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Kansas Citys, Kansas and Missouri  
Flood Damage Reduction Project  
Section 216 Feasibility Study  
& Environmental Impact Statement

**July 13, 2006**

**Public Meeting**



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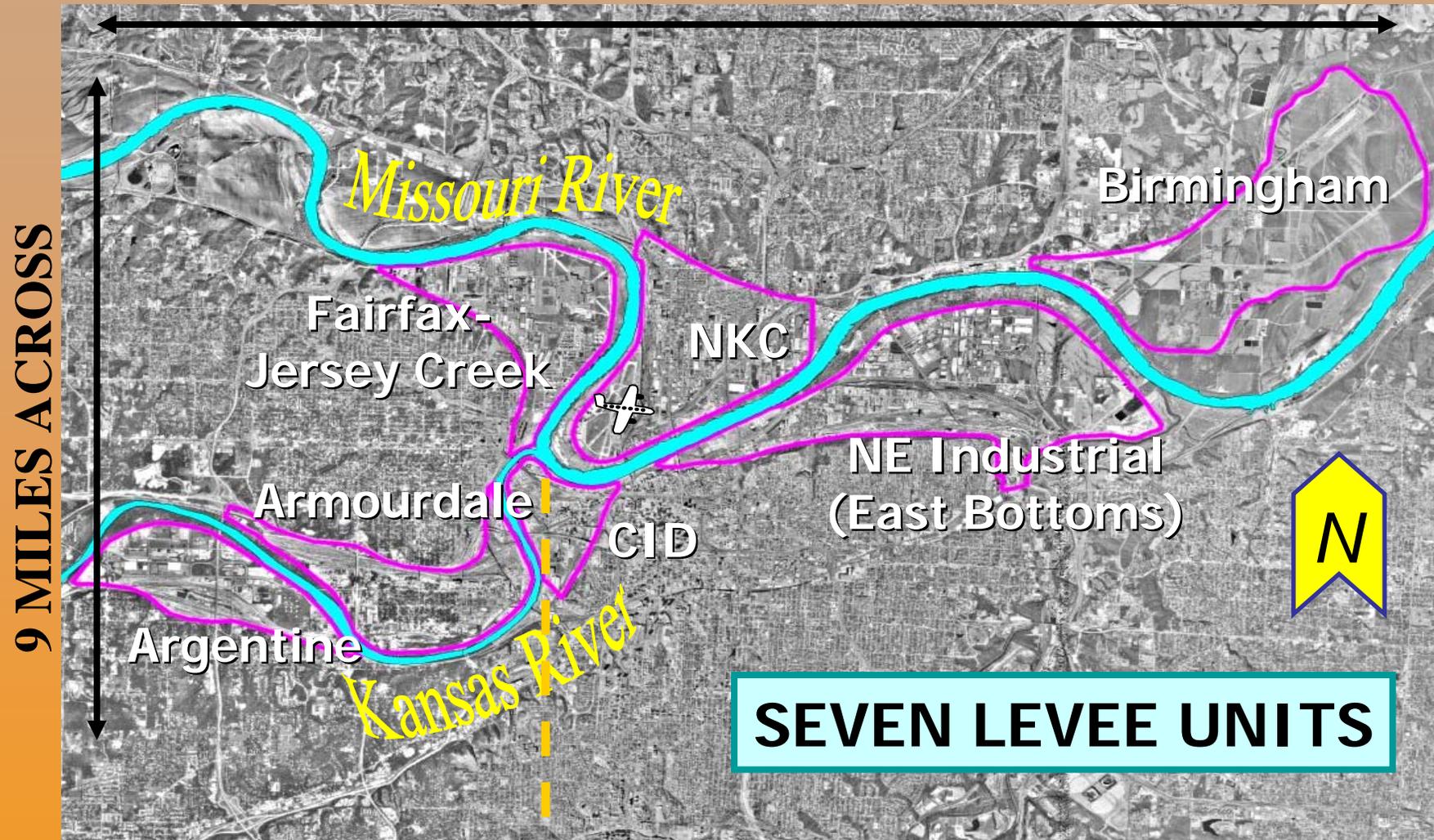
# Background



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# Project Area Overview

20 MILES ACROSS MAPPED AREA





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# Existing Kansas Citys, MO & KS Flood Damage Reduction Project

- Involves 2 states, 2 major rivers, & seven levee units in the Kansas Citys metro
- Over \$16B investment in study area
- 32 sq mi of urban industrial and commercial development
- Operates as a system of levee units providing coordinated protection



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# Levee, Floodwall, and Other Features

- **Over 50 miles of flood protection:**
  - **46 miles earthen levee (typ. over 12 ft high)**
  - **6 miles of floodwall with exposed floodwall heights ranging from 2 ft to over 22 ft**
- **Hundreds of stop-log gaps, retaining walls, gatewells, utility crossings, and associated appurtenant structures**
- **About 24 pump stations under analysis along the Kansas River Units**



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# History of Federal Involvement



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# Federal Involvement Summary

## 1930's through 1970's

- **Federal involvement began with 1936/1944 Congressional authorizations.**
- **Project implementation started late 1940's. The completed Federal construction was turned over to levee sponsors (who pre-existed Federal work).**
- **Major impacts from 1951 Kansas River flood → levee repairs and redesign, levee raises, and completion of the Kansas River Basin lakes.**
- **Project phasing and modifications spread levee construction over three decades: 1950s, 1960s, and ending in late 1970s.**



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# **Kansas Citys Project History & Federal Involvement Summary 1980's to Present**

- **Ongoing annual levee inspections**
- **Review of “work by others” within the critical zone**
- **Fed involvement in PL 84- 99 repairs after 1993 flood**
- **This Section 216 feasibility study**



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# Section 216 Authorization

**“The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects, the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to the significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying structures or their operation, and for improving the quality of the environment in the overall public interest.”**



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# Current Role of Corps in the Kansas City's Levees Project

- In general, the Corps represents the Federal Interest in Civil Works projects.
- The Federal Interest in the Kansas City's project can be broadly defined as: positively contributing to National Economic Development (through effective flood damage reduction) consistent with environmental protection and sustainability.
- The Corps also works to serve the public's interest, and preserve the project's original Congressionally-authorized purposes.
- The Corps does not own nor operate the levees.



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# Overview of Levee Units & Owner/Operators



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# Levee Unit Owner/Operators (Study Sponsors)

- **Fairfax Drainage District**
- **Kaw Valley Drainage District**
- **City of Kansas City, MO Levee Committee  
(Water Services -- lead department)**
- **North Kansas City Levee District**
- **Birmingham Drainage District** (*The Birmingham Drainage District owns and operate the levee. For purposes of the Kansas City Levees study, the Birmingham levee unit analysis is sponsored by City of KCMO.*)



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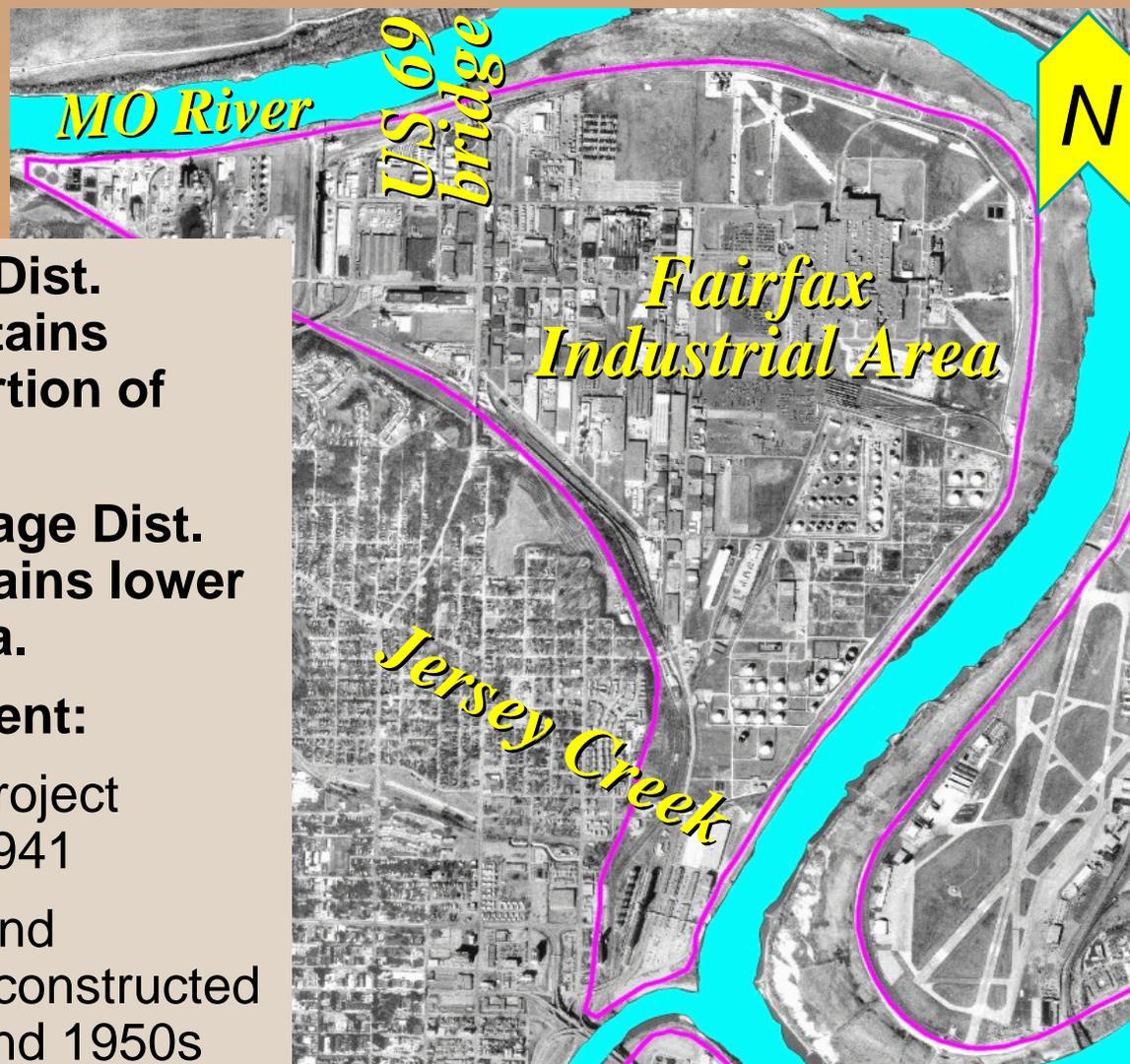
# Typical Levee District Operations and Governance

