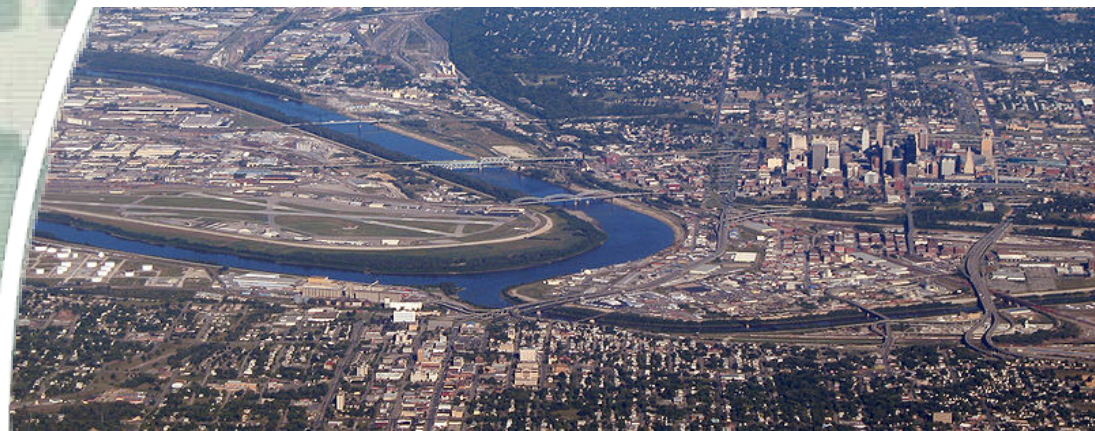
Kansas Citys, Missouri and Kansas Flood Risk Management Project Final Feasibility Study (Phase 2)

Colonel Andrew D. Sexton
Commander
Kansas City District

Presentation to the Civil Works Review Board
22 April 2014



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District Recommendation

- Approve the Kansas Citys Final Feasibility Report
- Release the Proposed Chief's Report for State and Agency Review

1951 KS & MO Rivers Confluence 1993

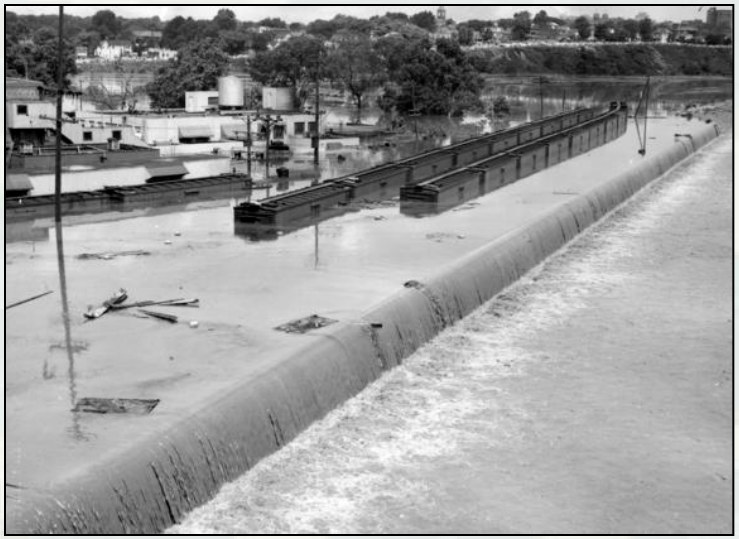
Recommended Plan

Improve the flood risk management benefits provided by the existing system

- Levee unit raises
- Structural and geotechnical reliability modifications

Recommended Plan Results

- Reduce damages by 88%
- Net Annual Benefits: $39.9M
- Benefit/Cost Ratio: 3.4



Armourdale Unit, July 1951

Project Briefing Outline

1. Study Purpose
2. Overview of Existing Project
   - Location and Features
   - Non-Federal Sponsors
   - Project History
   - Study Schedule and Phasing
3. Problems, Goals & Objectives
4. The Future Without Project Scenario
5. Alternative Identification
6. Alternative Evaluation and Comparison
7. Recommended Plan Selection
   - Recommended Plan Components
   - Cost Estimate and Cost Risk Analysis
   - Future Project Performance and Economic Analysis
8. Overall System Summary
9. Environmental and Policy Compliance Status
10. Environmental Operating Principles and USACE Campaign Plan
11. Project Implementation Schedule
12. Conclusion and Recommendation

CID-KS Floodwall

Feasibility Study Purpose

- Examine existing system performance and evaluate alternatives to identify a feasible plan to reduce flood risk within the existing Kansas Citys levee system.
- Section 216 of the Flood Control Act of 1970

