US Army Corps
of Engineers
Kansas City District

Sec 216 Feasibility Study of the Existing Kansas Citys, Missouri & Kansas Local Flood Protection Project

Public Information/Scoping Meeting
North Kansas City Community Center
August 20, 2003

agenda…

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Agenda

- Study team introductions
- Presentation
  - General information, authorization
  - Sponsors' discuss/describe levee units
  - Feasibility activities and analysis
  - NEPA process
- Comment collection & discussion (Audience)
- Adjourn -- target 8:00

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Public Comments

- Proceedings are being recorded and all comments become part of the public record
- Please hold comment forms until close of presentation:
  - Will be collected
  - Initial summary of comments to be posted on project website in late Sep.

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Meeting Objectives

- Obtain public input and accomplish coordination early in the study process
- Provide information regarding study status

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Kansas Citys Levees
Team Introductions

Corps & Local Sponsors

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Project Website

Current information on the project is available on our web page and will be updated during the study.

www.nwk.usace.army.mil/projects/7levees

The slides shown in this meeting will be posted on the above website within the next week.

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Agency and Public Meetings

- Introductory Feasibility Meeting: June 6, 2001
- Agency Info/Scoping Meeting – Aug 7, 2003
- Public Info/Scoping Meeting – Aug 20, 2003
- Draft Evaluation Report/Draft Environmental Impact Statement Public Meeting – Early 2005

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Flood Damage Reduction General Information

- **Congress** has provided the Corps of Engineers numerous authorities and mandates over the past 65 years regarding flood damage reduction
- The current **Administration** is supportive (budgets) of flood damage reduction initiatives
- **Sponsors** are local partners in Corps projects, and participate in the funding and execution of projects (or studies) per specific program guidance. In the case of the Kansas Citys levees, the sponsors own, maintain, and operate the entire seven levee system.

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Congressional Authority

Section 216 of the 1970 Flood Control Act provides authority to reexamine completed civil works.

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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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Typical Phases of a Corps Project

- Reconnaissance (completed)
- **Feasibility (Underway)... Is a detailed planning study that produces a Feasibility Report and associated NEPA documentation which are normally sent to Congress for review and potential project authorization**
- Preconstruction Engineering and Design
- Construction
- Project Operation & Maintenance

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Planning Objectives for this Feasibility Study

- Update & verify data on the reliability of the existing flood protection system
- Develop alternative plans (to include a review of "No Federal Action") for increasing reliability of the overall existing system and provide a final recommended plan for implementation that is technically, economically, and environmentally sound.

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Levee Reliability

For the purposes of this study, levee (and associated protective works) reliability will be defined as:

A measure of how well a levee system will perform under various flood conditions

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Discussion of the Existing Kansas Citys Local Flood Protection Project

- Seven levee units overview
- KC metropolitan (KS and MO) protected areas
- Individual sponsors presentations

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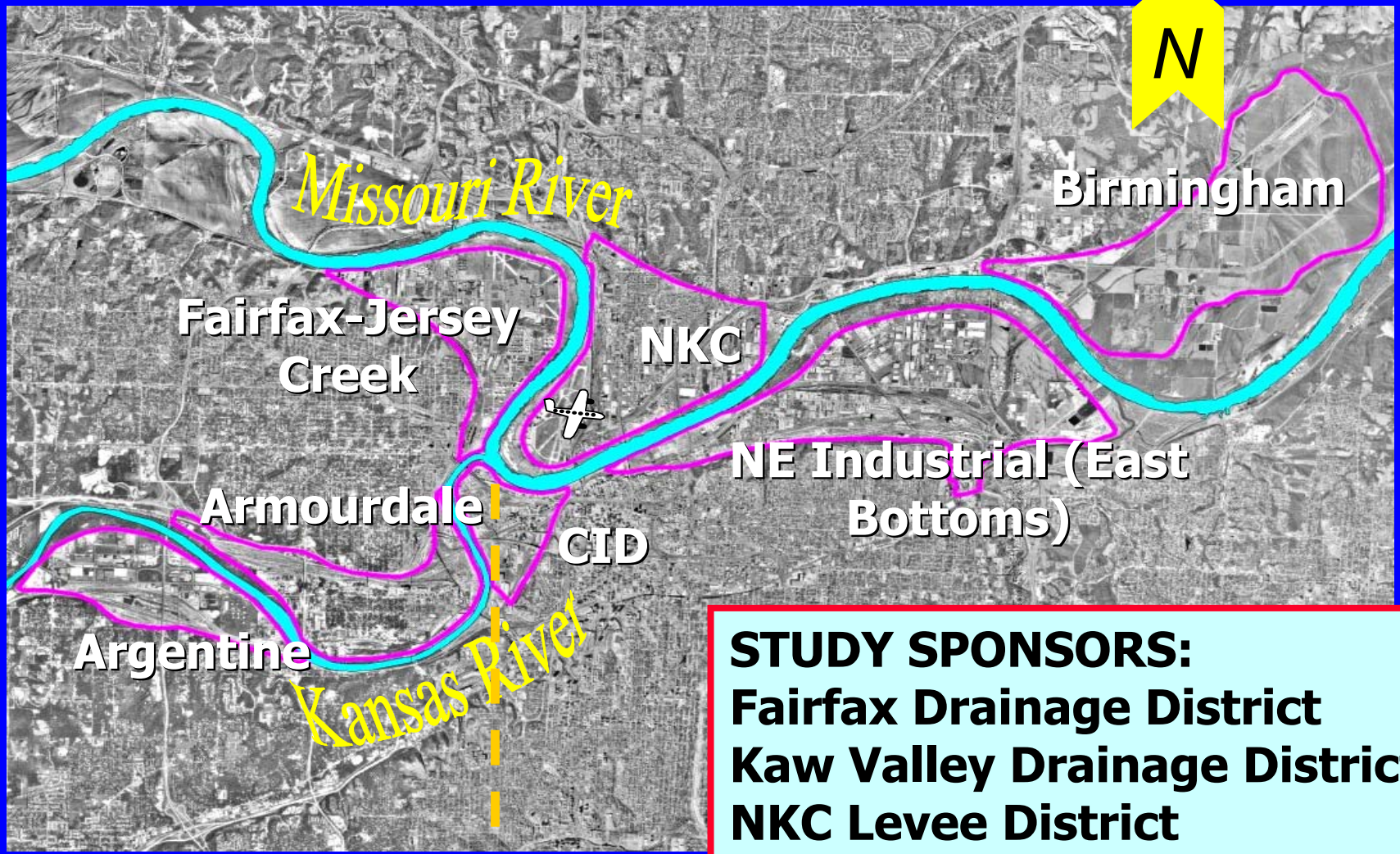
Kansas Citys Local Flood Protection Project Overview