- **Own and operate the levee units.**
- **State Chartered. Board of Directors is elected by property owners within the protected area**
- **Full-time engineer (and/or AE consultants), maintenance employees, and office staff**
- **Pump station opns, flood fighting, maintenance, compliance with 33CFR, annual inspections**
- **Primary funding source is local property tax. Other funding sources from local agreements.**
- **Bond issues are likely necessary for major Federal project work arising from this study.**



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# Fairfax / Jersey Creek Unit

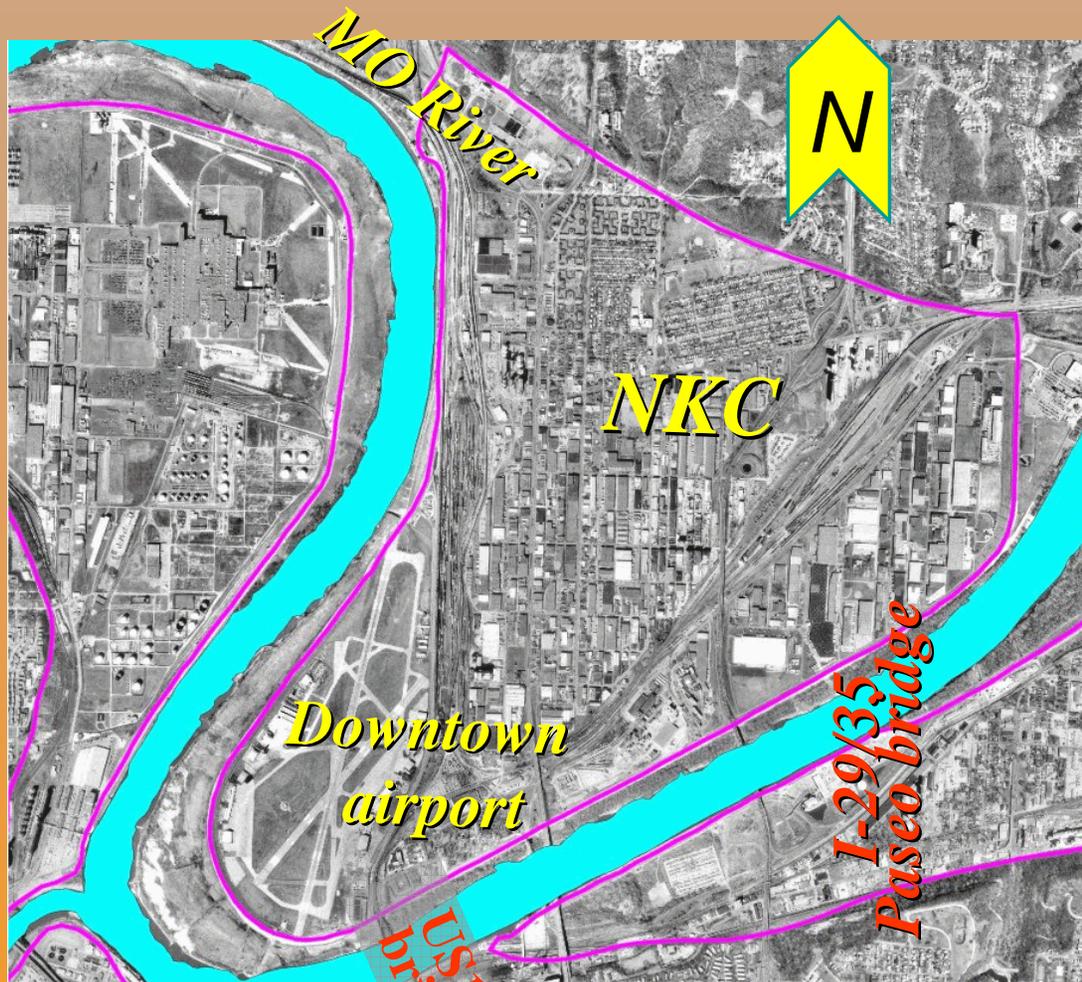


- **Fairfax Drainage Dist. operates & maintains Fairfax (main) portion of this unit**
- **Kaw Valley Drainage Dist. operates & maintains lower Jersey Creek area.**
- **Federal involvement:**
  - Federal/local project completed in 1941
  - Modifications and improvements constructed in late 1940s and 1950s



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# North Kansas City Unit



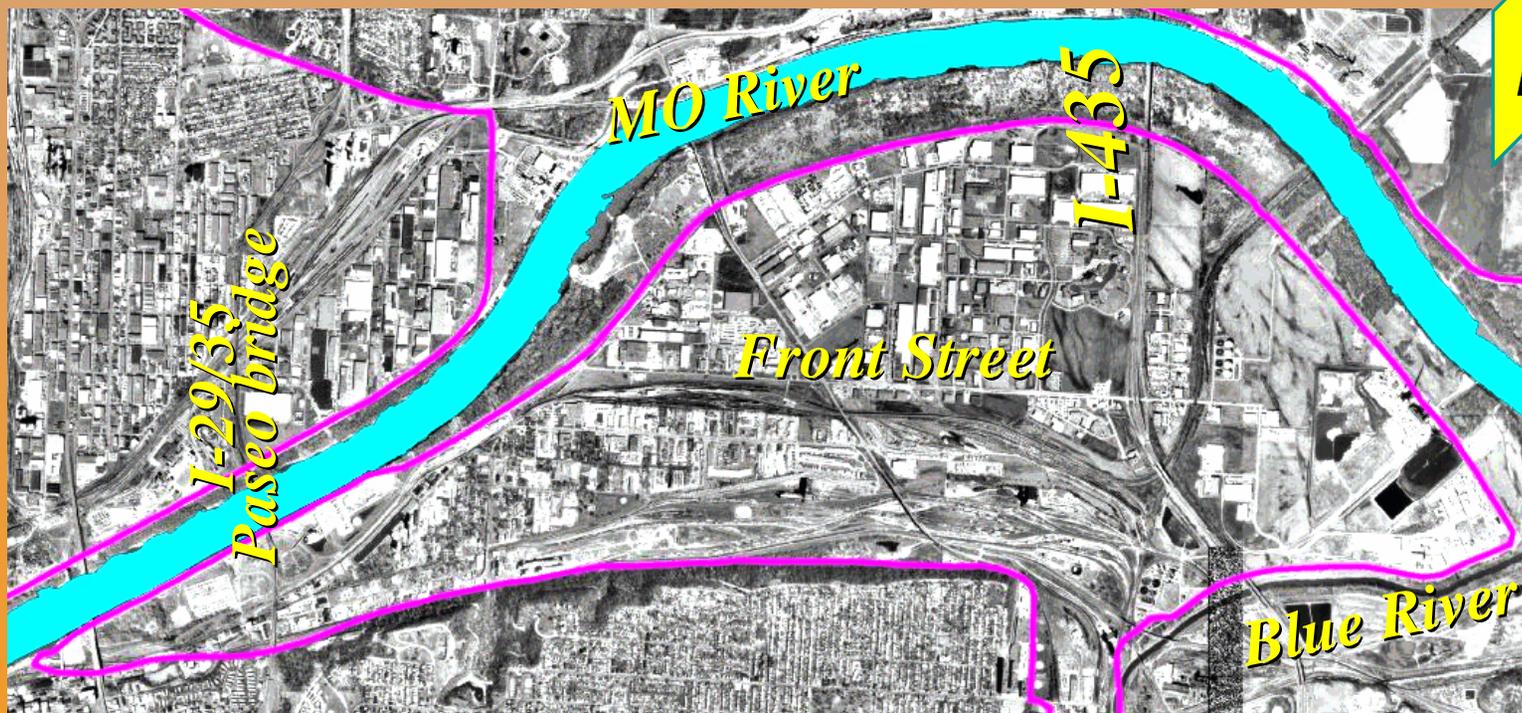
- The North Kansas City Levee District was organized in 1909 and built early works.
- Federal improvements in the 1940's
- Improvements made after 1951.