Kansas River, 2011

Missouri River, 2011

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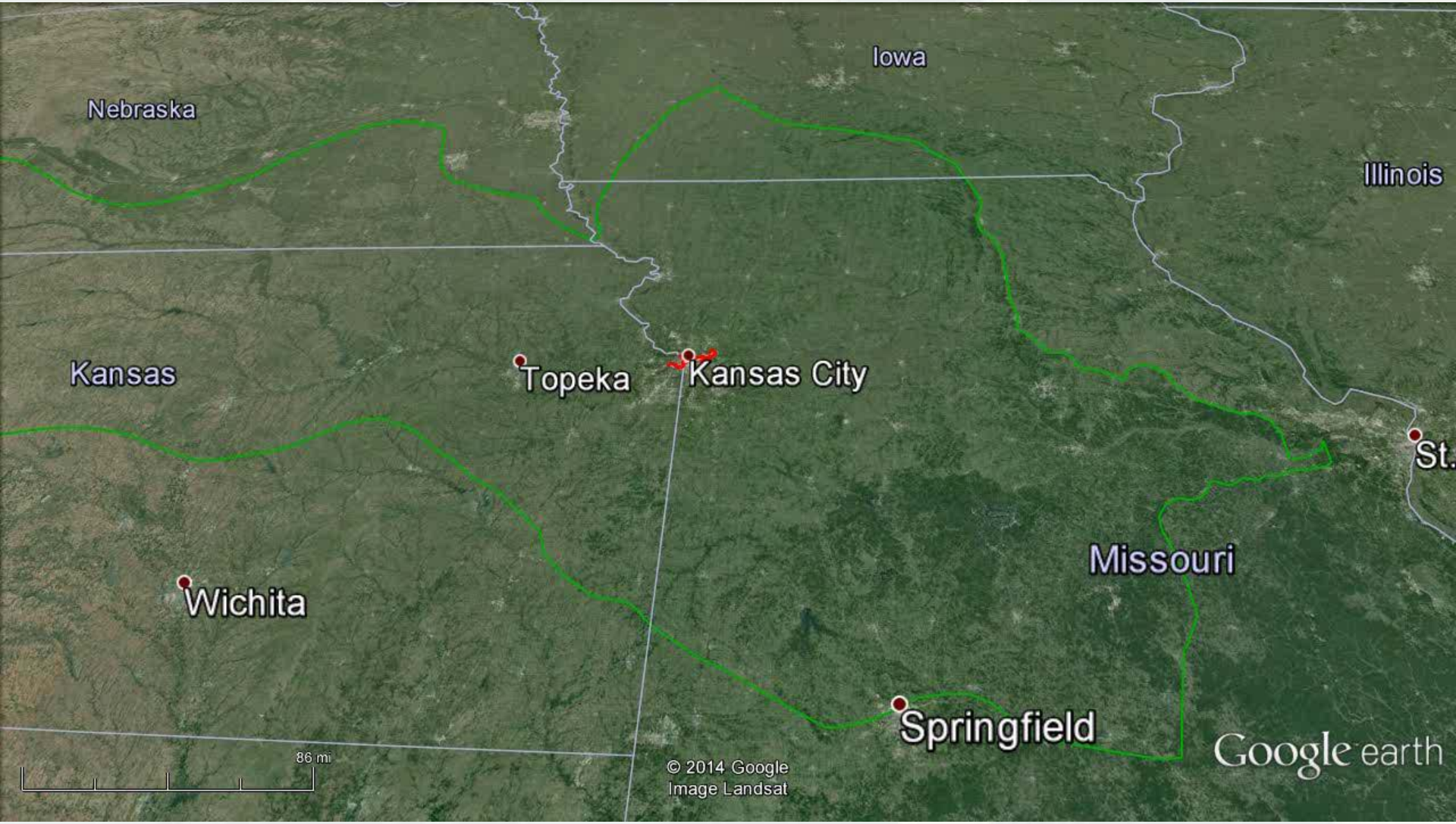
Iowa
Nebraska
Illinois
Kansas
Topeka
Kansas City
St.
Missouri
Wichita
Springfield
86 mi
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Image Landsat
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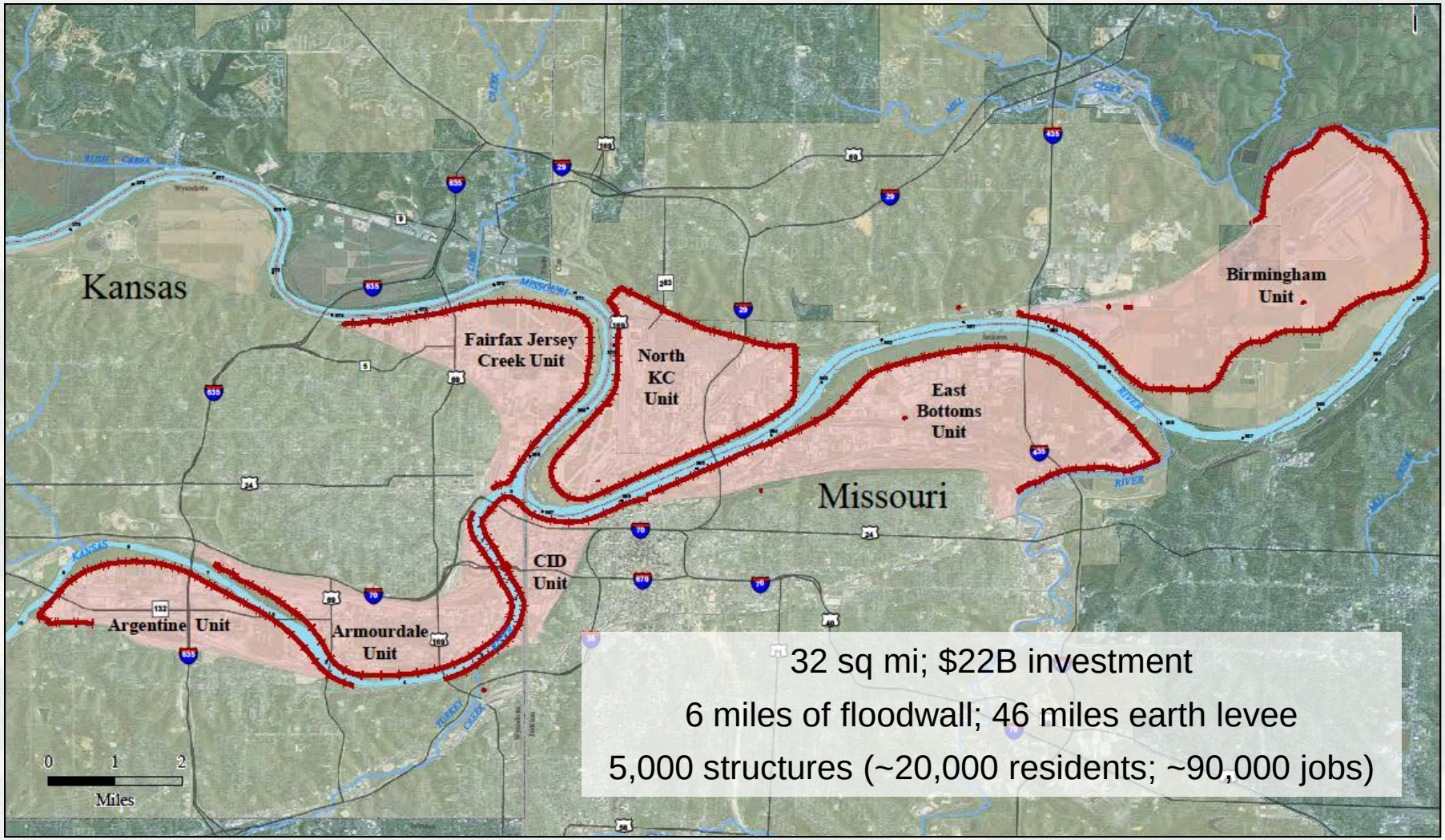
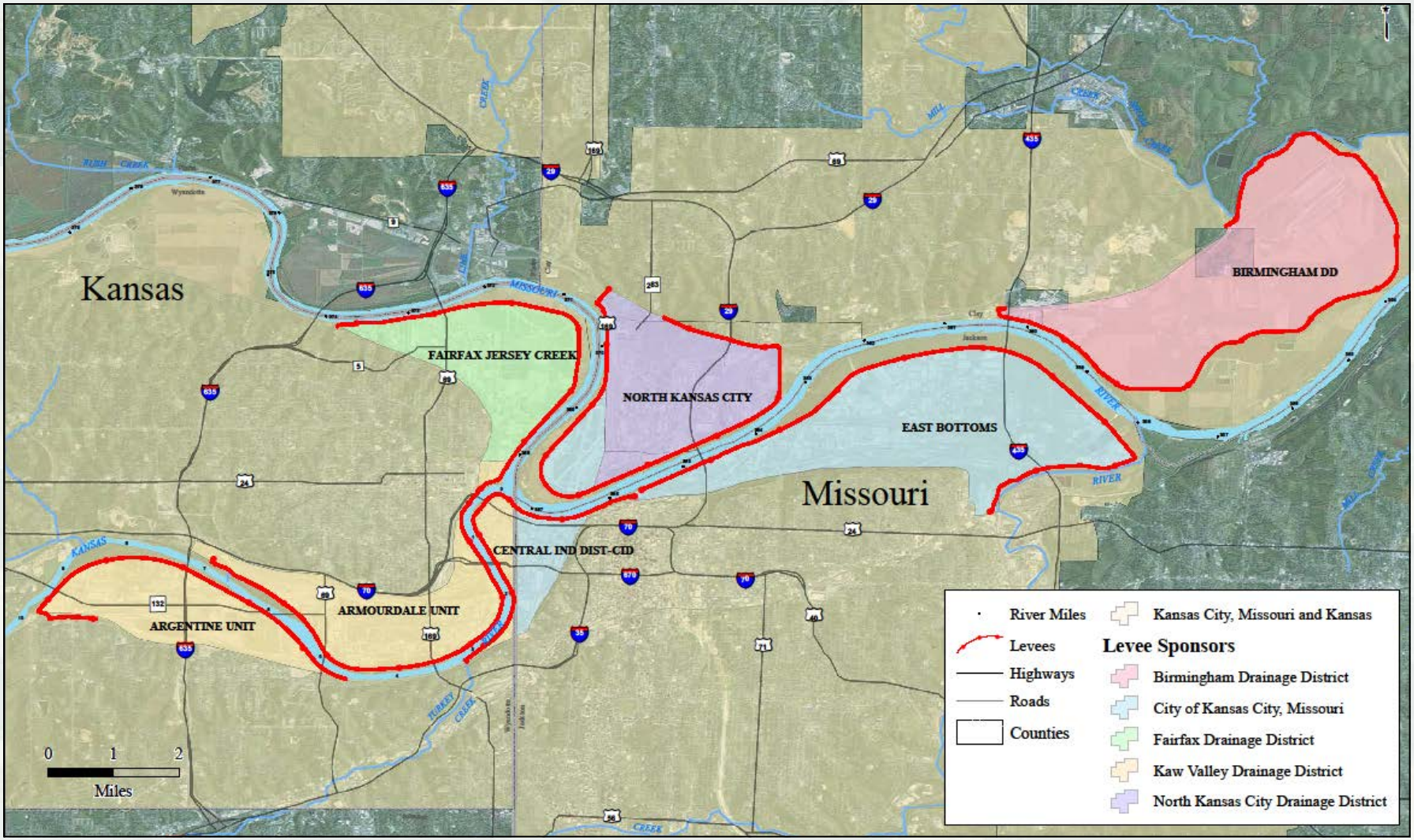
Kansas Citys Levee System



Kansas Citys System Non-Federal Sponsors



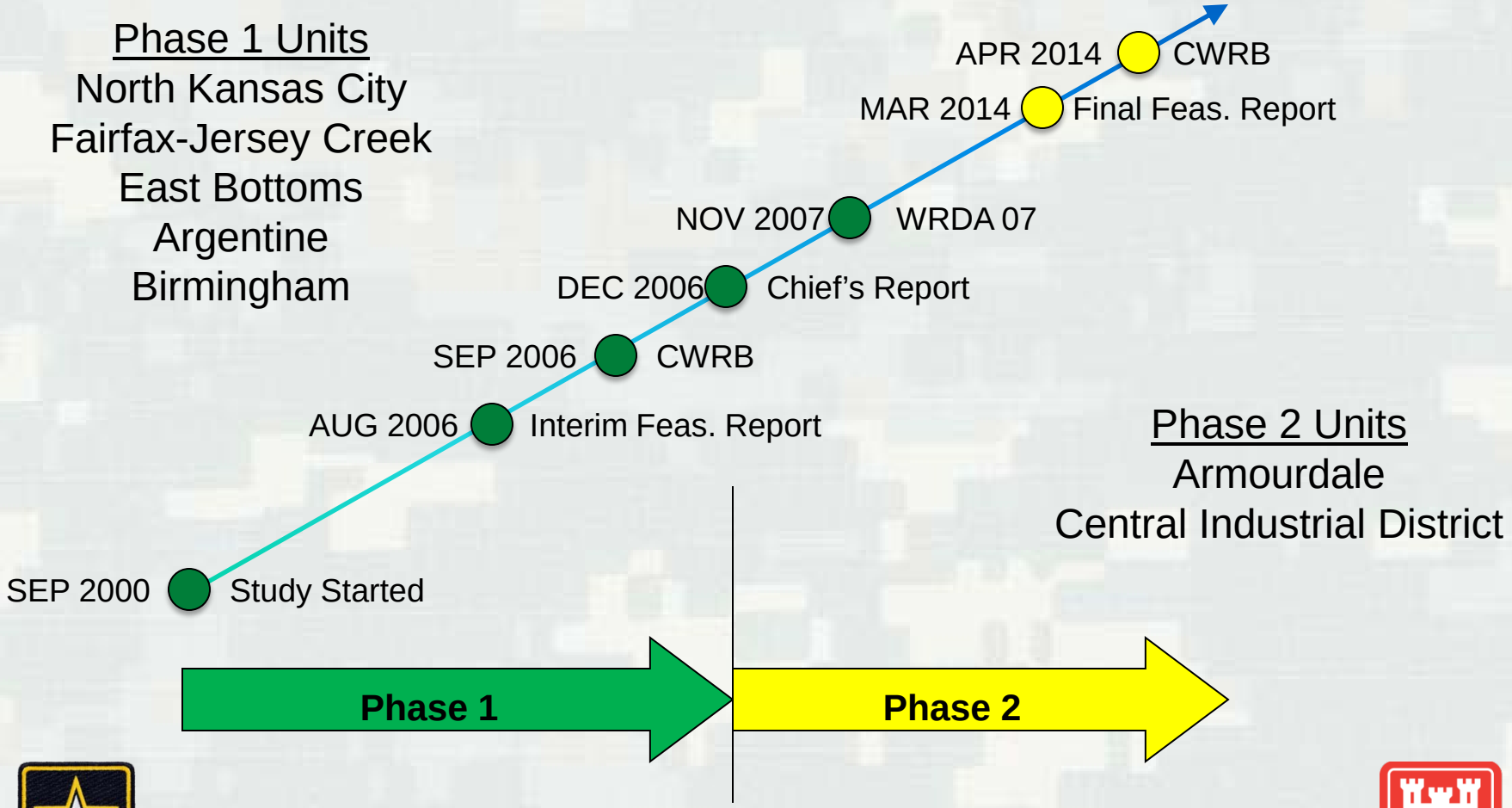
Project History

- Original Authorization: 1936
- Original Construction: 1940's
- Additional Authorizations: 1944, 1954, 1962
- Construction continued into the 1970's
- 1993 performance concerns prompted Feasibility Study