STUDY SPONSORS:
Fairfax Drainage District
Kaw Valley Drainage District
NKC Levee District
KCMO Levee Committee

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Overall Project Description

- Extends along 9.5 miles of Kansas River and 16 miles of Missouri River.
- Protects 32 square miles of mostly urban commercial and industrial areas with estimated investment of over $ 12 Billion.
- Recent Federal involvement began with the 1936/1944 authorized project

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Sponsor Presentations

- **Fairfax Drainage District**
- Kaw Valley Drainage District
- KCMO Levee Committee
- North Kansas City Levee District
- Birmingham

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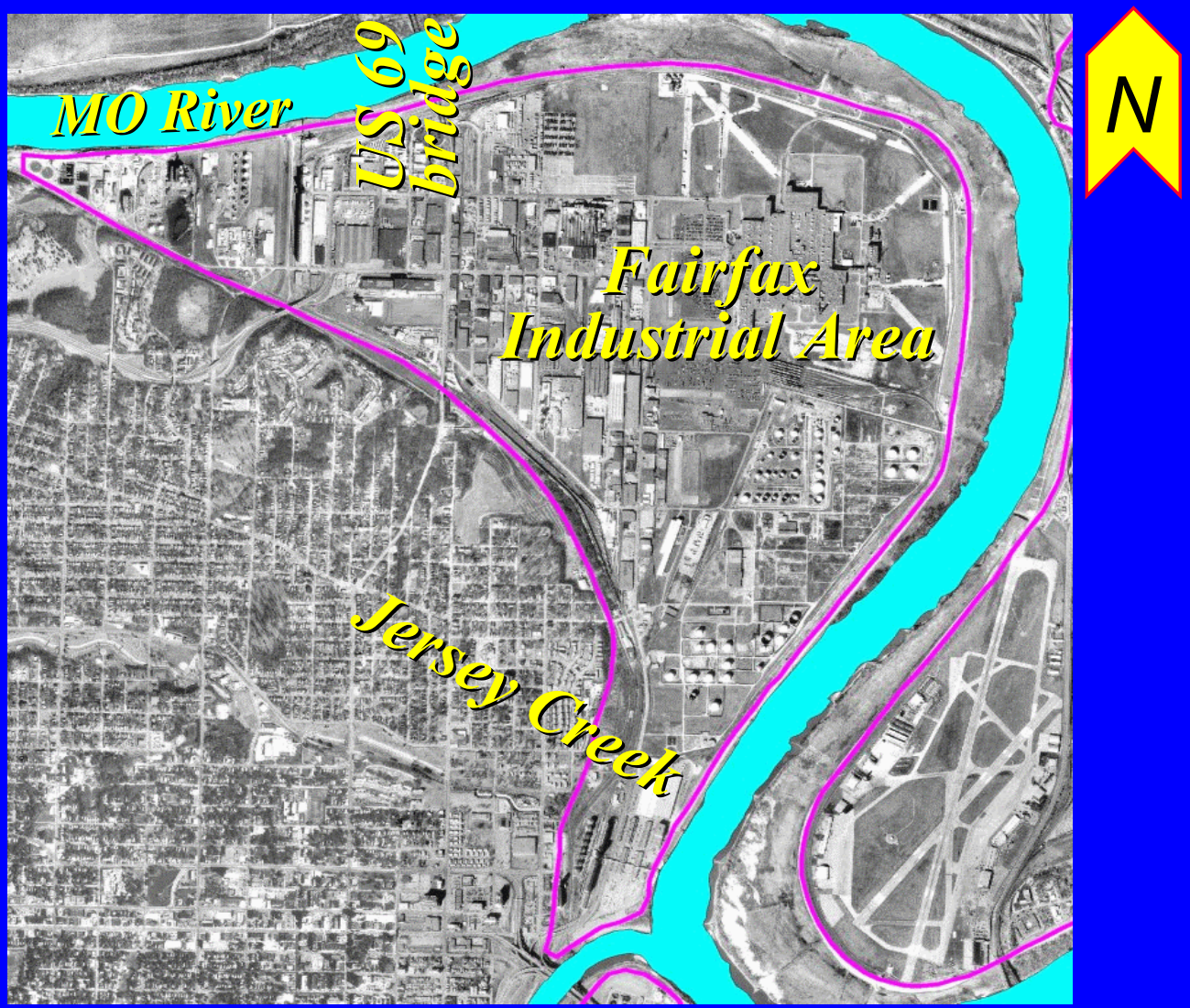
Fairfax / Jersey Creek Unit