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# Northeast Industrial District (East Bottoms) Unit

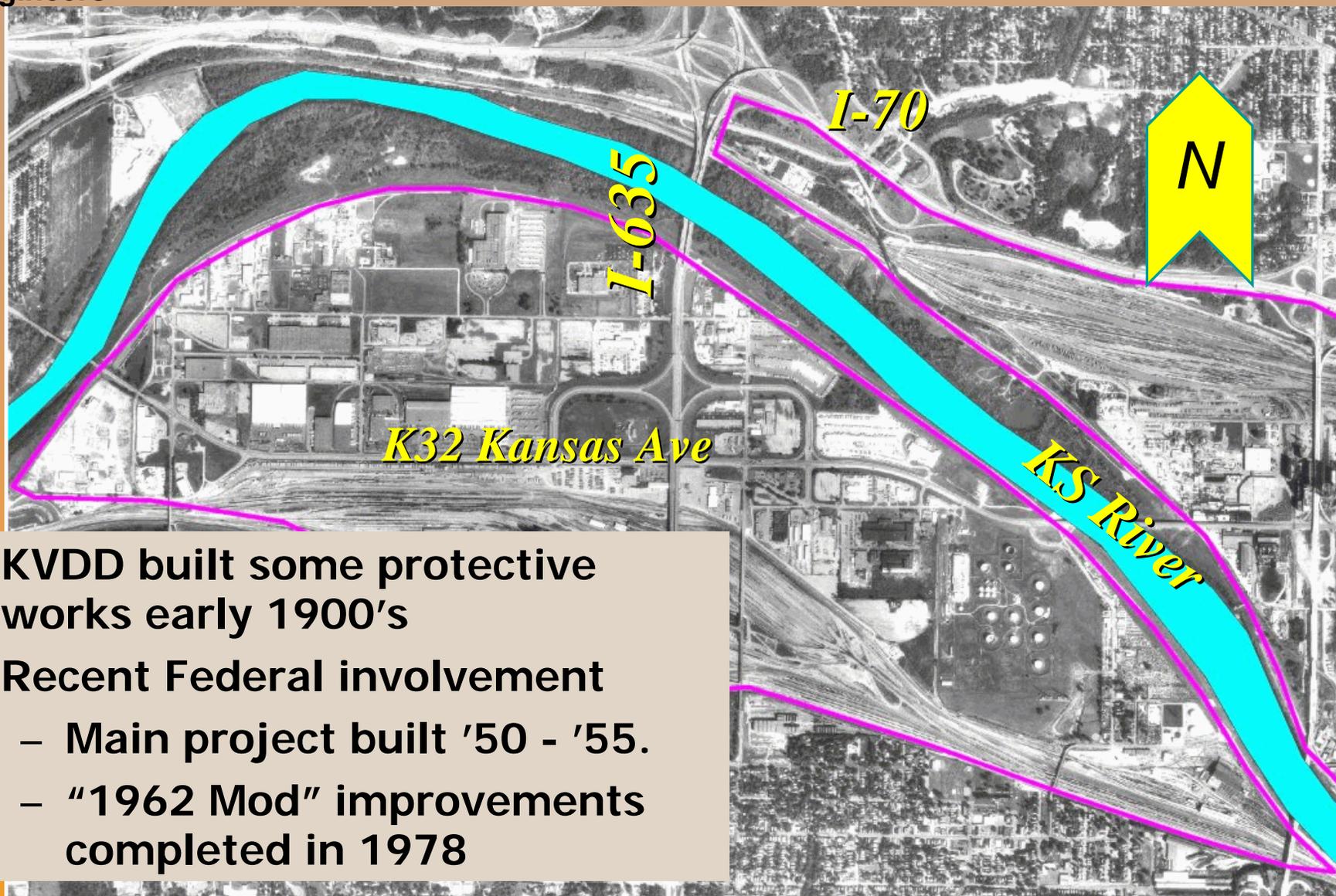
- Began with Federal & local KCMO cooperation
- Construction completed in 1950
- Various Improvements completed in 1974





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# Argentine Unit



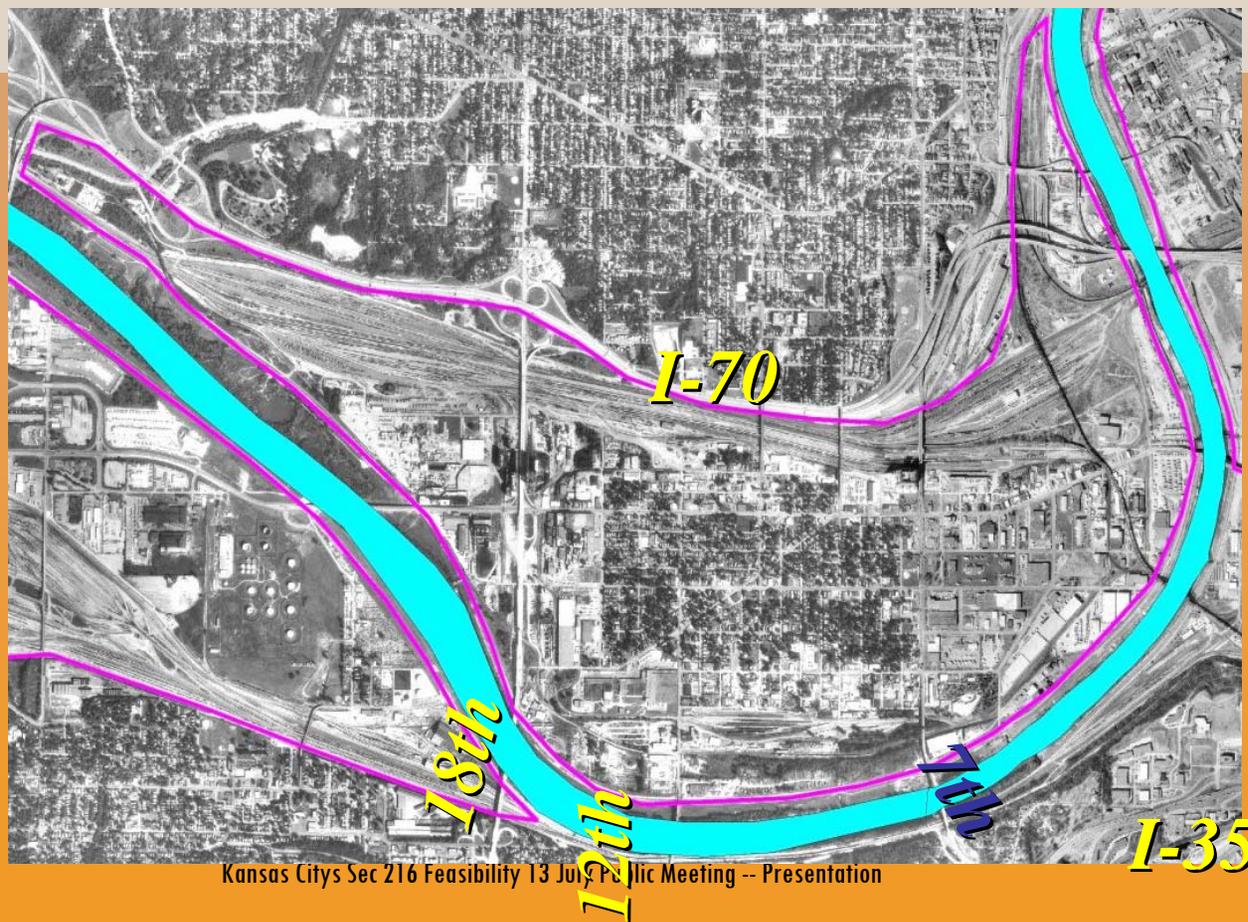
- KVDD built some protective works early 1900's
- Recent Federal involvement
  - Main project built '50 - '55.
  - "1962 Mod" improvements completed in 1978