Flood of 1951
- Kansas River Flood of Record
- Peak Flow ~510,000 cfs
- Multiple levee failures
- $462M damages (FY14: $8.23B)

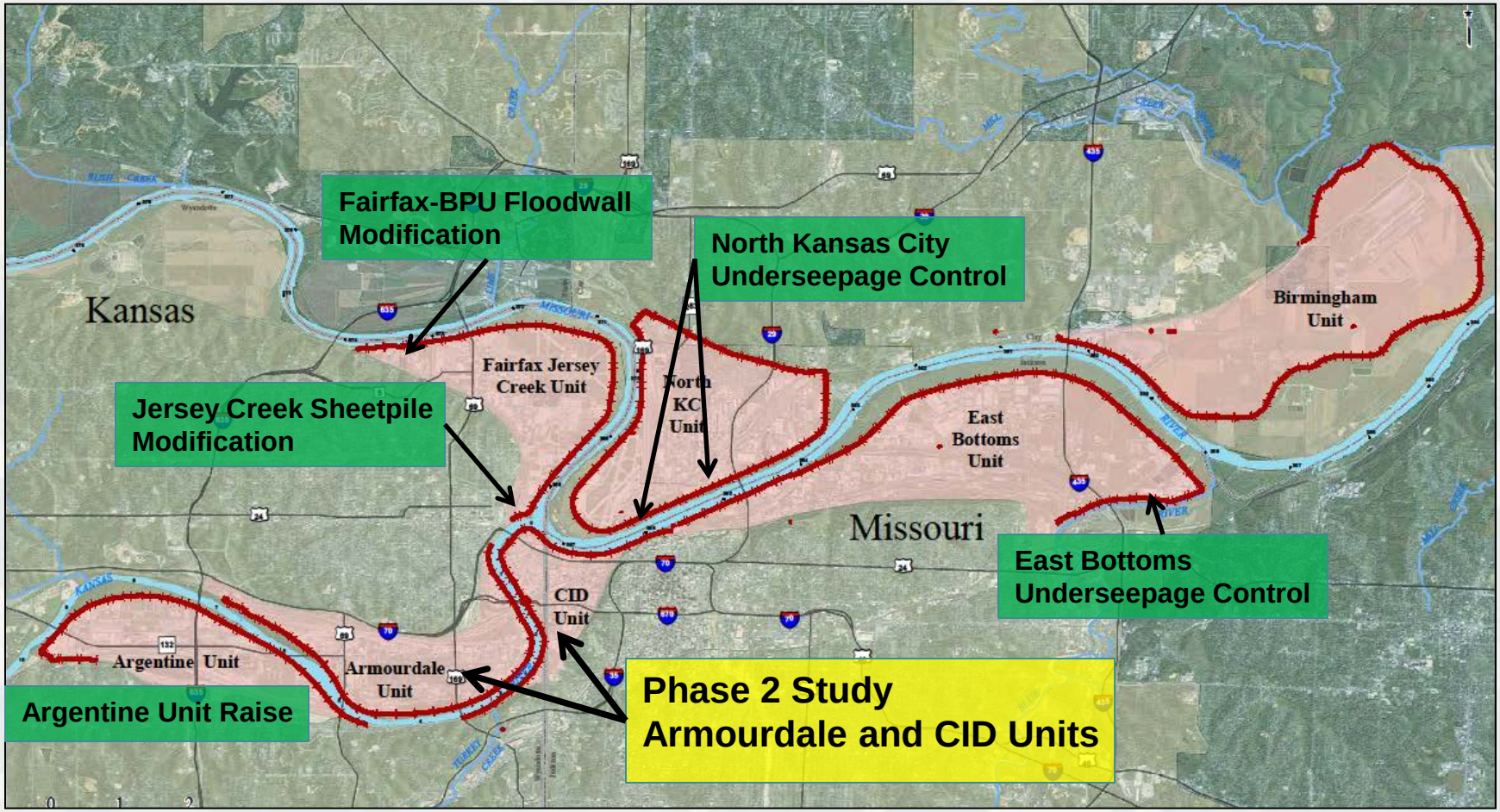
Flood of 1993
- Missouri River Event
- Passed Peak Flow ~543,000 cfs
- ~$4.5B damages prevented (FY14: $8.4B)

Kansas Citys Study Timeline



Kansas Citys Levee System

Phases 1 and 2



Phase 1 – Building Upon Strength

Risk Posture

- Phase 1 construction buys down risk
- Tangible progress in advance of Phase 2

Cost Risk

- Better understanding and application of cost risk
- Improved assessment of climate and conditions
- Application of current design criteria

NEPA

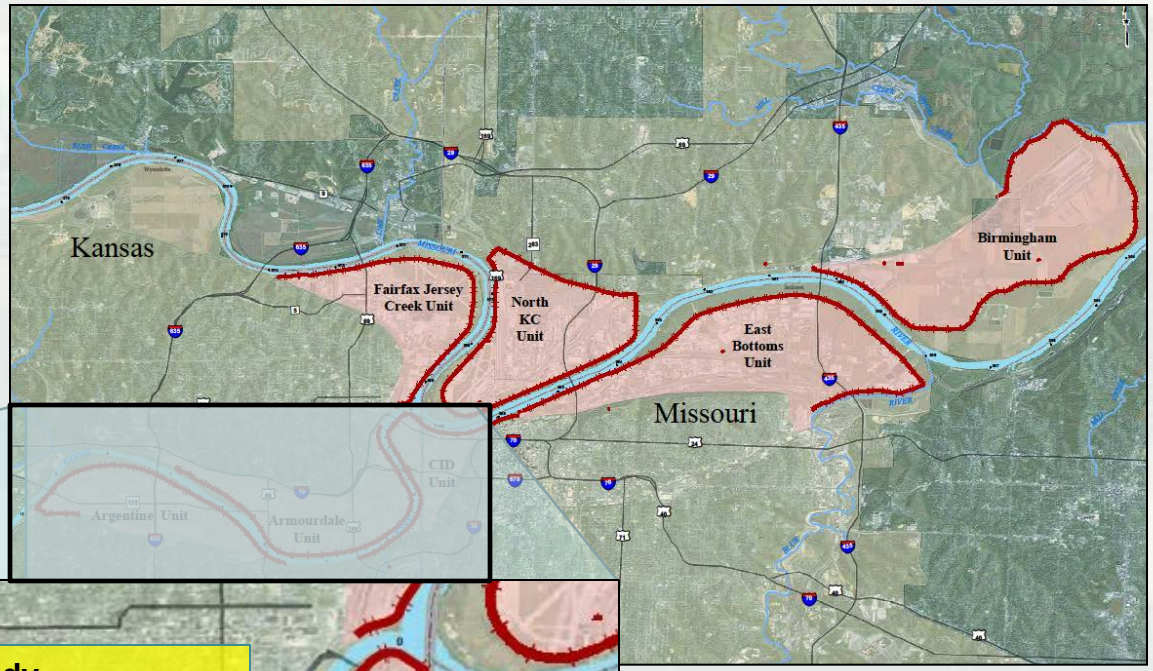
- Systems approach for NEPA and EIS
- Phase 2 effects anticipated and addressed proactively

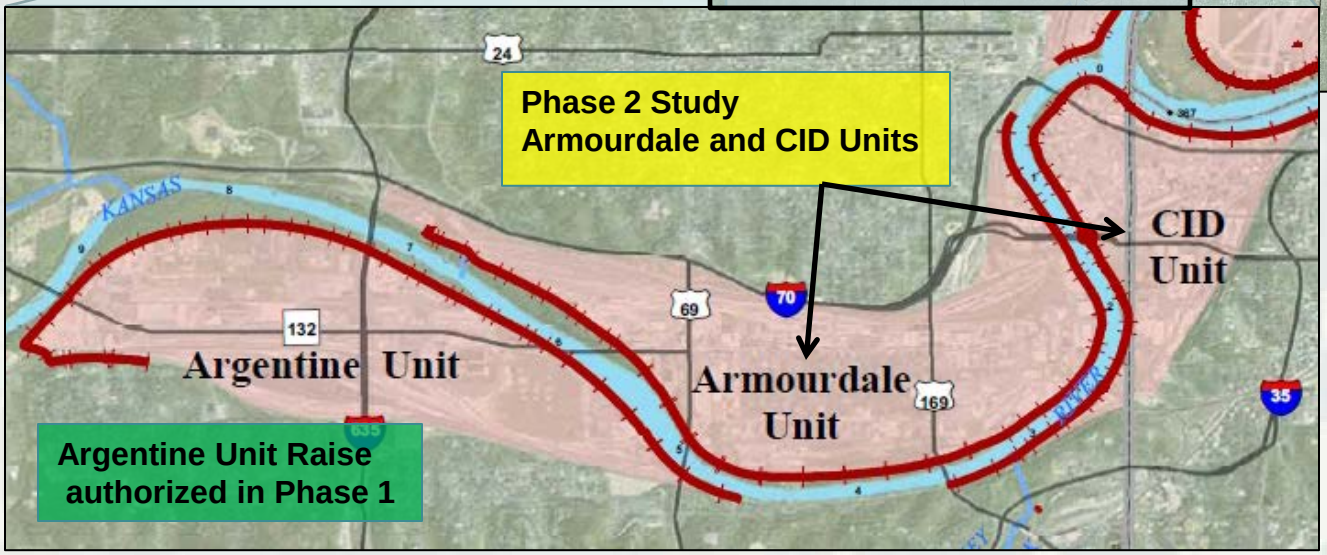
Hydraulic Analyses

- Hydraulic analyses encompasses system
- Based upon authoritative documentation
- Reviewed and validated for Phase 2

Phase 2 Study Area

- $5.4B investment
- 7.6 mi. levee
- 4.2 mi. floodwall
- 5.6 sq mi.