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Fairfax/Jersey Creek Unit

- The Fairfax Drainage District operates & maintains the Fairfax (main) portion of this unit.
- The Kaw Valley Drainage District operates and maintains the 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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Fairfax Drainage District

- A Board of Three Directors is Elected by Property Owners
- Full-time Engineer, four operator maintenance employees, and office staff
- Primary funding is property tax, and other funding sources from local agreements
- Pump station operation, flood fighting, system improvements, maintenance, etc.

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Sponsor Presentations Continued

- Fairfax Drainage District
- **Kaw Valley Drainage District**
- KCMO Levee Committee
- North Kansas City Levee District
- Birmingham

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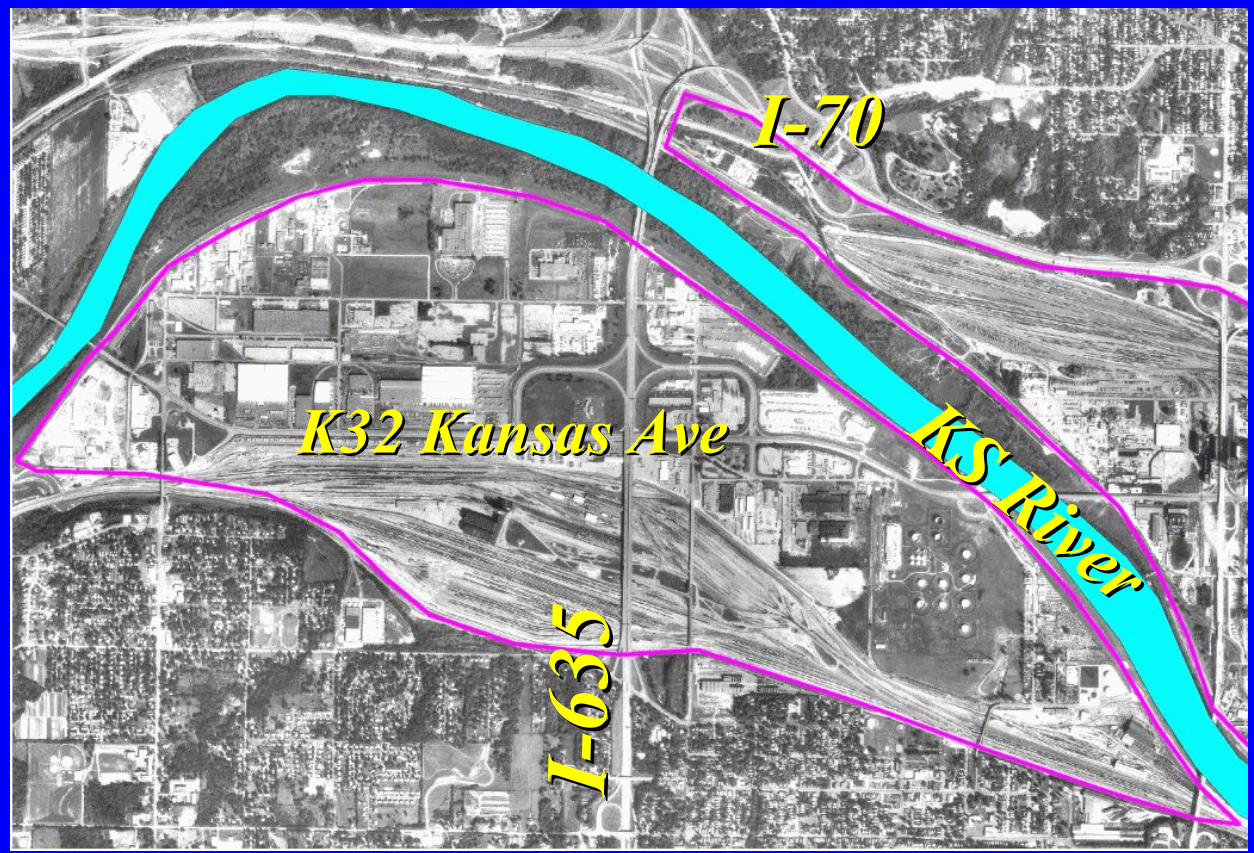
Argentine Unit

- KVDD built some protective works early in 1900's.
- Recent Federal involvement
  - Main project built 1951 through 1955.
  - Improvements completed in 1978.