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# Armourdale Unit

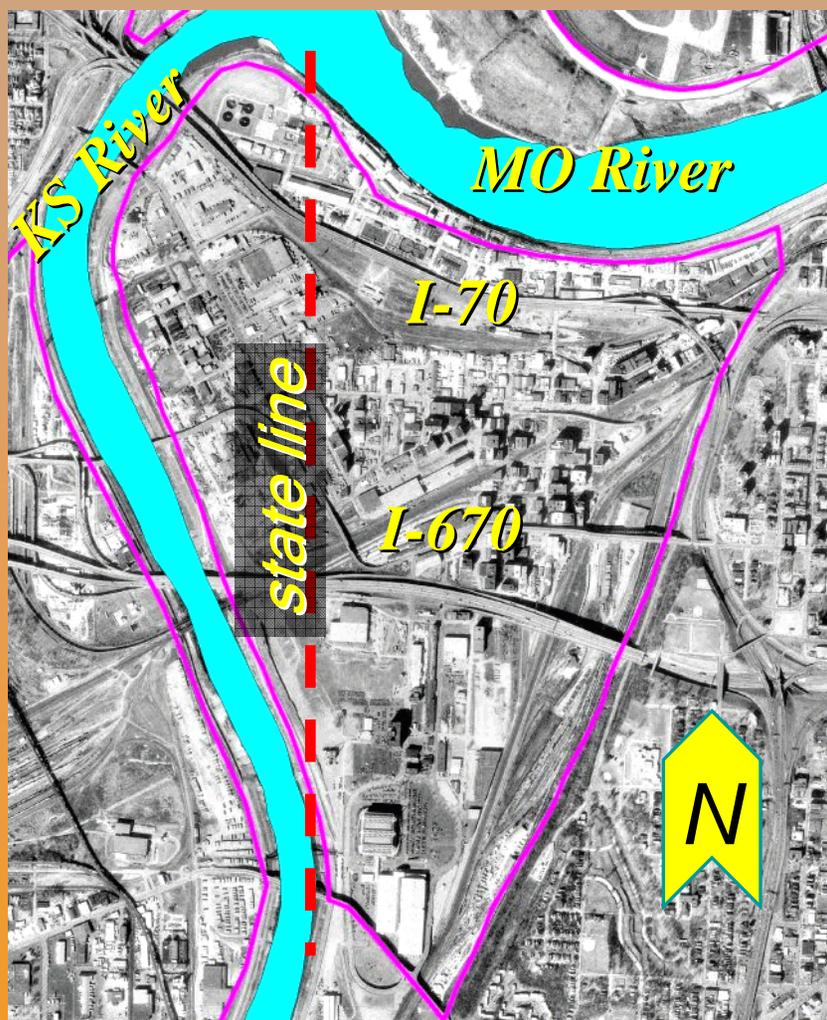
- KVDD built some protective works early 1900's.
- Recent Federal involvement
  - Main project built 1949 - 51 & post '51 flood.
  - "1962 Mod" Improvements completed 1976.





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# Central Industrial District Unit

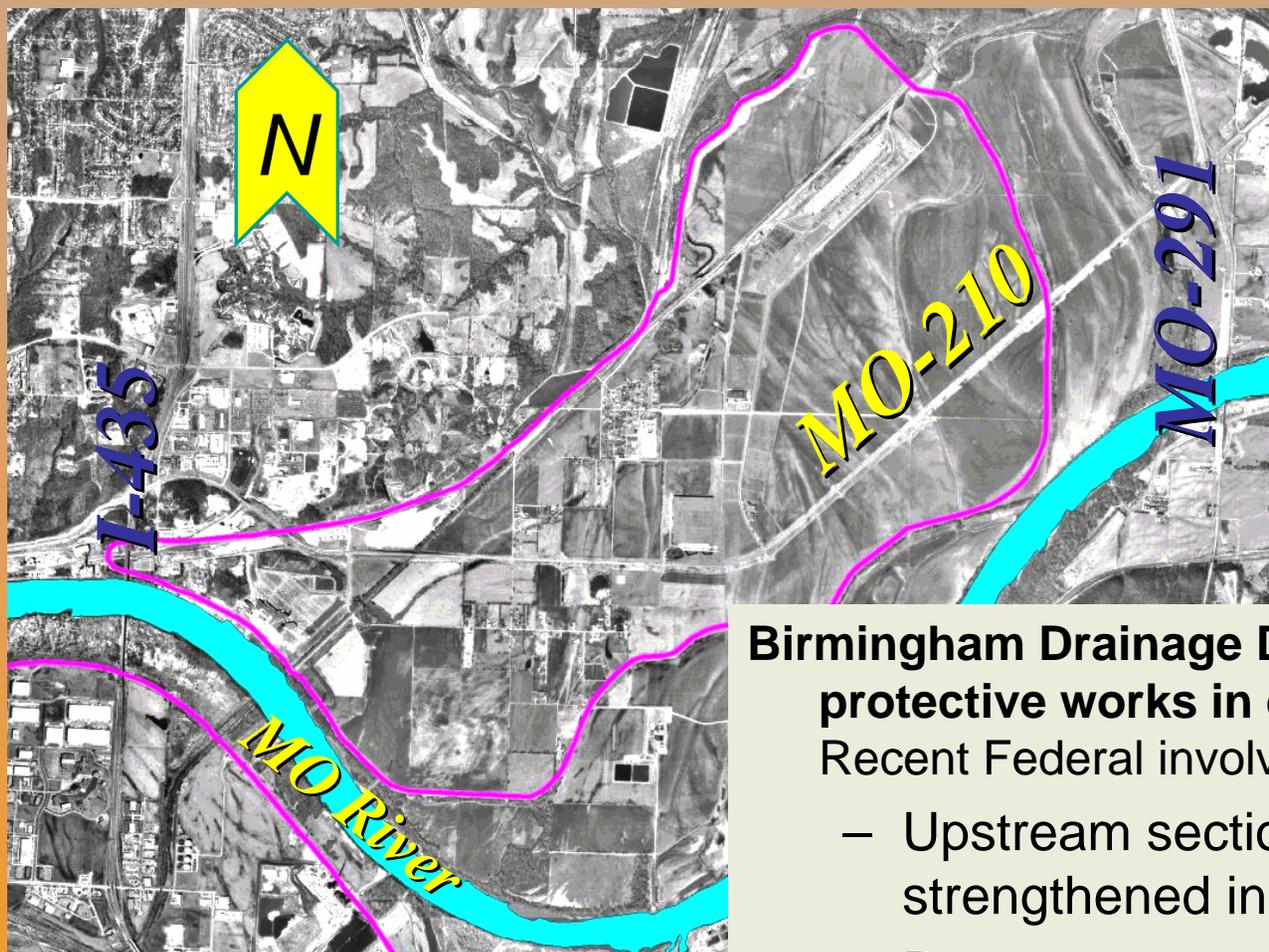


- Some protective works built early 1900s
- KVDD : Kansas portion
- KCMO : Missouri portion
- Recent Federal involvement
  - Main project built late 1940s through 1955
  - Improvements completed '79



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# Birmingham Unit



**Birmingham Drainage District built some protective works in early 1900's.**

Recent Federal involvement:

- Upstream section raised and strengthened in 1952
- Downstream section modified & strengthened from 1954-55.



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# Feasibility Study

**Essentially a Technical and Planning  
Investigation Producing Recommendations  
for Congress & Public Consideration**



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# Planning Objectives for this Feasibility Study

- 1) Update and verify data on the reliability of the existing flood protection project**
- 2) Develop alternative plans (to include a review of “No Federal Action”) for increasing the overall reliability of the existing levee system consistent with the original authorizations, and provide a final recommended plan for implementation that is technically sound, economically feasible & environmentally acceptable.**



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# Some Questions We Considered

- **The system is roughly 40 to 60 years old. Is everything still working as it is supposed to be working?**
- **Are we still achieving the original authorization and design objectives?**
- **What environmental considerations exist?**
- **Is the public aware of problems we need to look at?**
- **Are sponsors aware of problems we need to look at?**
- **How did the levee system behave in 1993 flood event?**
- **Is it possible to economically increase the current day benefits of the system?**



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# Hydrologic & Hydraulic Studies



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# Hydrologic & Hydraulic Analysis

**Much of our analysis is built on:**

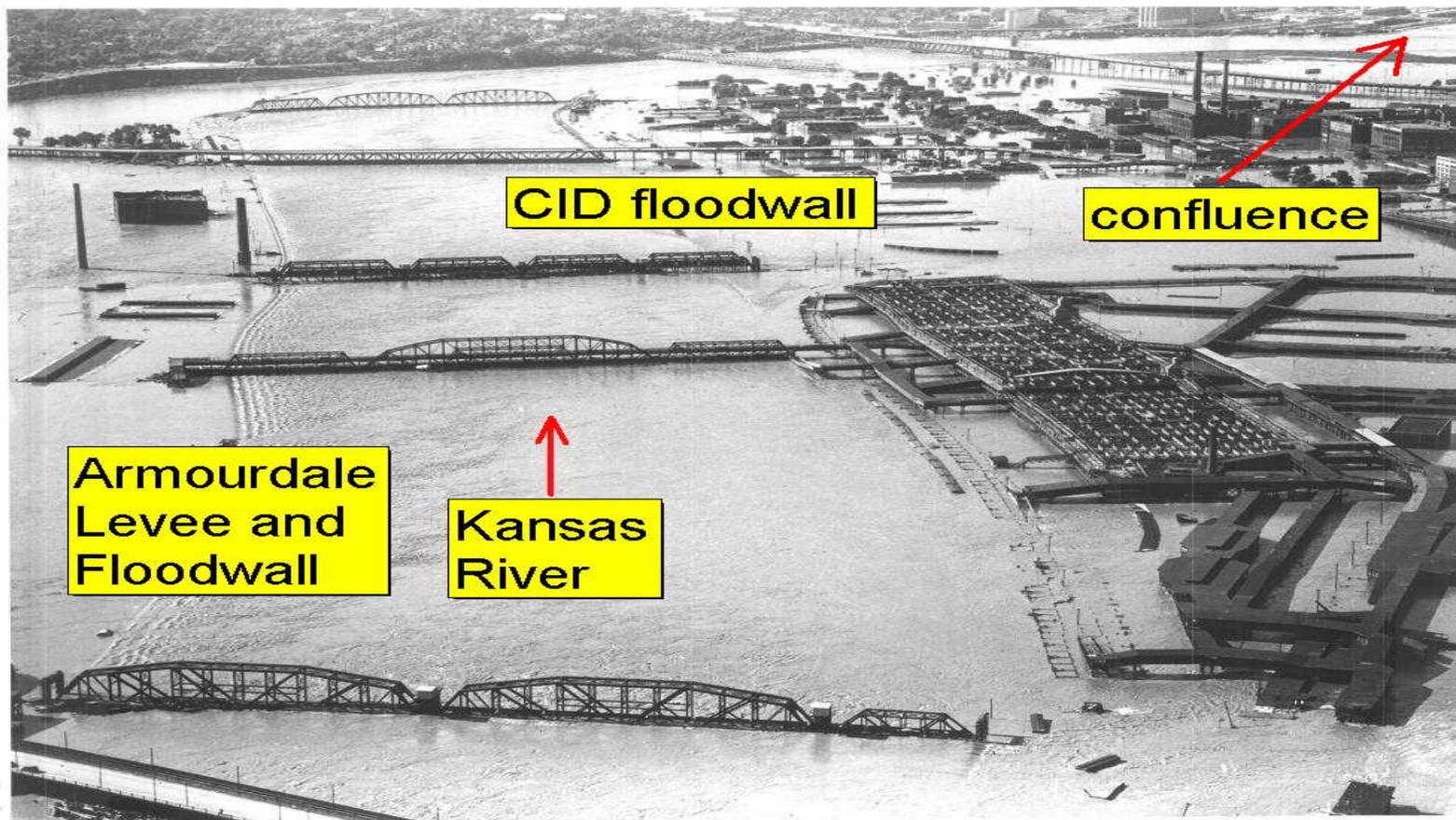
- **Examination of original design documents (dating back to 1930's and 1940's)**
- **Examination of 1951 flood and associated peak discharge on Kansas River which in turn led to the 1962 modified design discharges**
- **Examination of the 1993 flood event and associated MO River discharge and levee system performance.**
- **Recent hydrologic studies for the Kansas and Missouri basins**
- **Forecast conditions**