- > 1,600 structures
- ~4,100 residents
- ~14,200 jobs

Problem Identification

- Authorized discharge (1962): 390,000 cfs
- Current flow capacity:
  - CID: ~300,000 cfs
  - Armourdale: ~175,000 cfs

Reliability		
	Armourdale	**CID**
Overtopping or Breach		
1.0% event	45%	89%
0.2% event	8%	33%
Overtopping Only		
1.0% event	92%	93%
0.2% event	38%	41%
Annual Damages	$55.3M	$8.9M

Flow Frequency Study (2004)	
Annual Chance of Exceedance	**Kansas River Discharge (cfs)**
0.080%	403,000
0.100%	***390,000***
0.100%	388,000
0.133%	367,000
0.200%	341,000
0.400%	***300,000***
0.500%	283,000
1.000%	241,000
3.500%	***175,000***
10.000%	121,200

Opportunities, Objectives, and Constraints

Opportunities

- Reduce damage and life safety risks
- Apply current standards to the aging system

Study Objectives

- Identify plan to improve performance
- Maintain systems approach

Study Constraints

- Avoid impacts to other system units

Missouri River, 2011

Future Without Project

What is likely to occur if the system is not improved?

- Continued risk of flooding
- High cost of flood fighting
- Loss of flood insurance certification
- Slowdown in economic development
- Loss of businesses and residents

Future Without Project
Authorized Argentine Unit Project

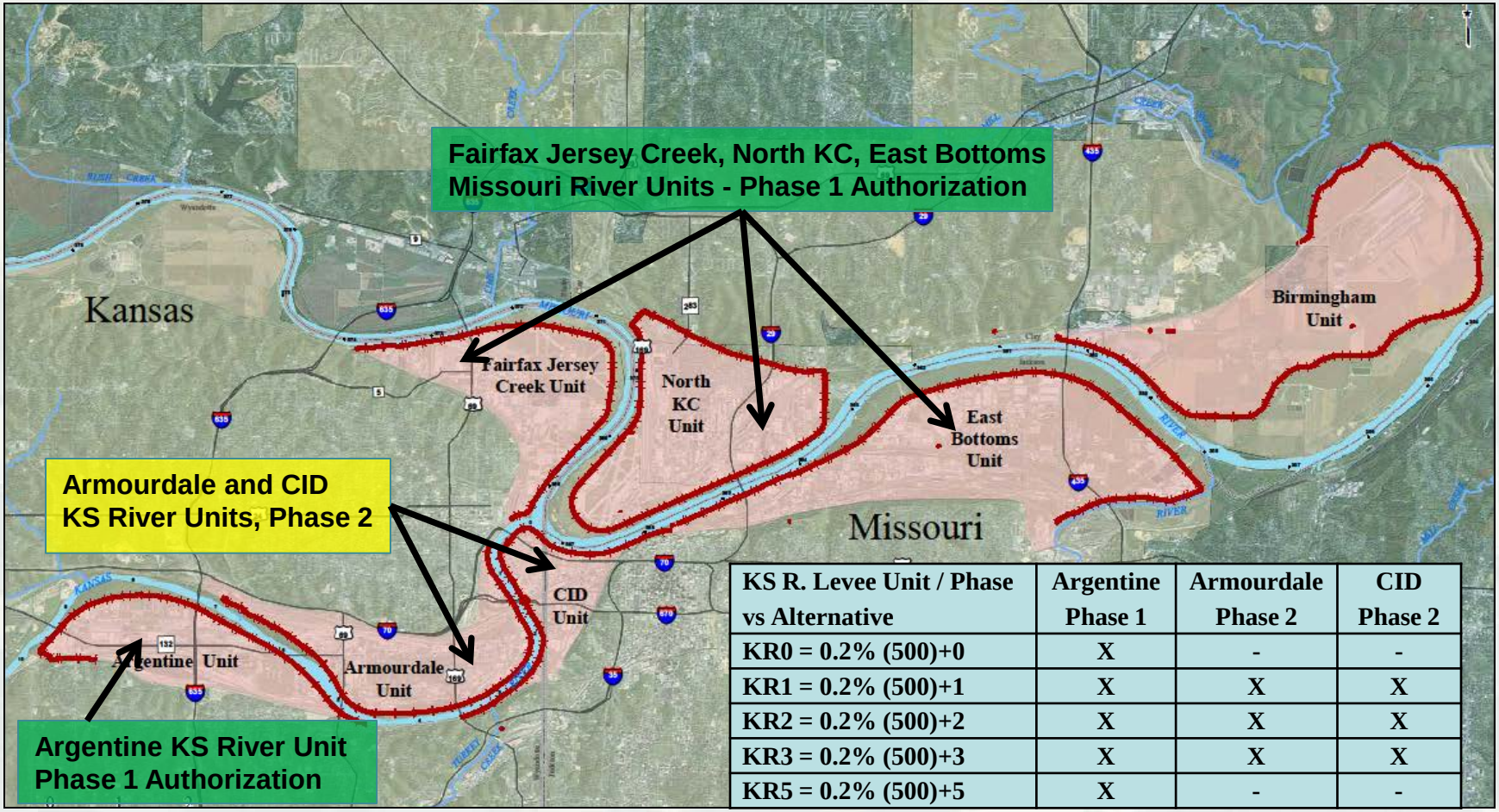
- Phase 1 approval and authorization for the Argentine unit established the formulation objective for the other Kansas River units

- The authorized with project Argentine plan sets the Future Without Project condition for the remaining two Kansas River units

- Objective based upon the Kansas River units having a common design discharge and profile for top of levee design

Phase 1 – Phase 2 Formulation &Transition

Kansas River (KR) Units



KS R. Levee Unit / Phase vs Alternative	Argentine Phase 1	Armourdale Phase 2	CID Phase 2
KR0 = 0.2% (500)+0	X	-	-
KR1 = 0.2% (500)+1	X	X	X
KR2 = 0.2% (500)+2	X	X	X
KR3 = 0.2% (500)+3	X	X	X
KR5 = 0.2% (500)+5	X	-	-

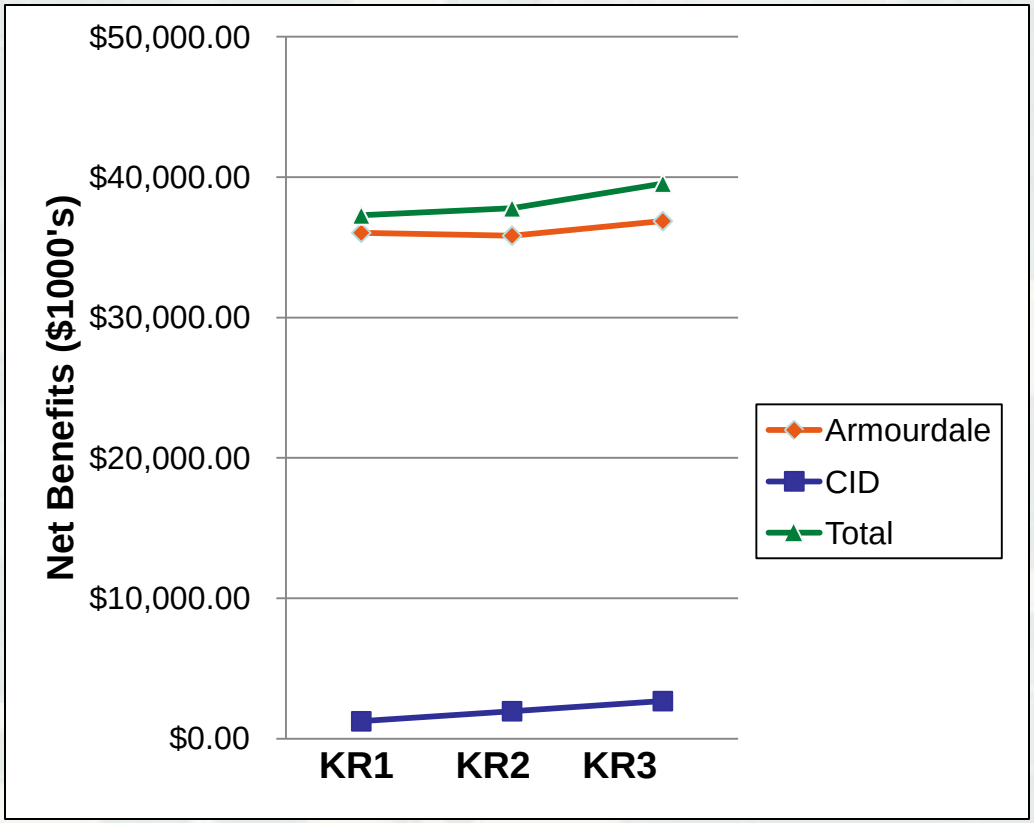
Measures Considered

Initial Alternatives	Complete	Effective	Efficiency	Acceptable	Carried Forward?
Floodfighting	Yes	Temporarily	High cost and manpower needs	Only on emergency basis	No
Tree Clearing/ Channel Modification	Addresses only overtopping risk	Capacity improvements difficult to maintain	Costly for small improvement in capacity	Environmental impact not acceptable	No
Relocation of structures	Addresses damages; Not risk	Yes. Removes risk of damages	Very costly– many structures	Not publicly acceptable	No
Flood-proofing of structures.	Addresses damages; Not risk	Yes. For low depths of flooding	Cost effective within limits.	Minimally	No
Modify or Replace Pump Stations	Addresses only structural risks	Yes	Multiple cost effective measures	Yes	Yes
Replace/Expand Underseepage Control	Addresses only geotechnical risks	Yes	Multiple cost effective measures	Yes	Yes
Levee and Foodwall Raises	Addresses only overtopping risks	Yes	Cost effective at optimized height	Yes	Yes
Levee Realignment/ Setback	Yes	Yes	Costly land acquisition and relocations	In limited locations	Yes

Alternative Evaluation and Comparison

Economic Screening Level Analysis			
Unit	Annual Cost	Annual Benefits	Net Benefits
KR1 Raise			
Armourdale	$12,429	$48,466	$36,037
CID	$4,190	$5,430	$1,240
Total	$16,619	$53,896	$37,277
KR2 Raise			
Armourdale	$12,640	$48,466	$35,826
CID	$4,574	$6,532	$1,959
Total	$17,214	$54,998	$37,784
KR3 Raise			
Armourdale	$13,141	$50,007	$36,866
CID	$4,711	$7,389	$2,678
Total	$17,852	$57,396	$39,544

Oct. 2012 Prices, 3.75% Interest Rate, 1000's



NED Plan determined to be higher than desired level of protection. Categorical Exemption from NED analysis applied.

