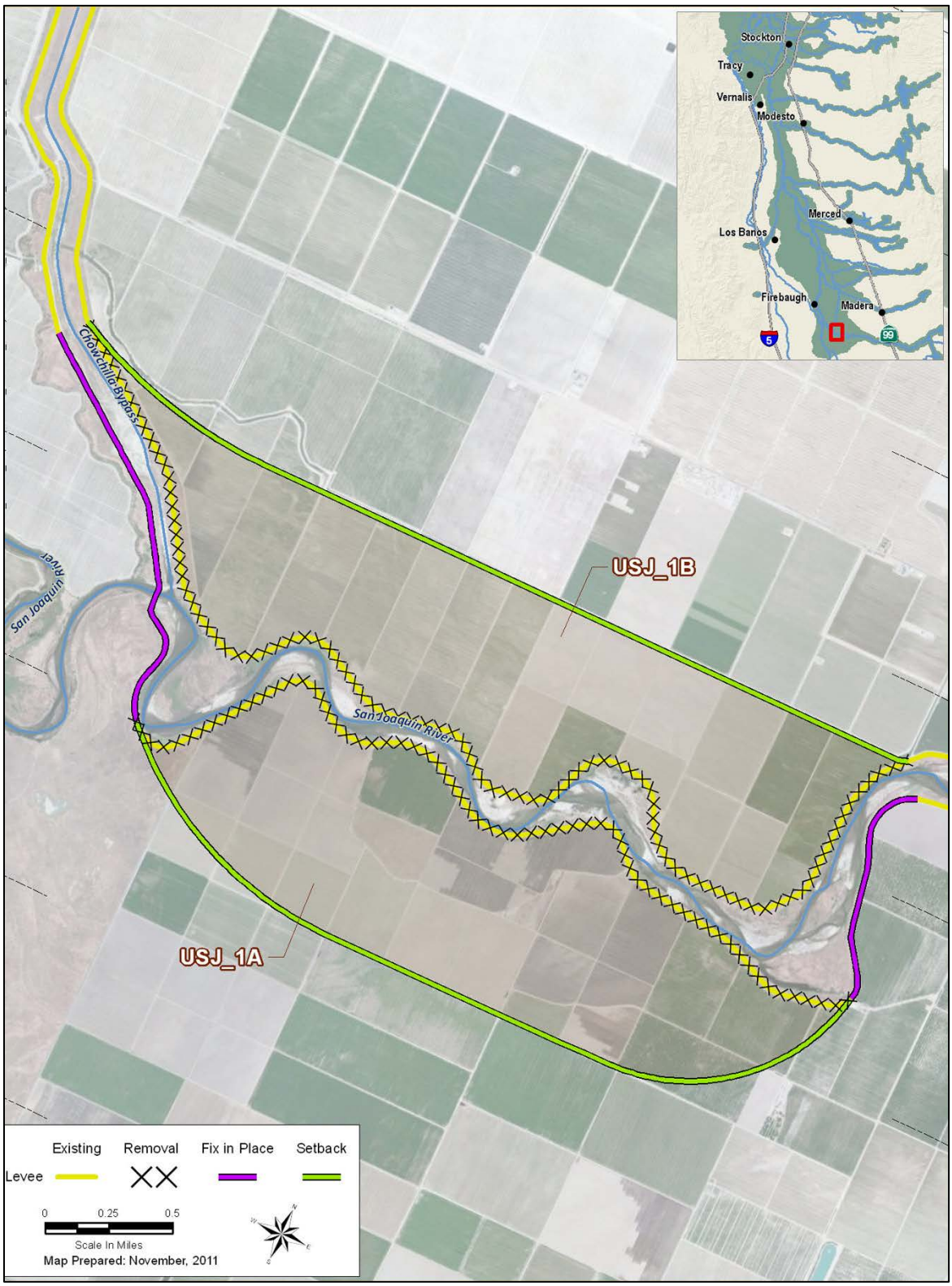


Figure E-3-7. USJ1 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, San Joaquin River