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# The Great Flood of 1951

- Kansas River flood event
- Kansas River Basin Lakes were not in place
- Estimated peak flow on the Kansas River – 510,000cfs

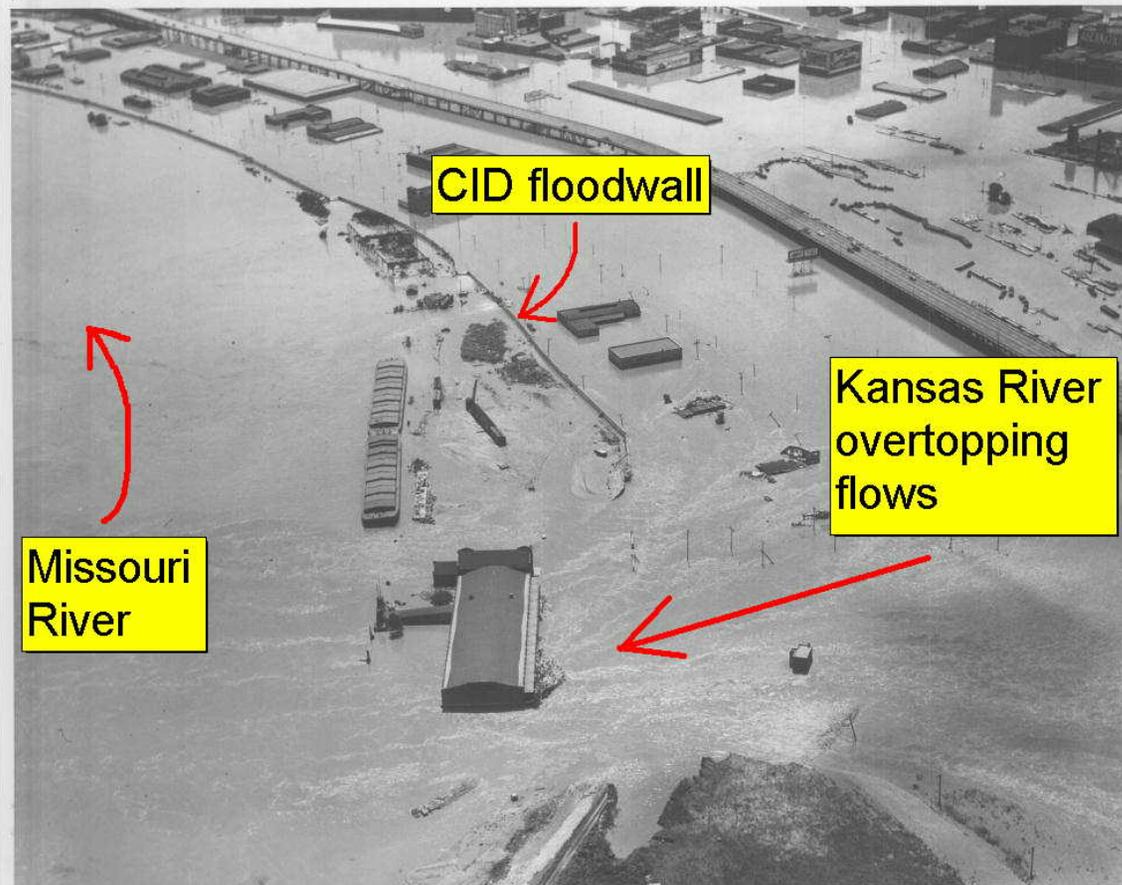




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# The Great Flood of 1951

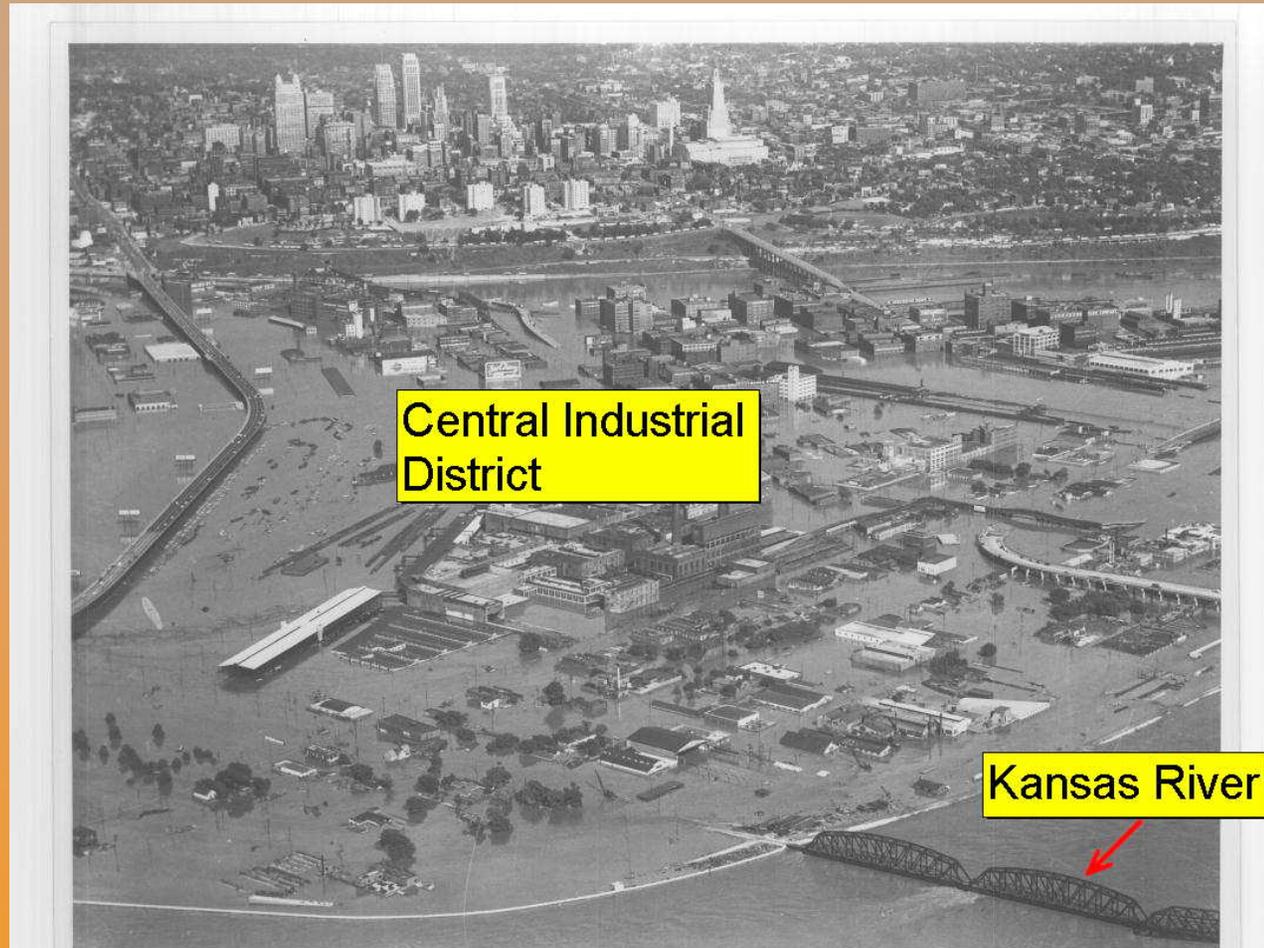
**Kansas River flowing through CID floodwall  
into the Missouri River**