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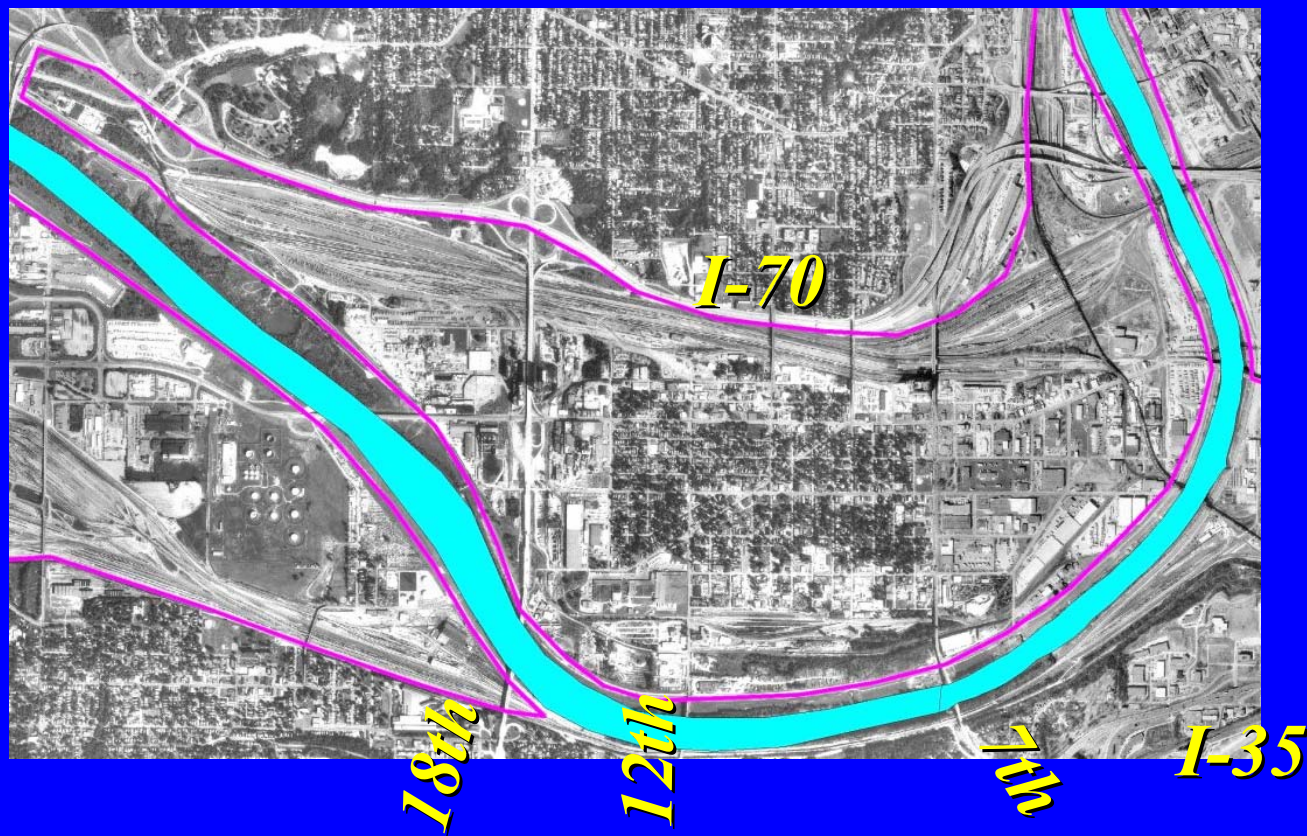
Armourdale Unit

- KVDD built some protective works early in 1900's.
- Recent Federal involvement
  - Main project built 1949 through 1951.
  - Improvements completed in 1976.



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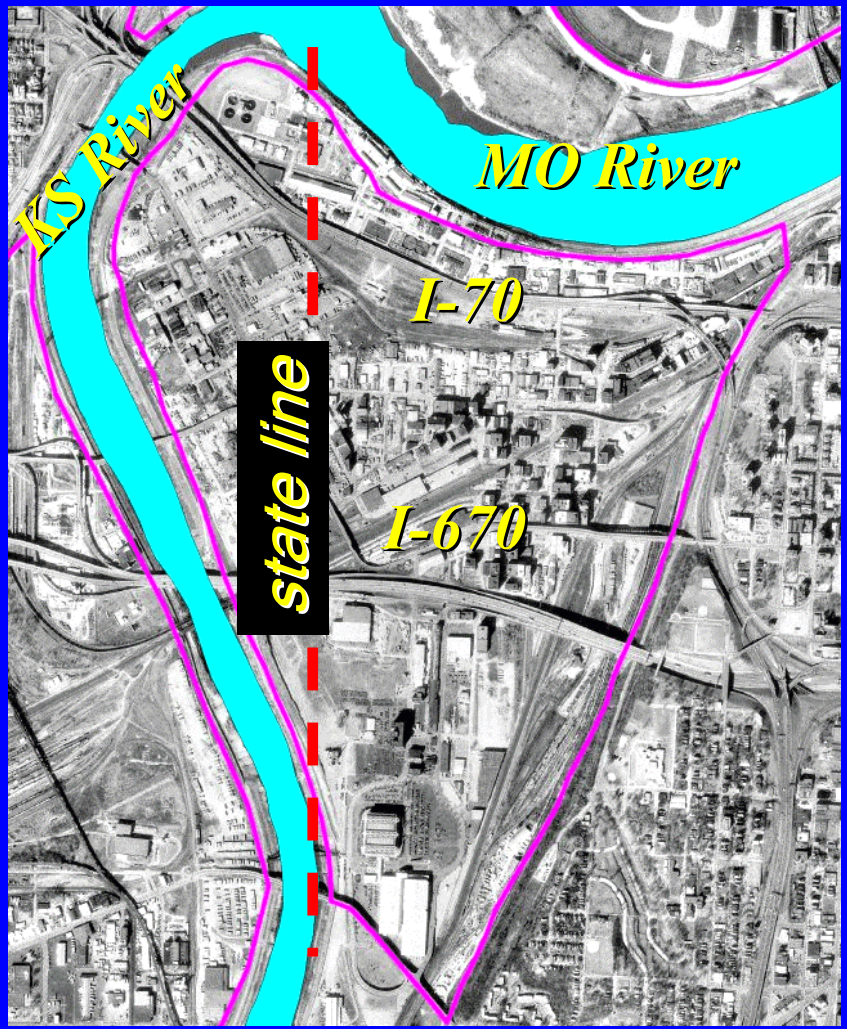
Central Industrial District Unit