KR3 Recommended Plan

- Categorical exemption applied as requested by cost-share sponsor

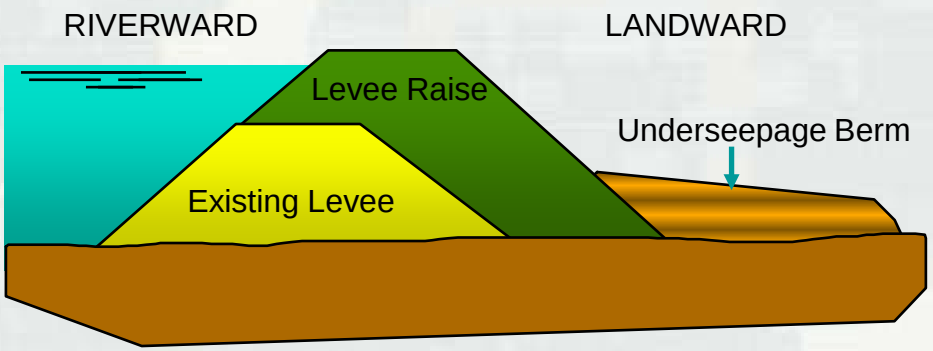
- Selected for the following reasons:
  - The plan meets the non-federal sponsors desired level of risk reduction
  - NED benefits do not optimize below the recommended plan
  - The plan has an acceptable residual risk

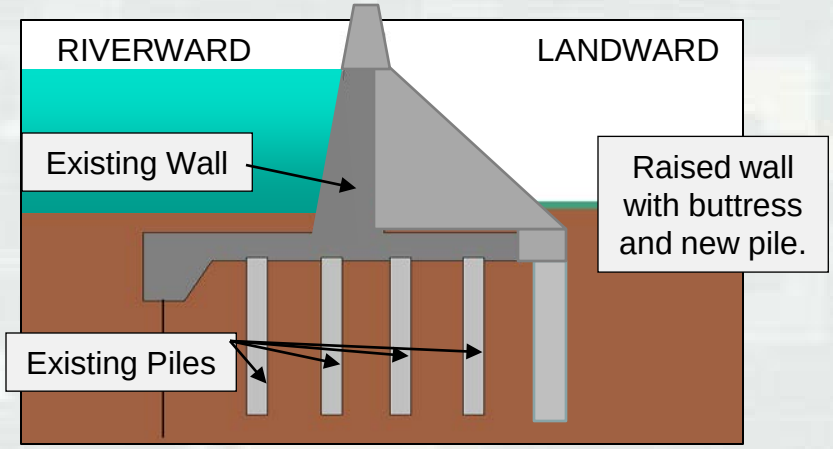
- Selecting the NED plan for CID and Armourdale would not provide uniform level of protection and would be not consistent with systems approach

Recommended Plan KR3

Components and Features

	CID	ARM	Total
Overtopping/Structural Measures			
Levee Raise (LF)	6,495	13,223	19,718
Floodwall Modification(LF)	4,649	4,208	8,857
Floodwall Replacement (LF)	152	2,105	2,257
New Floodwall (LF)	600	5,392	5,992
New T-Wall on Levee (LF)	-	7,715	7,715
Closure Structure Measures			
New Sandbag Closure	2	3	5
Convert Sandbag to Stop log	1	2	3
Replace Stop log Closure	1	2	3
New Stop log Closure	2	-	2
Underseepage Control Measures			
New Relief Wells	57	74	131
Underseepage Berm (LF)	3,448	-	3,448
Slurry Cutoff Wall (LF)	-	2,000	2,000
Drainage Control Measures			
Pump Station Removal	2	2	4
Pump Station Modification	5	7	12



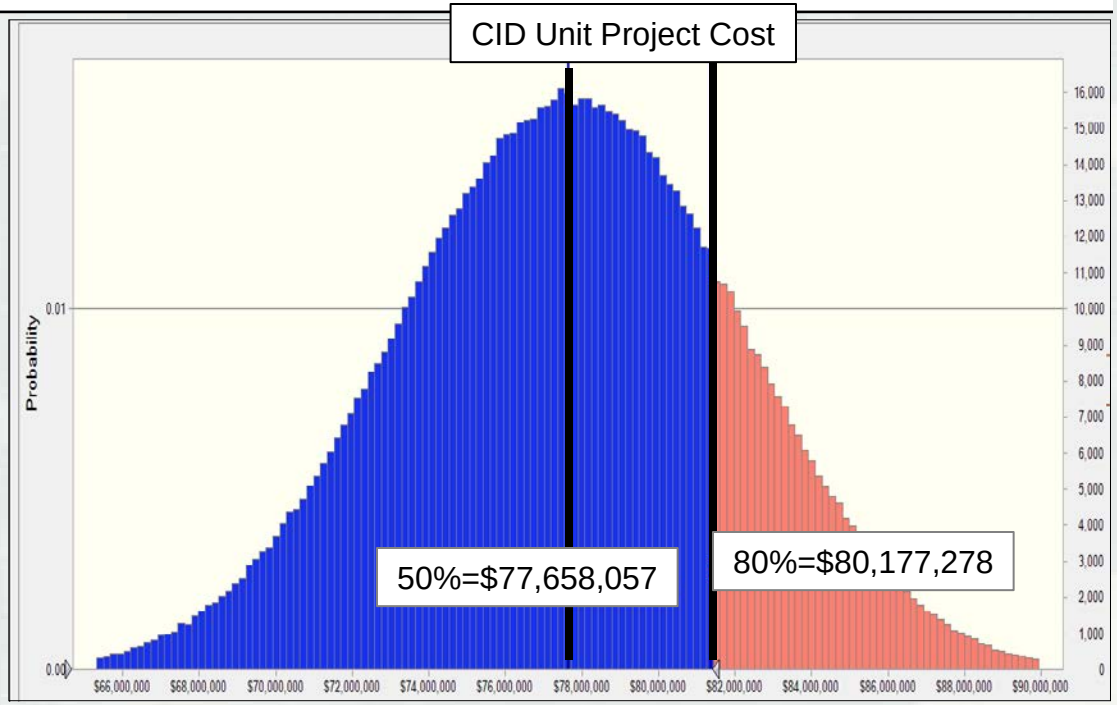


Recommended Plan KR3

Cost Estimate and Cost Risk Analysis

$1000's. Oct 2013 price level.	Armourdale	CID	Total
Construction	$ 153,199.0	$ 52,048.0	$ 205,247.0
Lands and Damages (LERRD)	$ 2,024.0	$ 1,730.0	$ 3,754.0
Planning, Engineering & Design (PED)	$ 11,934.0	$ 4,188.0	$ 16,122.0
Construction Management (S&A)	$ 10,724.0	$ 3,643.0	$ 14,367.0
Contingencies	$ 54,769.0	$ 19,142.0	$ 73,912.0
Total Cost	**$ 232,650.0**	**$ 80,177.0**	**$ 313,402.0**

CID Unit Likely Project Cost (*1000's*)
Low: $ 57,812
High: $ 97,310
50%: $ 77,658
80% $ 80,177



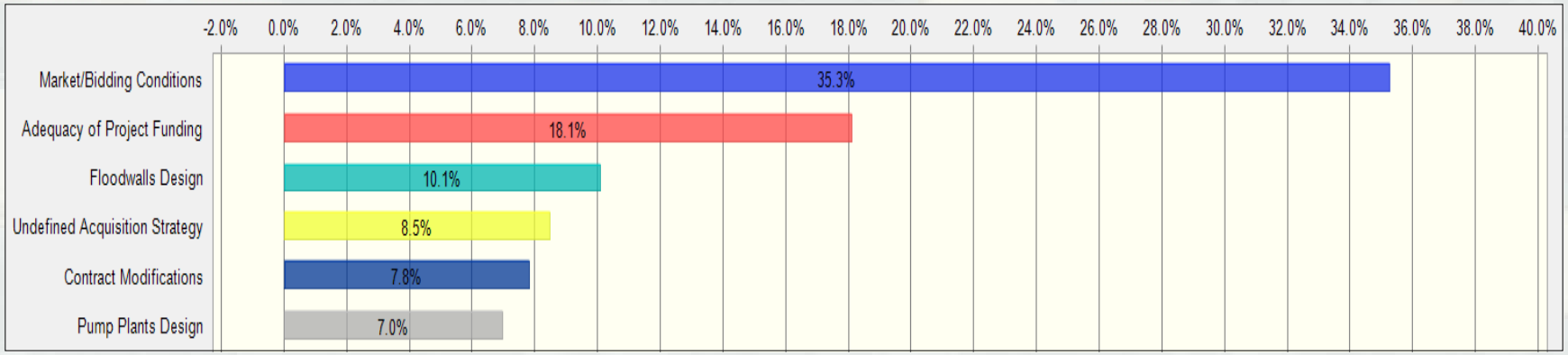
Cost Estimate & CSRA

- Cost Certification by Cost MCX on 10 Apr 2014
- FY14 Price Level: $313,402,000
- Fully Funded Cost: $ 399,395,000
- CSRA resulted in approximately 31% contingency
- Funding Stream Assumptions: MII estimate based on optimal funding. CSRA risk analysis takes into account funding delays. Schedule can be advanced in TPCS if no funding constraints.
- Key Cost & Schedule Risk Drivers
  - Market / bidding conditions (cost risk)
  - Adequate project funding (cost and schedule risk)
  - Schedule risk in terms of cost accounted for in contingency factor by means of escalation for duration of calculated delay.
  - Confidence in scope (floodwall length & relief wells)