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# The Great Flood of 1951



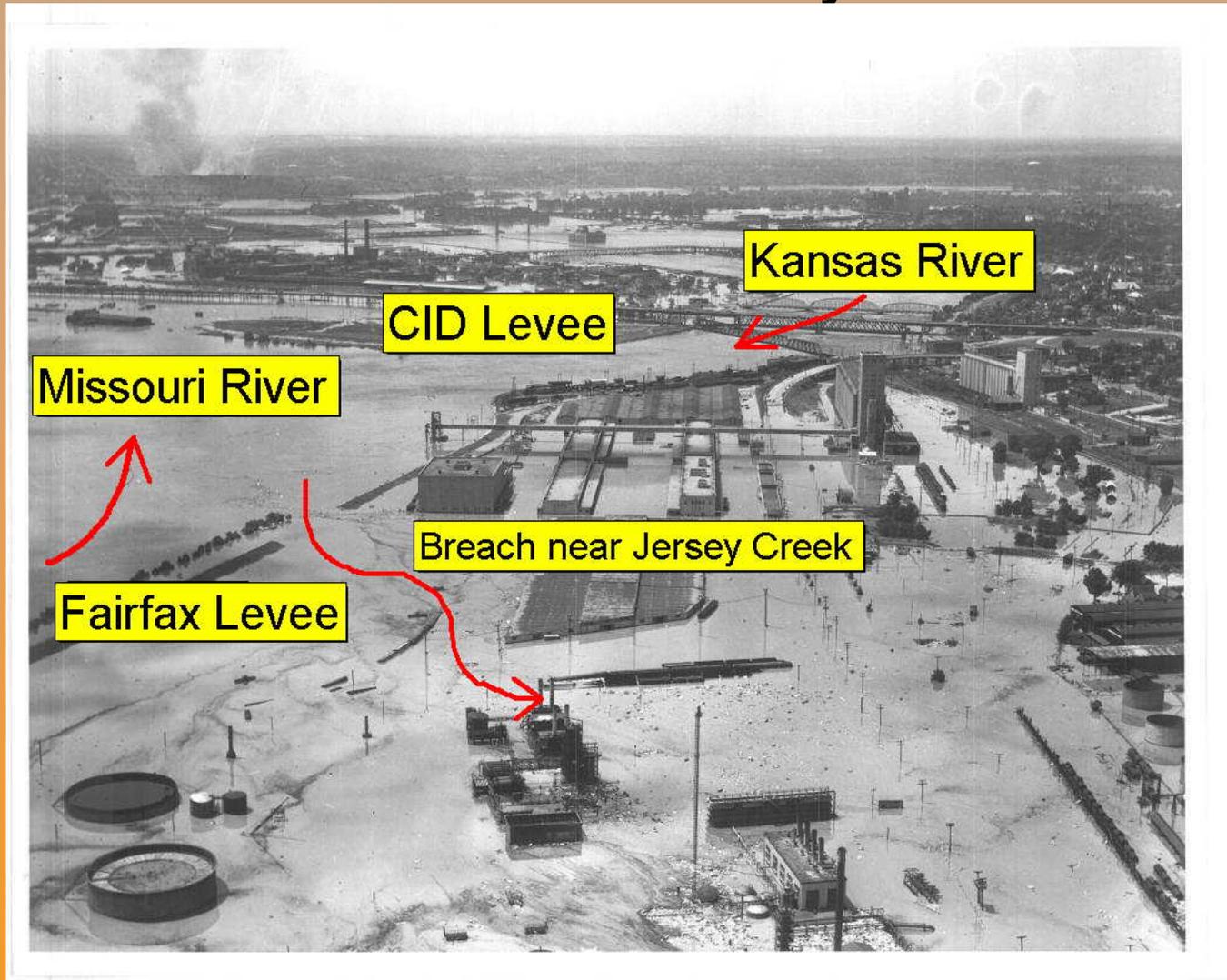
**All 3 Kansas River Units Overtopped**



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# The Great Flood of 1951

## Breach of the Fairfax-Jersey Creek Unit



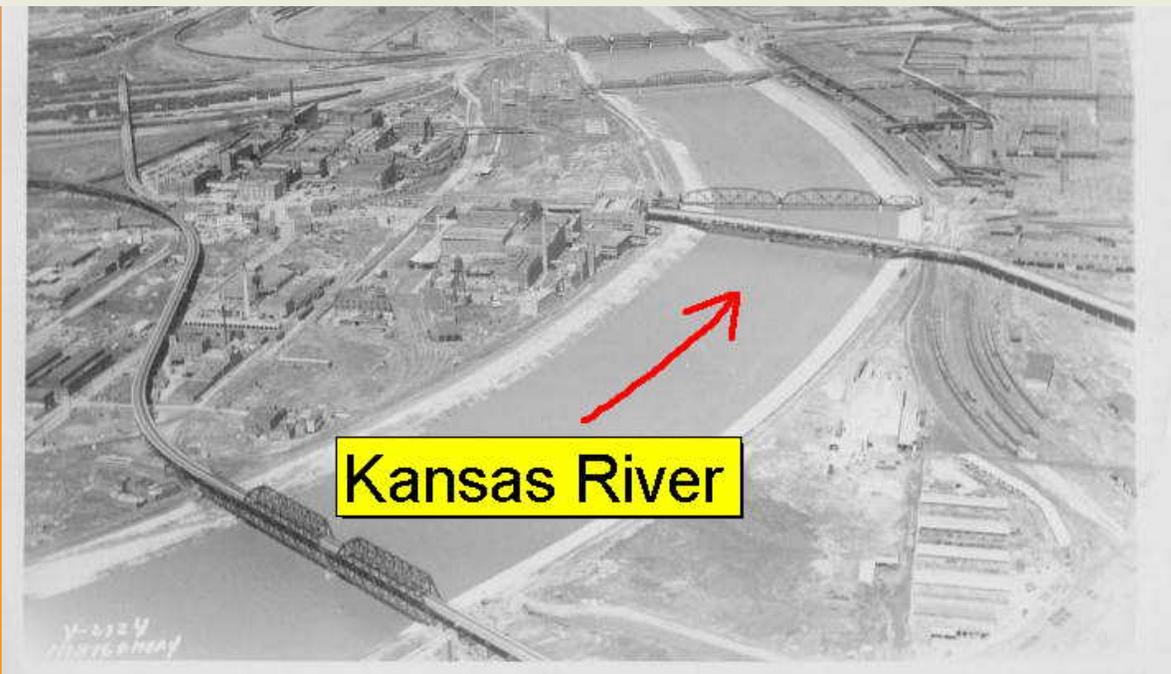


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# Kansas River, 1955

The 1951 flood and the associated peak discharge on Kansas River led to the “1962 modification” which raised the Kansas River levees

Kansas River 1962 modified design flows were based on a relatively “clean” flood conveyance zone, i.e. not much flow obstruction





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# Kansas River Post '51 Flood





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# Kansas River, 1999





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# Why 1993 is Important...

Armourdale

Fairfax

CID

NKC

Missouri River

**1993 Flood Stage Photo**



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# Characterization of the 1993 Flood Event

- **Primarily a Missouri River event**
- **Flood Peaked about 3 to 5 feet below Top of Levee on most Missouri units**
- **Provided HWM data for model calibration**
- **Downstream from the MO & KS confluence, the 1993 event was essentially the design flood event for NKC, CID-MO, East Bottoms and Birmingham Units**
- **Upstream from the Kansas River, the MO River flood flows of 376,000 cfs did not reach original 1940 upper Missouri design discharge flows of 460,000 cfs**
- **On the Kansas River, the peak flow at the mouth was about 165,000 cfs, well below the 1962 modified design discharge of 390,000 cfs**



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# Summary Findings & Recommendations for Overtopping Protection

- From a hydraulic overtopping standpoint, all of the 7 levees passed the 1993 event
- The three Kansas river units need increased overtopping protection
- Existing Missouri River units in general have lower overtopping risk -- but other localized reliability issues (structural and geotechnical) are present and those are addressed in our recommendations.