- Some protective works built early 1900s
- KVDD : Kansas portion
- KCMO : Missouri portion
- Recent Federal involvement
  - Main project built 1940s through 1955
  - Improvements completed in 1979

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Sponsor Presentations Continued

- Fairfax Drainage District
- Kaw Valley Drainage District
- **KCMO Levee Committee**
- North Kansas City Levee District
- Birmingham

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City of Kansas City Missouri Levee Units

- City of Kansas City, MO owns:
  - CID – MO
  - NE Industrial District (East Bottoms)
  - North Kansas City – Downtown Airport (only)

- KCMO Levee Committee administers all daily operation and maintenance (O&M).

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KCMO Levee Committee Organization

- KCMO Levee Committee is composed of staff from the various City Departments with responsibility for Levee O&M including:
  - Water Services
  - Aviation
  - Parks & Recreation.
- Daily operational tasks performed by KCMO Water Services Department – Stormwater Utility Division.

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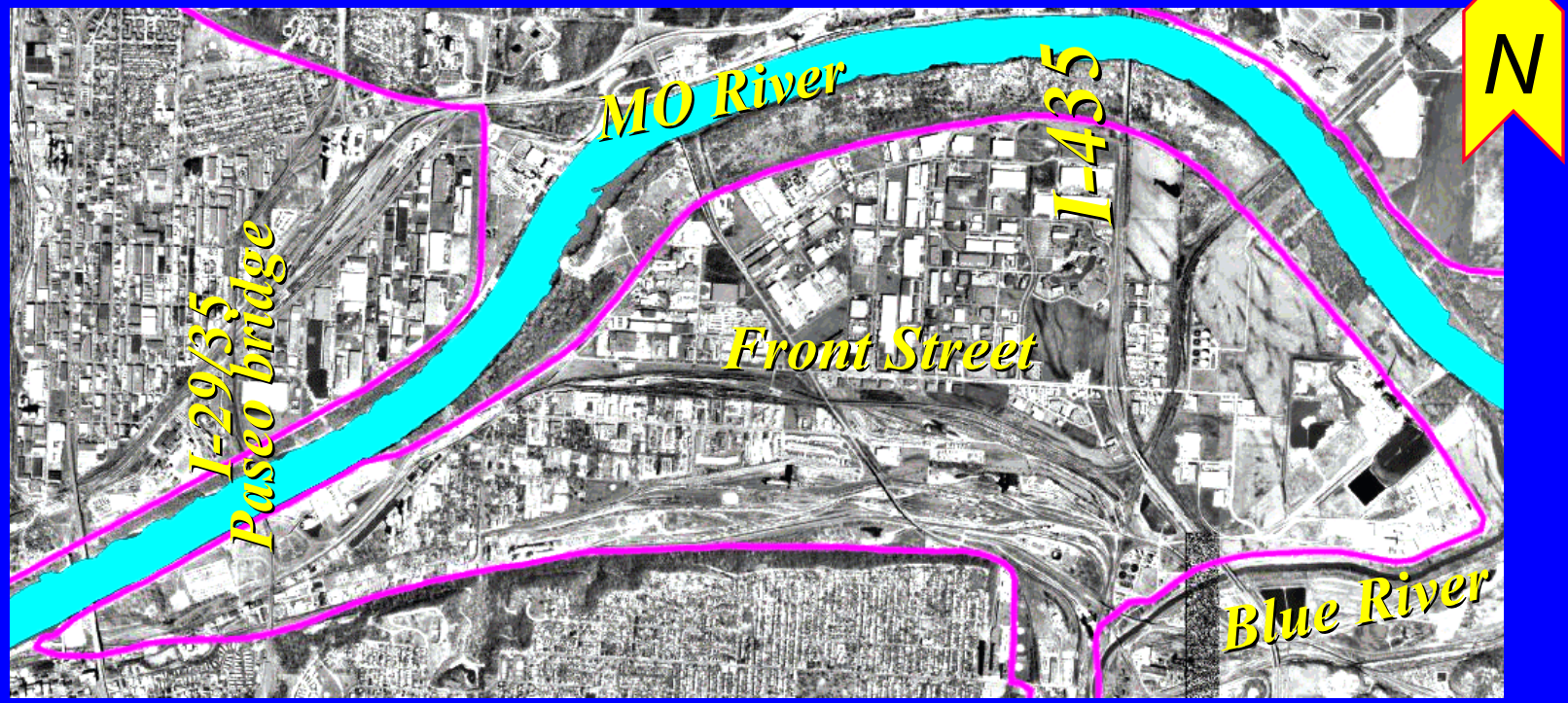
Northeast Industrial District (East Bottoms) Unit