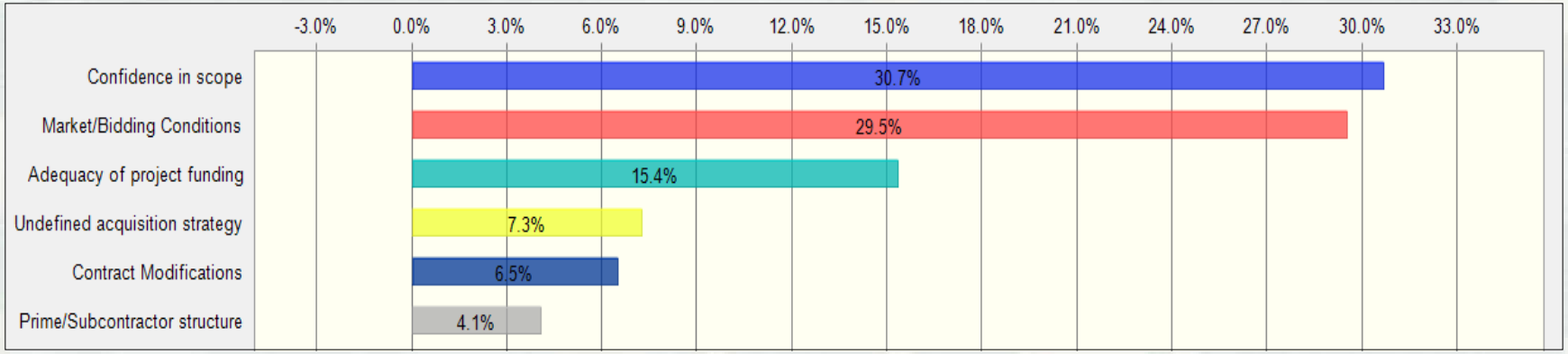
Recommended Plan KR3

Cost Risk Analysis - Contingency Sensitivity

CID



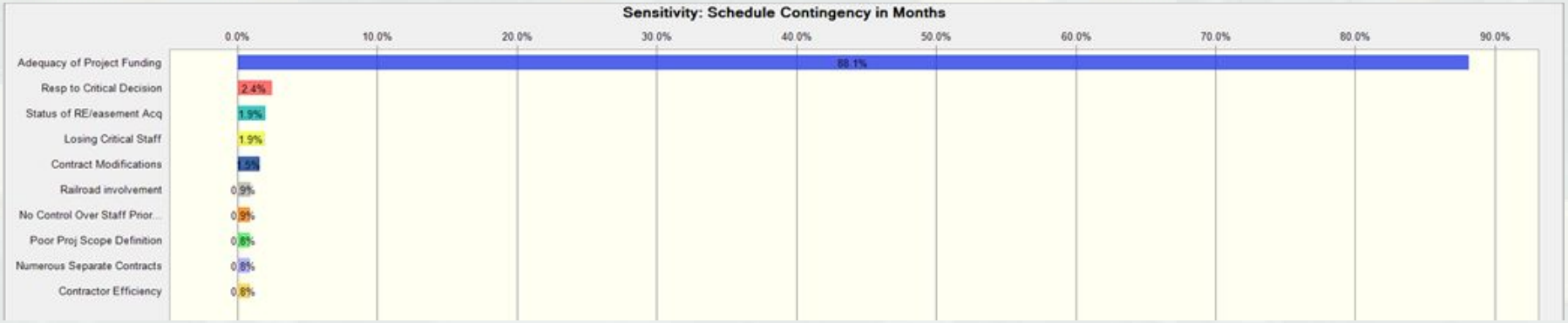
Armourdale



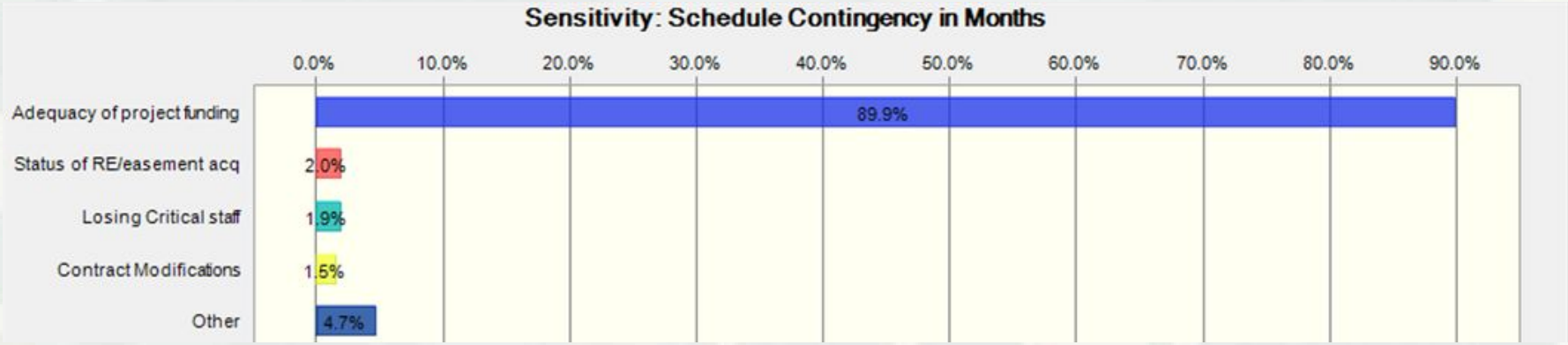
Recommended Plan KR3

Schedule Risk Analysis - Contingency Sensitivity

CID



Armourdale



Economic Summary

Phase 2 Cost Benefit Analysis				
Levee Unit	**Annual Costs**	**Annual Benefits**	**Benefit-Cost Ratio**	**Net Benefits**
Armourdale Unit	$12,344	$51,457	4.2	$39,113
Central Industrial District Unit	$4,376	$5,230	1.2	$854
Phase 2 Total	**$16,720**	**$56,687**	**3.4**	**$39,967**

System Cost Benefit Analysis				
Argentine Unit (*authorized*)	$3,822	$18,180	4.8	$14,359
Total Kansas River Units	**$20,541**	**$74,867**	**3.6**	**$54,325**
Total Phase 1 Units (*authorized)*	$5,046	$41,454	8.2	$36,408
Total System	**$21,766**	**98,140**	**4.5**	**$76,375**

Oct 2013 prices, 3.5% interest rate, 50 year period of analysis, $1,000s

Recommended Plan KR3

Future Performance and Residual Risk

Reliability	Armourdale		Central Industrial District	
	Without Project	With Project	Without Project	With Project
1.0% event	45%	98.6%	89%	99.3%
0.2% event	8%	65%	33%	71%
Annual Damages	$55.3M	$3.9M	$8.9M	$3.6M

Residual Risks

- ~$7.5 M in total annual damages remain
- 0.12% annual exceedance probability with-project.
- Performance of project modifications still dependent on proper operations and maintenance, and floodplain and emergency action planning.

Residual Risk

Remaining Risk After Implementation	Armourdale	CID
Annual Damages (1,000's)	$ 3,935.00	$3,638.32
Annual Exceedance Probability (expected)	0.14%	0.19%
Population At Risk (day/night)	6,700/2,924	7,274/813
Threatened Population (day/night)	1,817/681	2,503/252
Loss of Life – Breach prior to overtopping	19	22
Loss of Live – Overtopping Breach	9	14

Residual Risk Management

- Continued diligent maintenance according to current standards
- Risk communication
- Emergency planning and preparedness
- Updated and coordinated floodplain management planning
- Transparent communication of residual risk covered in the EIS
- Interim risks due to construction sequencing will be managed through enhanced emergency preparedness measures including monitoring and surveillance plans
- Sponsors have detailed flood response and evacuation plans

Levee Safety Considerations

- Annual and periodic inspections by the Kansas City District
- Regular maintenance and vegetation control by the Sponsors
- No deferred maintenance
- Identification and timely management of encroachments
- Compliance with rigorous guidelines for review and approval of work by others in the levee critical zone

Environmental Considerations of the Recommended Plan

- Project area is highly urbanized and previously disturbed. The natural environment has been highly altered
- No significant impacts expected to Threatened & Endangered Species, wildlife habitat, or wetlands
- No historical or cultural resource impacted
- Hazardous, Toxic, and Radioactive Waste
  - Multiple known or potential areas of contamination identified within the study area
  - Plan formulation employed avoidance of HTRW as a selection criteria
  - Recommended plan has no known HTRW impacts or encroachments
  - Investigation recommended during design phase to verify no previously unknown locations with proposed project area.