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# **Geotechnical Studies**

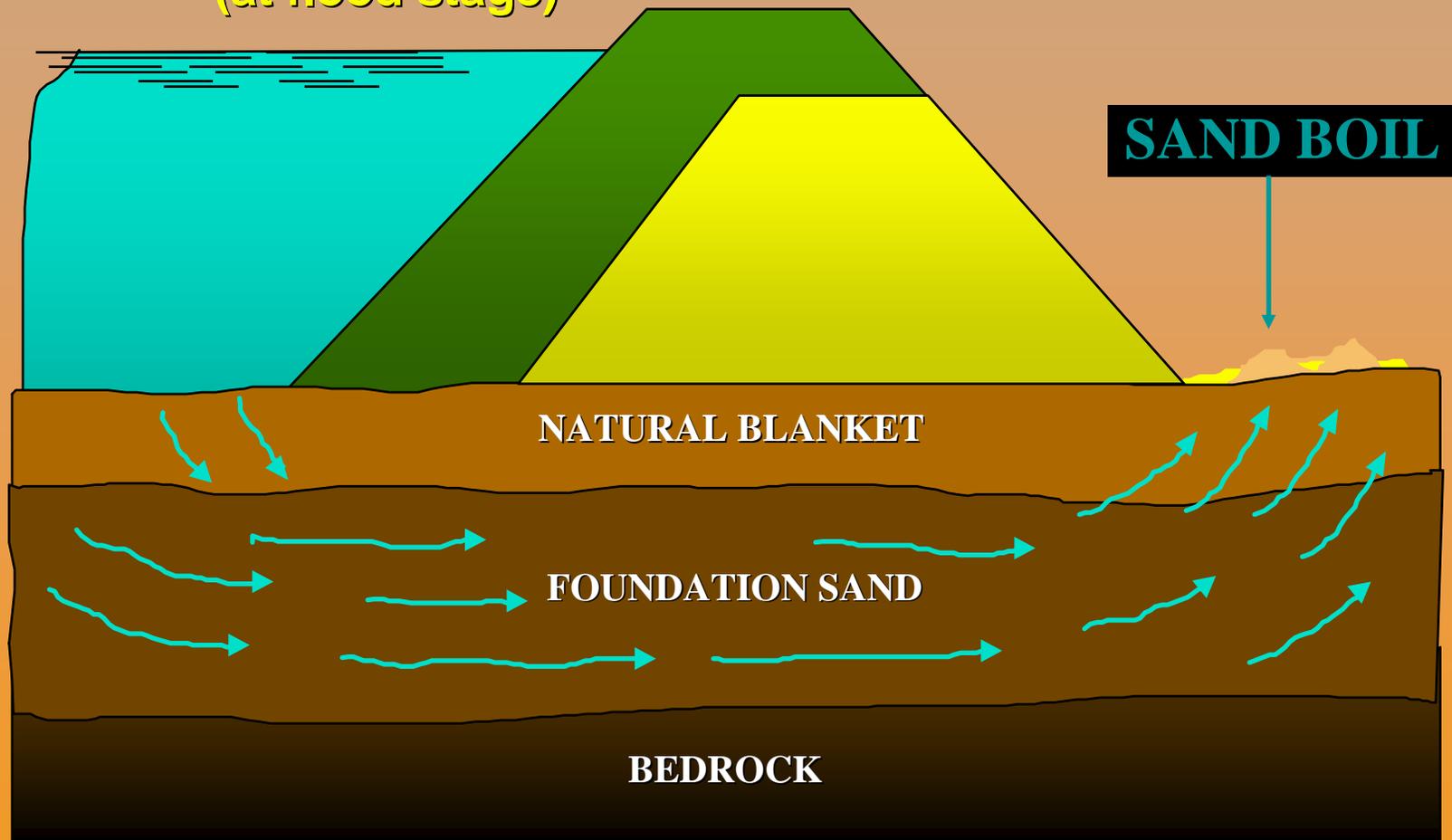


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# Sand Boil Formation

**RIVERWARD**  
(at flood stage)

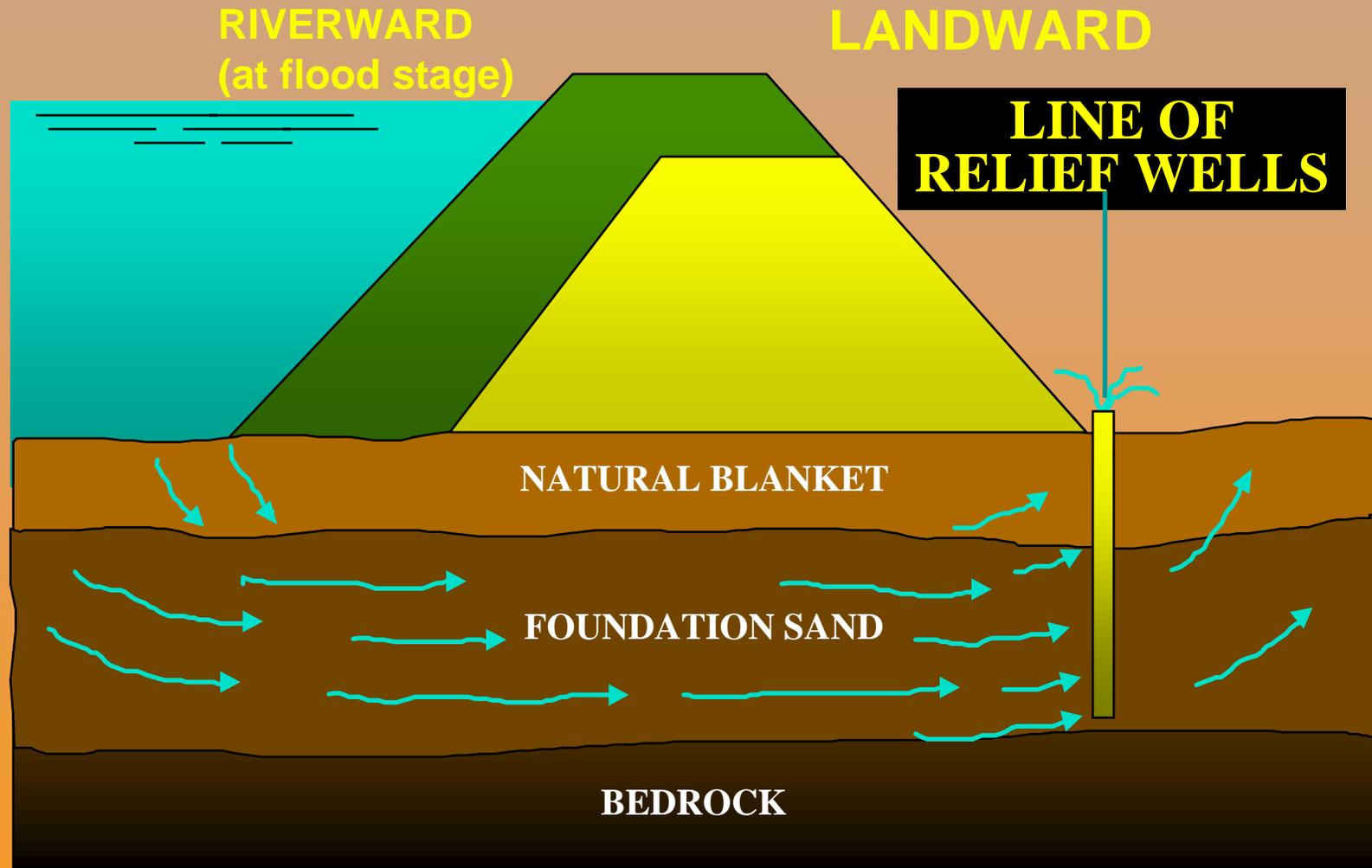
**LANDWARD**





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# Underseepage Control -- Relief Well System





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# Underseepage Analysis Findings & Recommendations

Recommend Improved Underseepage Control at:

Harlem Area and National Starch Area on the  
Lower Section of the NKC Levee Unit

East Bottoms Levee Section near the Confluence  
of the Blue River and the Missouri River



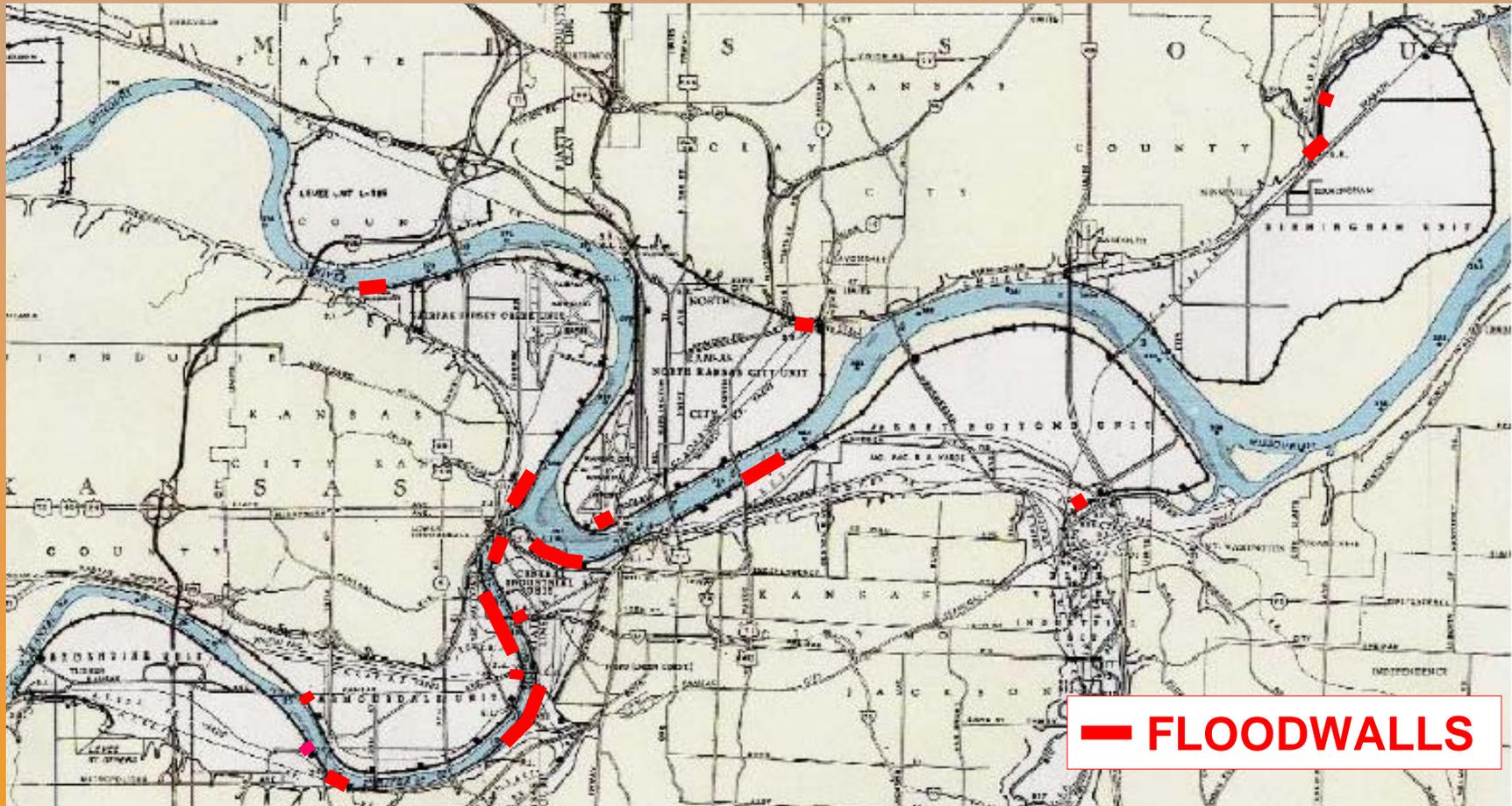
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# **Structural Studies**