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



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Sponsor Presentations Continued

- Fairfax Drainage District
- Kaw Valley Drainage District
- KCMO Levee Committee
- **North Kansas City Levee District**
- Birmingham

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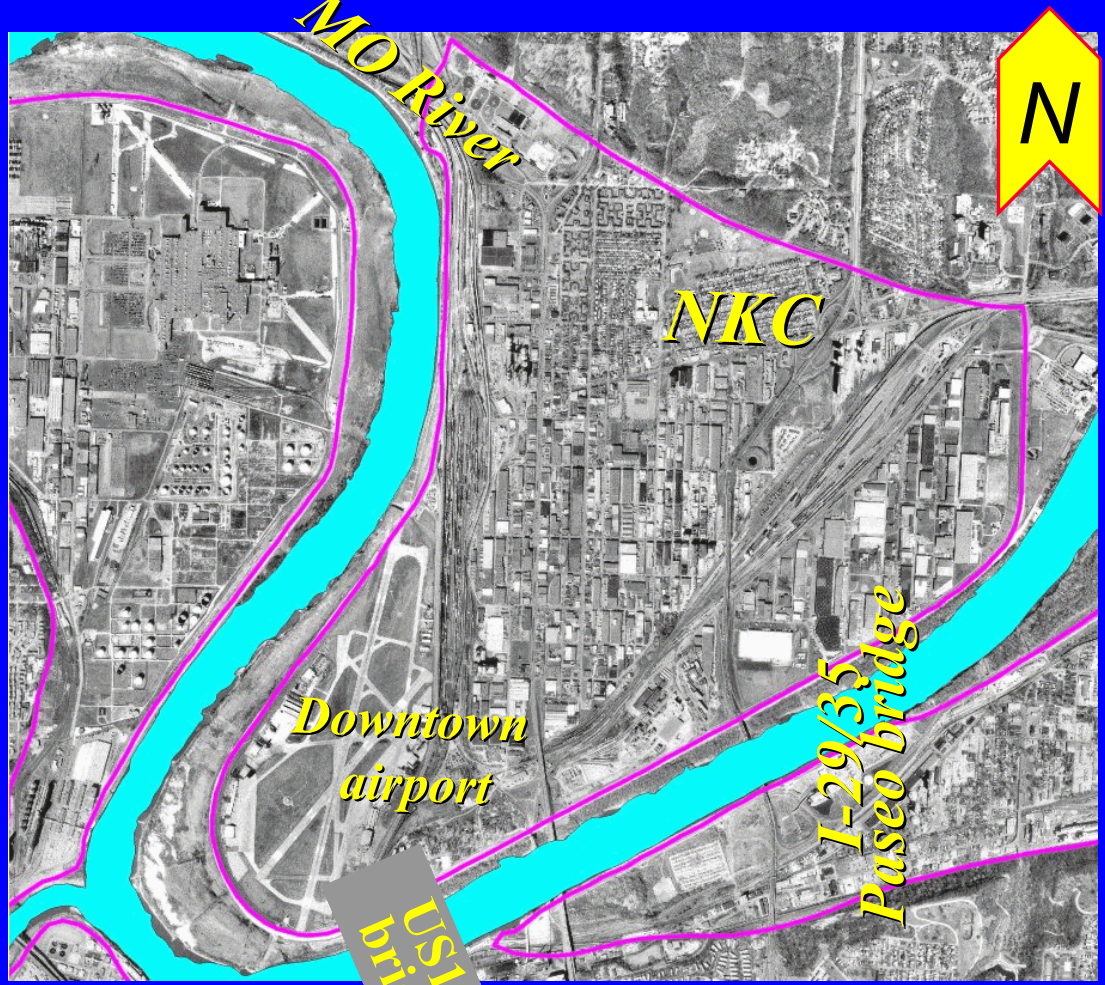
North Kansas City Unit



- The North Kansas City Levee District was organized in 1909
- In 1941, the NKC Levee District entered into agreement with the Corps of Engineers and became a local sponsor
- This led to Federal improvements in the 1940's
- More improvements were made after 1951

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NKC Levee District Responsibilities

- The North Kansas City Levee District Owns and Maintains the Protective Works
- Technical Guidance & Oversight is Provided by the Corps of Engineers
- The NKC Levee District Levies a Tax on Properties in the Protected Area

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NKC Levee District Officials

Property Owners elect a Board of Supervisors

- Richard Lanning, District President
- William Zimmer
- Clay Edwards
- Ed A. Brown
- Michael K. O'Neill

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NKC Levee District
Local Cooperation

- The NKC Levee District is a separate entity from the City of North Kansas City.
- The City leases the District's pumping plants.
- The City provides support during flood fight operations.