Environmental and Policy Compliance Status

NEPA Compliance

- 2006 Environmental Impact Statement evaluated existing conditions and potential impacts for both study Phases
- 2013 review determined no significant changes to conditions or recommended project since 2006
- State and Federal agency coordination conducted
- Additional NEPA documentation not required

Policy Compliance

- Agency Technical Review engaged throughout the study. Certified 28 March 2014
- Independent External Peer Review complete, Jan 2014
- Public review period completed, Nov-Dec 2013
- HQ-USACE policy comments addressed

Final Report Public Involvement

- 30-day public comment period
- Mailed notice of report availability
- Written responses received from:
  - US Fish & Wildlife Service
  - Kansas State Historic Preservation Office
  - Missouri Department of Natural Resources
  - Missouri Department of Conservation
  - Environmental Protection Agency, Region 7

IEPR

- Review Panel managed by Battelle Memorial Institute
- IEPR team engage early in the process
- Draft Report Review Issues of concern
  - Clarification of existing conditions analysis and reliability
  - Completion of NEPA administrative record
  - Continuity and redundancy of system operations
- All comments responded to and closed by the panel with concurrence
- Additional discussion of IEPR process and comments will be provided later in the CWRB agenda

Environmental Operating Principles and the USACE Campaign Plan

Environmental Operating Principles

- Foster Sustainability
- Consider environmental consequences
- Create economic and environmentally sustainable solutions
- Consider the environment in employing a risk management and systems approach
- Leverage scientific, economic and social knowledge to understand the environmental context and effects

Consistent with EO 11988

Campaign Plan Goals

Transform Civil Works (2.a, 2.d)

Reduce Disaster Risks (3.a)

Prepare for Tomorrow (4.b)

Project Implementation Schedule

- Pending CWRB approval and funds appropriation, begin design phase in FY2016.
- Design: 2-3 years to finalize design plans and specifications followed by real estate acquisition.
- Construction: Multiple contracts FY2020 to 2030. Depending on authorization and funding.
- Phase 2 implementation must be coordinated with the schedule of Phase 1 work on the Argentine Unit upstream.

Conclusion and Recommendation

- Recommend the Civil Works Review Board approve the Final Feasibility Report and release the proposed Chief's Report.

River Market, Kansas City, MO

- The Recommended Plan improves the future flood risk management benefit of the Kansas Citys Levee System.
- The plan is economically justified and supported by the Non-Federal Sponsors.

Sponsor and Stakeholder Support

- Frank Pogge, MOARC
- Mark Young, Kansas City, MO
- James Jenkins, KAW Valley Drainage District
- Tom Roberts, Kansas City Industrial Council
- Robert Roddy, Unified Government of Wyandotte County and Kansas City, KS

NWD Commander's Briefing

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BLUF:
NWD Recommendations

- Approve the Final Report
- Release the Proposed Chief's Report for State and Agency Review
- Complete the Chief's Report

Thank you to the team! – internal and external, horizontal and vertical.

Rationale for NWD Support

- Concur with the District Commander's findings and recommendations
- Consistent with Federal, State, and local laws and ordinances
- Strong Sponsor(s) and stakeholder support
- $39.9 million in net average annual FRM benefits
- 3.4 to 1 BCR
- Completes effort to address Kansas Citys FRM system that was begun with Phase I, authorized in WRDA 2007

Certification of Legal and Policy Compliance

- Cost certification completed 25 October 2013
- IEPR completed on 27 January 2014
- District Counsel's legal certification of final report on 7 March 2014
- ATR certification on 27 March 2014
- Vertical Team alignment; legal and policy reviews completed and all issues resolved.
- Project is consistent with FRM mission, EOP, and Campaign Plan

Quality Assurance Activities

- Vertical team coordination to ensure technical and policy compliance
- PCX coordination to ensure ATR and IEPR complete and compliant.
- Reviewed DQC compliance and certification
- Reviewed ATR and IEPR comments and responses to ensure appropriate resolution and documentation
- Vertical team coordination to resolve all review comments/issues during various phases of study
- Review Plan (RP) for Feasibility Study approved by MSC on 19 December 2012

REVIEW OF COMPLETED PROJECT , KANSAS CITYS LEVEES, MISSOURI AND KANSAS

Agency Technical Review Briefing

Roger Dale Setters, PE
Chief, CELRD Regional FRM Planning
Technical Center of Expertise

April 22, 2014

US Army Corps of Engineers
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Agency Technical Review Team

Team Member	Discipline(s)	Organization
Roger Dale Setters, PE	ATR Lead, Planning	CELRL
Ken Meffert	Economics	CELRL
Michael Robinette, PE	Geotechnical Engineering	CELRH
John Allison, PE	Civil Design	CELRL
Brenden McKinley, PE	Mechanical/Electrical Engineering	CELRH
David Force, PE	Structural Engineering	CELRC
Gary Smith, PE	Cost Engineering	CENWW
James Neubauer	Cost Engineering	CENWW

Agency Technical Review Scope

- This ATR was essentially a continuation of the review started in 2001 for the entire system of levees in the Kansas Cities area.

- The Phase I interim feasibility effort covering five of the seven components of the levee system was approved at the 20 September 2006 CWRB and authorized for construction by Congress in 2007.

- The Phase II report addresses the remaining two system components, both located along the Kansas River. H&H for the entire system was reviewed and approved, along with a programmatic EIS, as part of the 2006 Phase I interim report. Additionally, by direction from Corps leadership the Phase II components were to be formulated to match up with the other Kansas River levee component authorized as part of the 2006 report.

- The scope of the ATR effort for Phase II was scaled in recognition of the above guidance.

Agency Technical Review Timing

- Phase II review led by LRL with reviewers from LRL, LRH, and LRC, initiated in 2008.
- AFB held in April 2013.
- Draft final documentation reviewed June – August 2013.
- Cost estimates certified by Cost Engineering Center of Expertise August 2013.
- ATR Draft Final Report certified September 2013
- Final ATR certification March 2014.

Agency Technical Review Issues

- **Significant issues raised during the Phase II ATR**
  - Capacity of the current pumping system to remove interior drainage from the protected area after implementation of the recommended improvements
  - Constructability of some subsurface cutoff walls on the Armourdale unit when given the constraints of nearby utilities, existing overhead bridges, and potential HTRW concerns

- **Resolution**:
  - Additional information was included in the report to document the viability of the currently proposed methodologies
  - The cost estimate was reviewed to assure that there were sufficient contingencies to address these potential risk item
  - As a further precaution these items have been flagged for additional scrutiny during Preconstruction Engineering and Design

- **There were no unresolved issues**

Independent External Peer Review (IEPR) Kansas Citys, Missouri and Kansas, Section 216 Flood Risk Management Project

Presented to the USACE CWRB on April 22, 2014

Karen Johnson-Young, PMP
Program Manager

Corey Wisneski
Project Manager

IEPR - Panel and Schedule

Kansas Citys Panel Members	Panel Discipline
Charles Aubeny, P.E., Ph.D. (Panel Lead)	Geotechnical/Structural Engineering
Harry Shoudy	Civil Works Planning
Soorgul Wardak, P.E., Ph.D.	Hydrologic and Hydraulic Engineering
Judy Dudley, Ph.D.	Biology/Ecology
James O'Brien, P.E.	Civil Engineering/Construction Engineering

Kansas Citys IEPR was conducted in two phases:

- Phase 1: September 2012 - January 2013. The Panel reviewed the Alternative Formulation Briefing Pre-Conference Submittal document (dated October 2012) and associated appendices

- Phase 2: September 2013 - January 2014. The Panel reviewed the Final Feasibility Report (dated September 2013) and associated appendices

IEPR Bottom Line Up Front

The Panel concurred with all PDT Responses to the Phase 2 Final Panel Comments.

IEPR - Results

The Final IEPR Report was submitted during Phase 2 on November 25, 2013 and included the Final Panel Comments from Phases 1 and 2. No Final IEPR Report was submitted during Phase 1.

Results:

- Phase 1: 14 Final Panel Comments – 5 high significance; 7 medium; 2 low
- Phase 2: 7 Final Panel Comments – 1 high significance; 2 medium; 4 low

The Post-Final Panel Comments/Responses Process was not conducted for Phase 1 by agreement between Battelle, FRM Planning Center of Expertise and the PDT. Post-Final Panel Comments/Response Results for Phase 2 were documented on January 16, 2014.

Results:

- PDT Evaluator Responses to Phase 1 Final Panel Comment – 4 concurs, 10 non-concurs
- PDT Evaluator Responses to Phase 2 Final Panel Comments – 7 concurs
- Panel BackCheck Responses to the Phase 2 PDT Responses – 7 concurs

IEPR – Phase 1 Notable Findings

- The closure system and its required processes lacked detailed documentation and appeared to exclude redundancy, which could affect reliability. The Panel believes that the closure system may have an inherent lack of redundancy since key functions are being conducted by and known only by single individuals.
- The Environmental Impact Statement contained information that is considered outdated by NEPA standards and did not fully consider the resources and impacts associated with Phase II of the project.
- Potential risks to the riverside impermeable blanket and levee embankments from tree roots, animal burrows, and man-made features (including scour associated with bridge piers) were not discussed.
- The risk and uncertainty associated with a number of project structural features (e.g., pile inspection, potential impacts of bridge failure, abandoned conduits) were not fully described.

IEPR – Phase 2 Notable Findings

- The connection between the reliability assessments for the levee system's individual components and the overall assessment of system reliability (the 29-year and 250-year return intervals for levee failure) were not strongly documented.
- The Kansas Citys project's administrative record to document compliance with several federal environmental laws was incomplete.
- An in-depth discussion was not included of the planned coordination with non-Federal sponsors to demonstrate continuity and redundancy of the closure system operation and other flood-fighting efforts.