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# Floodwall Locations





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# Overview of Structural Analysis Process

- **Structures with reliabilities that adversely impact the overall reliability of the existing unit are considered for potential reliability improvement.**
- **Structural remedies/modifications are designed to current “new construction” requirements (99.8% reliable).**



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# Floodwall & Retaining Wall Findings & Recommendations

- **Fairfax/BPU Floodwall:** Risk of floodwall failure under extreme flood conditions. Recommend strengthening pile foundation and buttressing the main stem wall.
- **Fairfax-Jersey Creek Sheetpile Wall:** Risk of failure under flood conditions results from combination of geotechnical and structural factors. Recommend reconstruction using a driven open-cell sheetpile wall.



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# **Economic Studies**



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# Economic Importance of the Existing System

- **System protects**
  - Well over 5000 structures
  - About 20,000 residents
- **Businesses within the protected areas employ about 90,000 people**
- **Extensive rail and road systems within the protected areas... of regional and national importance**
- **Downtown airport and several vital utilities**



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# Economic Assessment Summary

- Determination of extent, \$ value, and susceptibility to flood damage of the properties within protected areas.
- Calculation of the benefits associated with potential reliability improvements
- Comparison of benefits and costs of various alternatives, and optimization of the various alternatives to determine the National Economic Development (NED) Plan.
- The NED plan is the Recommended Plan.



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# Recommended Plan Summary

*More details are available during the Information  
Tables segment of the meeting...*

*Also refer to the “Syllabus” handout*



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# Interim Feasibility Report (Phase 1) Recommendations

## Kansas River Levee Unit Recommendations:

Overtopping reliability improvement (levee raise) is recommended for the Argentine unit. NED Plan is nom500+3 ft (approx 5 ft levee raise).

- Armourdale & CID-KS will be addressed in final report aiming at an overall uniform (system) level of protection on the three lower Kaw units.
- Argentine levee raise concurrent with geotechnical, structural and pump station reliability improvements.



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# Recommendations (Continued)

## Recommend five smaller reliability improvements on three Missouri River levee units:

- Fairfax-Jersey Cr. Sheetpile Wall Reconstruction
- Fairfax/BPU Floodwall Modifications
- North Kansas City (NKC) -- Harlem Underseepage
- NKC -- National Starch Area Underseepage
- E. Bottoms -- MO River and Blue River Confluence Underseepage Control

***Note: No raises identified for the Missouri units***

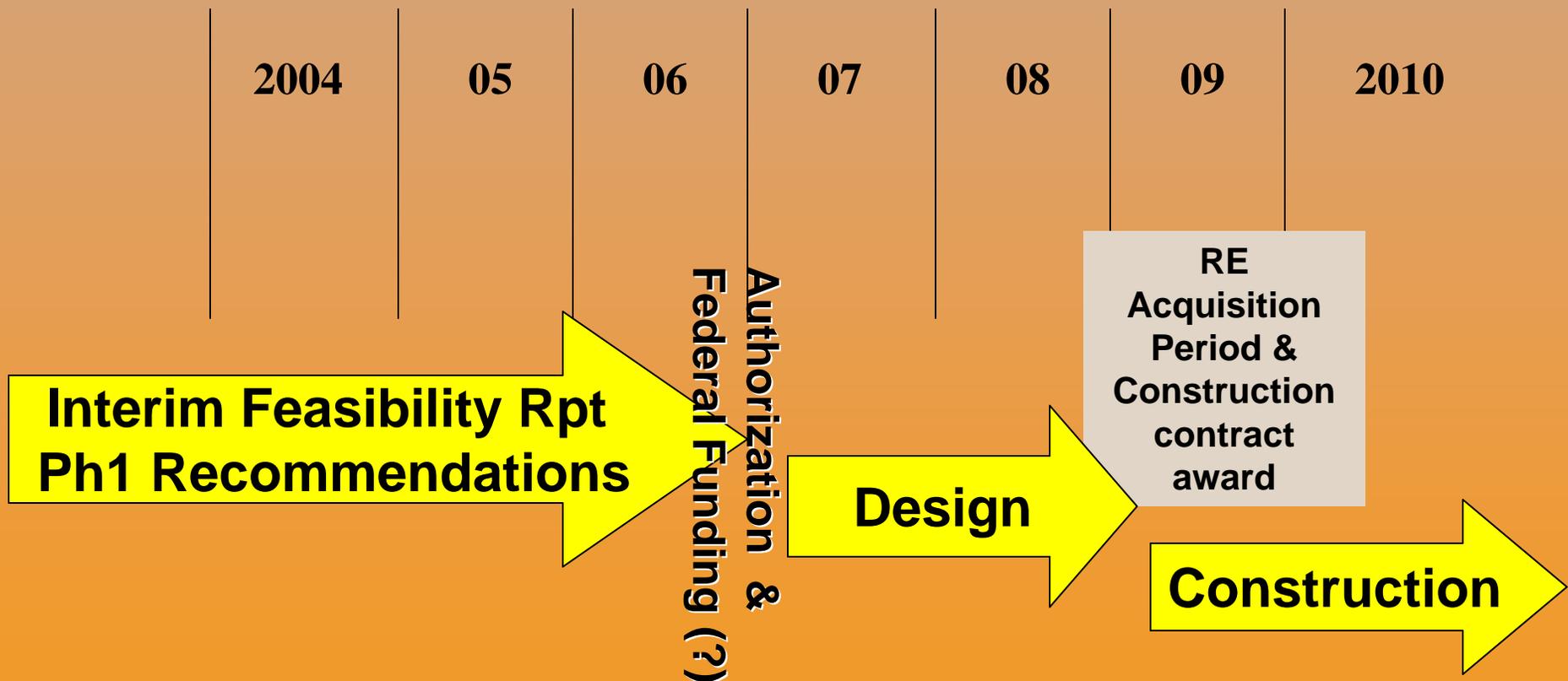


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# PHASE 1 RECOMMENDATIONS

## Generalized Implementation Timeline

Individual project sites will vary depending on specific design & construction requirements





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# EIS and NEPA



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# EIS Process

- Corps preparing Environmental Impact Statement (EIS) concurrently with engineering & planning
- Preliminary scoping with public/agency meeting and input through September 22, 2003.
- Mid-2006 Draft EIS & Feasibility Report  
→ tonight's Public Review/Meeting
- Mid-2006 Final EIS & Report → Agency Reviews
- Approved Reports & Formal Decision (ROD) in late 2006.



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# EIS -- Coordinating Agencies

- Purpose - gain input for environmental review process, seek out special expertise, and for NEPA compliance purposes
- Held Agency Information/Scoping Meeting on August 7, 2003
- Coordinating agencies include local, state and Federal – Kansas & Missouri
- Ongoing coordination during management measure and EIS development period
- EPA signed-on as formal “Cooperating Agency”



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# EIS -- Evaluating Impacts

- Fish & Wildlife
- Water Supply
- Navigation
- Air Quality
- Noise
- Soils & Farmland
- Wetlands
- Fisheries
- Socio-Economics
- Vegetation & Habitat
- Recreation
- Hazardous Waste
- Geology
- Navigation
- Water Quality
- Cultural Resources
- Threatened & Endangered Species
- Aesthetics
- Visual Qualities
- Land Use
- Environmental Justice



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# EIS – Impact Findings

- **No to negligible permanent impacts were found for most resources.**
- **Temporary impacts were identified for:**
  - **Noise, Water & Air Quality, Fisheries & Wildlife**
- **Permanent impacts were identified for:**
  - **Three wetlands totaling less than one acre within the Argentine Levee Unit and proposed borrow area.**
  - **Prime farmland totaling up to 60 acres is used for proposed borrow area.**
  - **Historic pump house within Fairfax-Jersey Creek Levee Unit will need sand-filled basement.**



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Presentation**