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Sponsor Presentations Continued

- Fairfax Drainage District
- Kaw Valley Drainage District
- KCMO Levee Committee
- North Kansas City Levee District
- **Birmingham**

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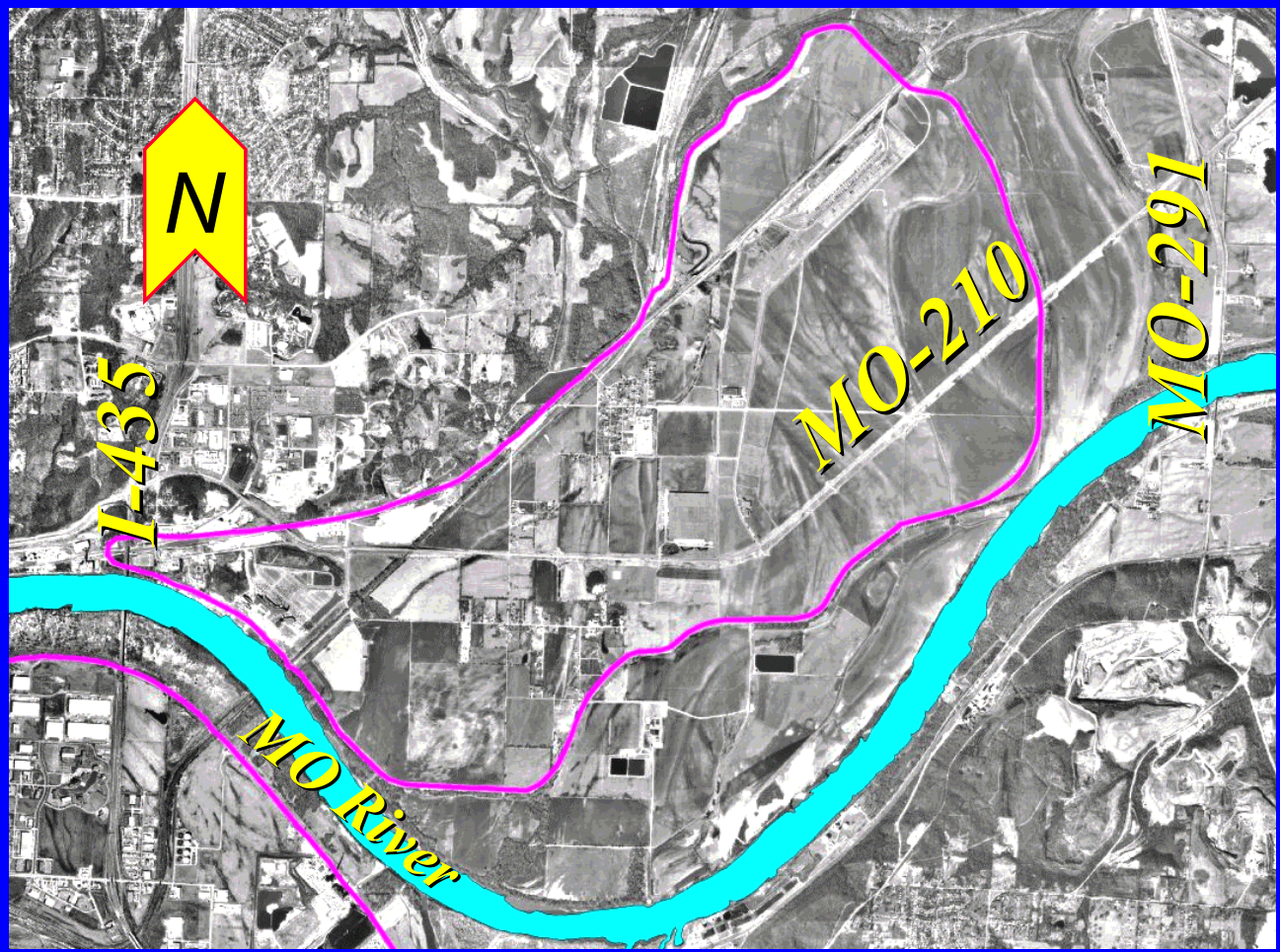
Birmingham Unit



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Birmingham Levee Unit

- Birmingham Levee District built some protective works in early 1900's
  - Recent Federal involvement
    - Upstream section raised and strengthened in 1952
    - Downstream section modified and strengthened from 1954-1955

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Major Feasibility Activities

- Examine existing conditions: hydrologic, geotechnical, structural, economic, and environmental
- Hold agency and public meetings
- Identify potential management measures & feature modifications to address problems (areas of interest)
- Refine baseline information & existing conditions
- Formulate, evaluate and make recommendations on alternative plans -- NED, environmental and sponsor criteria all play a role
- Prepare concurrent draft feasibility report & draft Environmental Impact Statement in early 2005
- Issue final report mid to late 2005

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Some Questions We Will Consider During The Study

- 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 design objectives?
- What environmental opportunities exist?
- Is the public aware of problems we need to look at?
- Are sponsors aware of problems we need to look at?
- What did the 1993 event ***(will discuss this further later in presentation)*** tell us about the system?
- Is it possible to economically increase the benefits of the system?