REVIEW OF COMPLETED PROJECT, KANSAS CITYS LEVEES, MISSOURI AND KANSAS

Flood Risk Management Project

HQUSACE POLICY REVIEW CONCERNS

Scott Nicholson
Office of Water Project Review
Planning and Policy Division

April 22, 2014

US Army Corps of Engineers
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HQUSACE Team Reviews:

- Alternative Formulation Briefing, April 2013
- Draft Report, October 2013
- Final Feasibility Report, March 2014

HQ OWPR Review Team:

Jeff Strahan - Economics

Deborah Scerno - Environmental

Dave Margo - Engineering

Ted Nettles - Real Estate

Mayely Boyce - Counsel

Scott Murphy - Counsel

Policy Issues from Alternative Formulation Briefing, Draft Report and Final Report Reviews

- Mitigation Requirements
- **Environmental and Technical Documentation**
- **NED Plan Selection**
- HTRW Assessment and Legal Requirements
- Plan Comparison - FWOP Interior Drainage
- Project Performance Description
- Datum
- Cost Effective Analysis
- **NED - Categorical Exemption Assessment**
- **Real Estate - Encroachments**
- Real Estate Plan - Relocation Requirements
- **Agency Technical Review**
- FWOP Key Uncertainties and Other Studies
- Flood Risk Benefits after 1991
- Executive Order 11988 on Flood Plain Management
- **System Performance - Uniform Level of Protection**
- **System Implementation Risk - Induced Flooding**
- **System Operation Risk - Emergency Management**

Significant Areas of Policy Concern

- Environmental and Technical Documentation
- NED Plan Selection
- NED - Categorical Exemption Assessment
- System Performance - Uniform Level of Protection
- System Implementation Risk - Induced Flooding
- System Operation Risk - Emergency Management
- Real Estate - Encroachments
- Agency Technical Review

Environmental and Technical Documentation

- **CONCERN:** Draft report environmental and H&H documentation identified the 2006 EIS as the environmental document for the current two levee units; however there was little indication of its current relevance or changes that had occurred since 2006 .

- **REASON:** CEQ guidance states that EISs that are more than 5 years old should be carefully reexamined to determine if the criteria in Section 1502.9 compel preparation of an EIS supplement.

- **RESOLUTION**: The final report contains language that indicates the 2006 EIS was evaluated and determined to be sufficient and current in describing the environmental effects of the current two levee units. The ATR and HQUSACE review concur with the evaluation.

- **RESOLUTION IMPACT**: The concern is resolved.

NED Plan Selection

- **CONCERN:** Draft report documentation identified the NED Plan by applying HQ guidance for the 905b approval to formulate for a uniform level of protection. The minimum recommended plan for the Interim Report was for the Argentine Unit which established the performance criteria for over topping but did not require levee performance modifications to prevent breaching. The future without project condition changed for the phase 2 formulation and economic evaluation to include both failure modes.

- **REASON:** ER 1105-2-100, 2-3 provides that the future without-project condition provides the basis from which alternative plans are formulated and impacts are assessed and that the alternative that reasonably maximizes net economic benefits consistent with protecting the Nation's environment, the NED plan be selected.

- **RESOLUTION**: The changed future without project condition was used in the Phase II economic evaluation to include both overtopping and levee performance (breaching) as a failure mode. The analysis used one foot increments above Phase I Argentine Unit plan as a system objective metric to identify the plan that maximized benefits for both failure modes.

- **RESOLUTION IMPACT**: The concern is resolved.

NED - Categorical Exemption Assessment

- **CONCERN:** Categorical exemption to the NED Plan for flood risk management is being utilized.

- **REASON:** ER 1105-2-100 provides that for flood damage reduction studies, where the non-Federal sponsor has identified a desired maximum level of protection, where the with project residual risk is not unreasonably high, and where the plan desired by the sponsor has greater net benefits than smaller scale plans, it is not required to analyze project plans providing higher levels of protection than the plan desired by the sponsor.

- **RESOLUTION**: Documented the request and use of the categorical exemption based on the sponsor's desire to have a uniform level of protection. Documented acceptance and management of the additional residual risk in conjunction with HQ 905b approval guidance to formulate for a uniform level of protection for the authorized system.

- **RESOLUTION IMPACT:** The concern is resolved.

System Performance - Uniform Level of Protection

- **CONCERN:** The level of protection defined by the annual exceedance probability of levee overtopping is not the same for all seven units. The Missouri River units vary between about a 0.1% (1000 year) and 0.03% (3300 year) flood. The level of protection for the Kansas River units is about a 0.12% flood (800 year).

- **REASON:** Guidance for the feasibility study stated that "*the formulation of alternatives can proceed on the basis of providing a uniform level of protection*" and the 1936 Flood Control Act authorized the seven units as one system.

- **Discussion**: Several incremental decisions were made to establish system performance. 1) A decision was made during Phase 1 to maintain the existing height for all of the Missouri River levee units because these units could pass the authorized discharge. 2) Levee raises were considered for the Kansas River units because they could not pass the authorized discharge due to changed conditions. 3) Raising the Argentine unit to address overtopping was identified as the NED plan. 4) A system objective for Phase 2 was to consider raising the Armourdale and CID units to the Argentine height so all the Kansas River units would have a uniform level of protection.

- **RESOLUTION IMPACT:** The basis for these incremental decisions is sound and consistent with the intent of the guidance. The concern is resolved.

System Implementation Risk - Induced Flooding

- **CONCERN:** Implementation of Phase 1 Argentine Unit and Phase 2 Armourdale and CID Units must proceed on a parallel path to minimize the potential for induced flooding.

- **REASON:** Construction of the Phase 1 Argentine Unit will increase water surface elevations near the Armourdale and CID units by approximately ½ foot for the 0.33 annual chance flood (300 year flood).

- **RESOLUTION**: Design and construction activities for Phase 1 and Phase 2 will be closely coordinated and adapted as needed to manage the risk. Risks associated with induced flooding are not significant because the initiating flood event is relatively infrequent, the duration of exposure is expected to be relatively short based on projected construction schedule, and results in minimal depth from overtopping that may be managed through flood fighting.

- **RESOLUTION IMPACT:** The concern is resolved.

System Operation Risk - Emergency Management

- **CONCERN:** The project was authorized as a system yet there is no system operations plan. Operational failures at one unit may induce flooding on another unit.

- **REASON:** The Kansas Citys system of levees was authorized as one system to minimize the transfer of flood risk. The combined recommendations include seven separable units with five different sponsors in two different states. This issue was partially resolved through HQ 905b policy guidance that established the Kansas City system performance objective to provide a uniform level of protection. This did not address the operations risk.

- **RESOLUTION**: The sponsors have initiated collaborative emergency management planning that addresses this issue. The related floodplain management plans are being updated to reflect this collaboration.

- **RESOLUTION IMPACT:** The concern is resolved.

Real Estate - Encroachments

- **CONCERN:** The 2012 annual inspection of completed works report and the Kaw Valley Drainage District's own surveys identified encroachments on the right-of-way for the existing Federal project.

- **REASON:** Prevention and removal of encroachments on the right-of-way of the existing Federal project is a non-Federal operation and maintenance responsibility.

- **RESOLUTION**: NWK confirmed that Kaw Valley Drainage District has directed the owners of to remove the encroachments. NWK confirmed that the Phase II Recommended Plan does not accommodate or cost share for encroachments. The Main Report was revised to document the non-Federal sponsor's resolution of the encroachments.

- **RESOLUTION IMPACT:** The concern is resolved.

Agency Technical Review

- **CONCERN:** The review plan did not include an H&H subject matter expert and did not include a flood risk analysis subject matter expert. It was assumed that these disciplines were not needed because the study relied on existing published H&H information from the Interim Report. This resulted in some terminology issues and consistency issues in the Final Report.

- **REASON:** EC 1165-2-214 requires that the ATR team include a flood risk analysis subject matter expert for all decision documents involving flood risk reduction measures to ensure consistent identification, analysis, and written communication of risk and uncertainty.

- **RESOLUTION**: The report was revised for consistency to improve terminology and communication of risk and uncertainty. ATR lesson learned was captured to include risk analysis subject matter expert on all flood risk management studies. One was assigned for the Final Report.

- **RESOLUTION IMPACT**: The concern is resolved.

HQUSACE POLICY COMPLIANCE REVIEW TEAM RECOMMENDATION

Approval to release the proposed Chief's Report, Final Feasibility Report (revised) **and**

Interim Feasibility Report and Programmatic EIS, dated August 2006 for S&A Review

NWK Lessons Learned

1. Length of study required extra efforts to maintain knowledge of key milestones and past decisions.
2. Identify risks/potential impacts due to changes in team members, new policies, or updated design criteria. Especially in the last year leading up to CWRB.
3. Briefing for HQ on Phase 1 only would have established better background information and awareness for the review team.
4. Study would have benefitted by more frequent formal IPR's involving NWD, ATR team, and HQ, similar to Smart Planning process.
5. ATR and IEPR reviews were very beneficial in producing quality products.
6. The strong sponsor partnerships have greatly contributed to the high level of maintenance of the levee system and in the study process and report development.

NWD Lessons Learned

- Because the entire HQ review team changed between Phase I and Phase II, we should have held a detailed vertical team briefing on Phase I, prior to the Phase II reviews
- Site visits help reviewers better understand the project, particularly when there are several separate elements that function as a system
- Draft IEPR responses should be coordinated with the vertical team earlier to resolve any potential issues
- Initiate tracking spreadsheet for all phases of review to provide vertical team alignment on completeness, with embedded documentation

Agency Technical Review Lessons Learned

- The review plan did not include an H&H subject matter expert and did not include a flood risk analysis subject matter expert. It was assumed that these disciplines were not needed because the study relied on existing published H&H information from the 2006 Interim Report. This resulted in some terminology issues and consistency issues in the Final Report. In the future a risk analysis subject matter expert should be on all flood risk management studies.

- In some instances the PDT was required to provide reviewers with documentation on study area baseline data that had been included in the Phase I report, but left out of the Phase II report. While this did not ultimately lead to any major technical comments, it did cause some wastage of time to perform the ATR.

- The phasing of the study effort led to an inordinately long time frame for the review. Most original ATR team members had to be replaced due to changing job status. Hopefully this study represents a unique circumstance unlikely to reoccur.