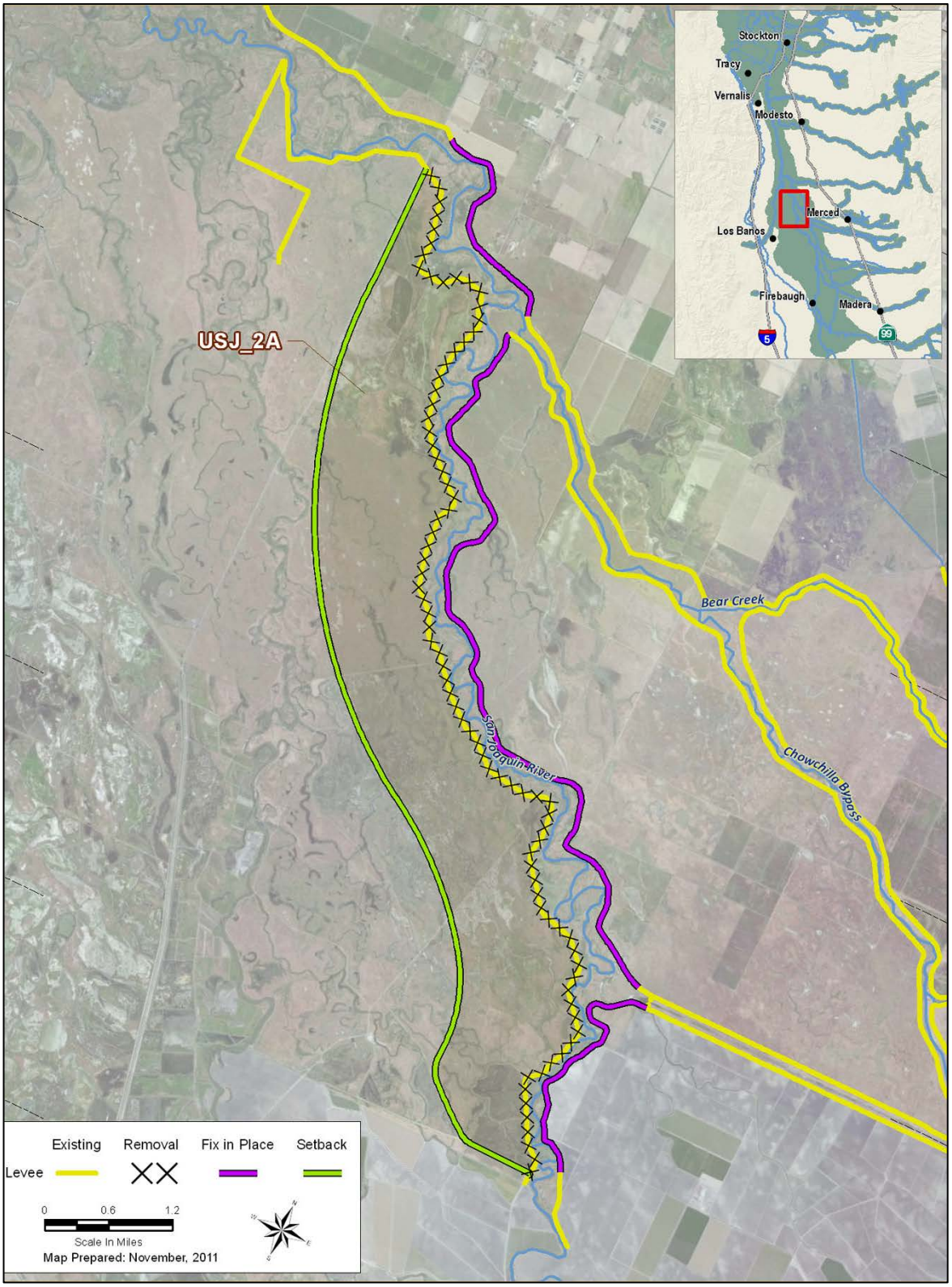


Figure E-3-8. USJ2 Conceptual Setback Project Considered in Enhance Flood System Capacity Approach, San Joaquin River

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4.0 References

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DWR. *See* California Department of Water Resources.

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5.0 Acronyms and Abbreviations

AACE ..... Association for the Advancement of Cost Engineering

AF ..... acre-feet

Annual Report ..... Local Agency Annual Report

Board ..... Central Valley Flood Protection Board

CDP ..... Census-Designated Place

CFR..... Code of Federal Regulations

cfs ..... cubic foot per second

CVFPP ..... Central Valley Flood Protection Plan

Delta..... Sacramento-San Joaquin Delta

DWR ..... California Department of Water Resources

FCSSR..... Flood Control System Status Report

GAR ..... Geotechnical Assessment Report

FROA ..... Floodplain Restoration Opportunities Analysis

NULE ..... Non-urban Levee Evaluations

O&M..... operations and maintenance

PCE..... Parametric Cost Estimation

PCET ..... Parametric Cost Estimating Tool

RACER ..... Remedial Alternatives and Cost Estimate Report

RD..... Reclamation District

SPFC ..... State Plan of Flood Control

TRLIA..... Three Rivers Levee Improvement Authority

ULDC ..... Urban Levee Design Criteria

ULE..... Urban Levee Evaluations

USACE..... U.S. Army Corps of Engineers

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