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Why 1993 is Important...

1993 Flood Stage Photo

Implications of 1993

- Overall the seven levee system withstood the Flood of 1993, but some elements were seriously challenged as the flood crest reached near overtopping levels.
- This experience raised concerns that the levees may provide less than the level of protection for which they were designed.

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Post 1993 Actions

- Kansas City, KS, and Kansas City, MO, wrote to KC District Corps of Engineers expressing concerns about the system
- In response, Corps completed a reconnaissance report in Aug 1999.
  - It found a reasonable likelihood of a Federal interest in a potential project to improve system reliability
  - And led to the current Feasibility study

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Initial Technical / Economic Analysis for Each Levee Unit

1. **Hydrologic Reliability**
2. Geotechnical Reliability
3. Structural Reliability
4. Economic Investment and Estimated Flood Damages

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1940's Missouri River Levee Units Original Design Flow Scenario

Critical Missouri River Flows

- Fairfax
- NKC
- East Bottoms
- CID-Missouri
- Birmingham

Corrections made to this slide 27Aug03

CENWK Civil Planning, 20Aug03

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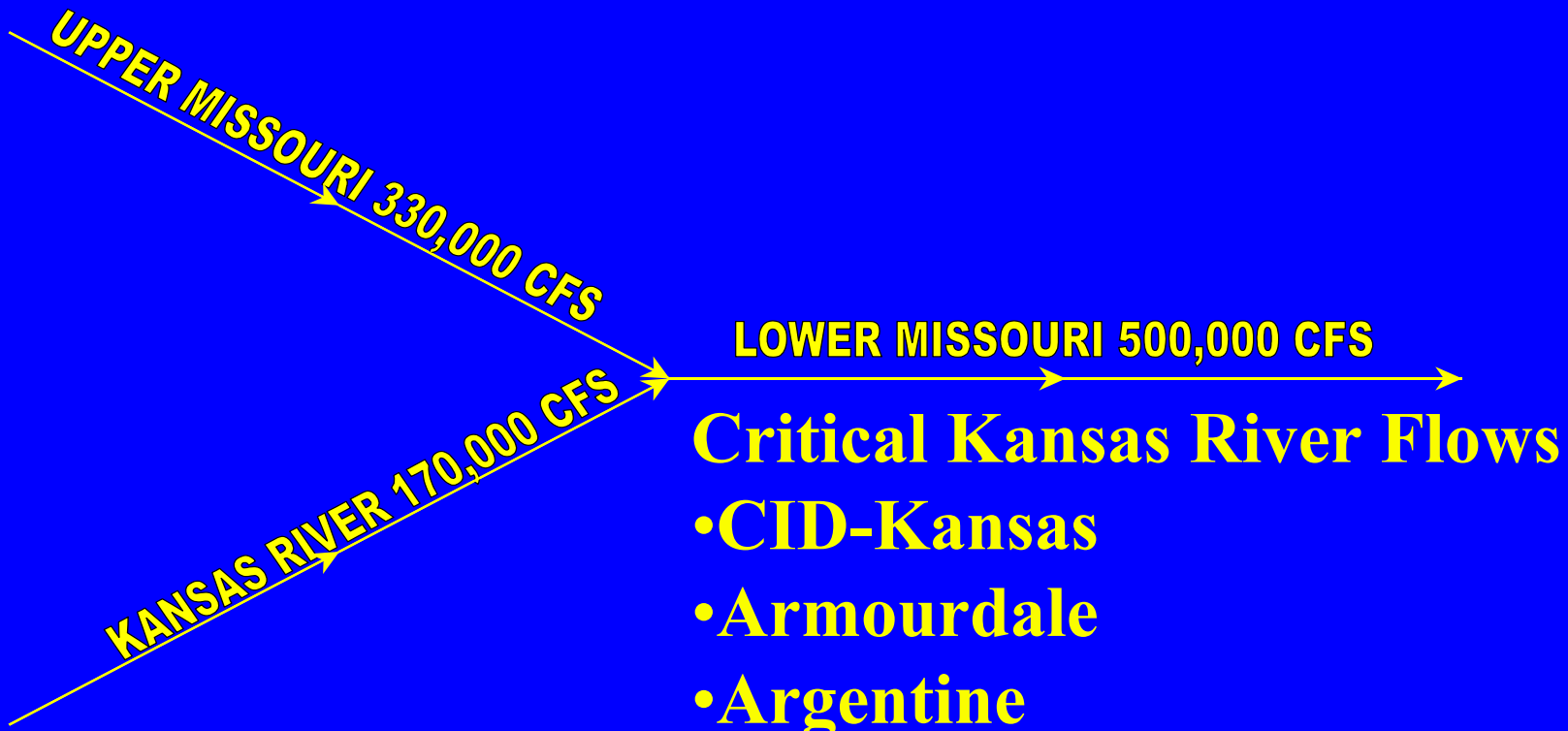
1940's Kansas River Levee Units Original Design Flow Scenario



Critical Kansas River Flows

- CID-Kansas
- Armourdale
- Argentine

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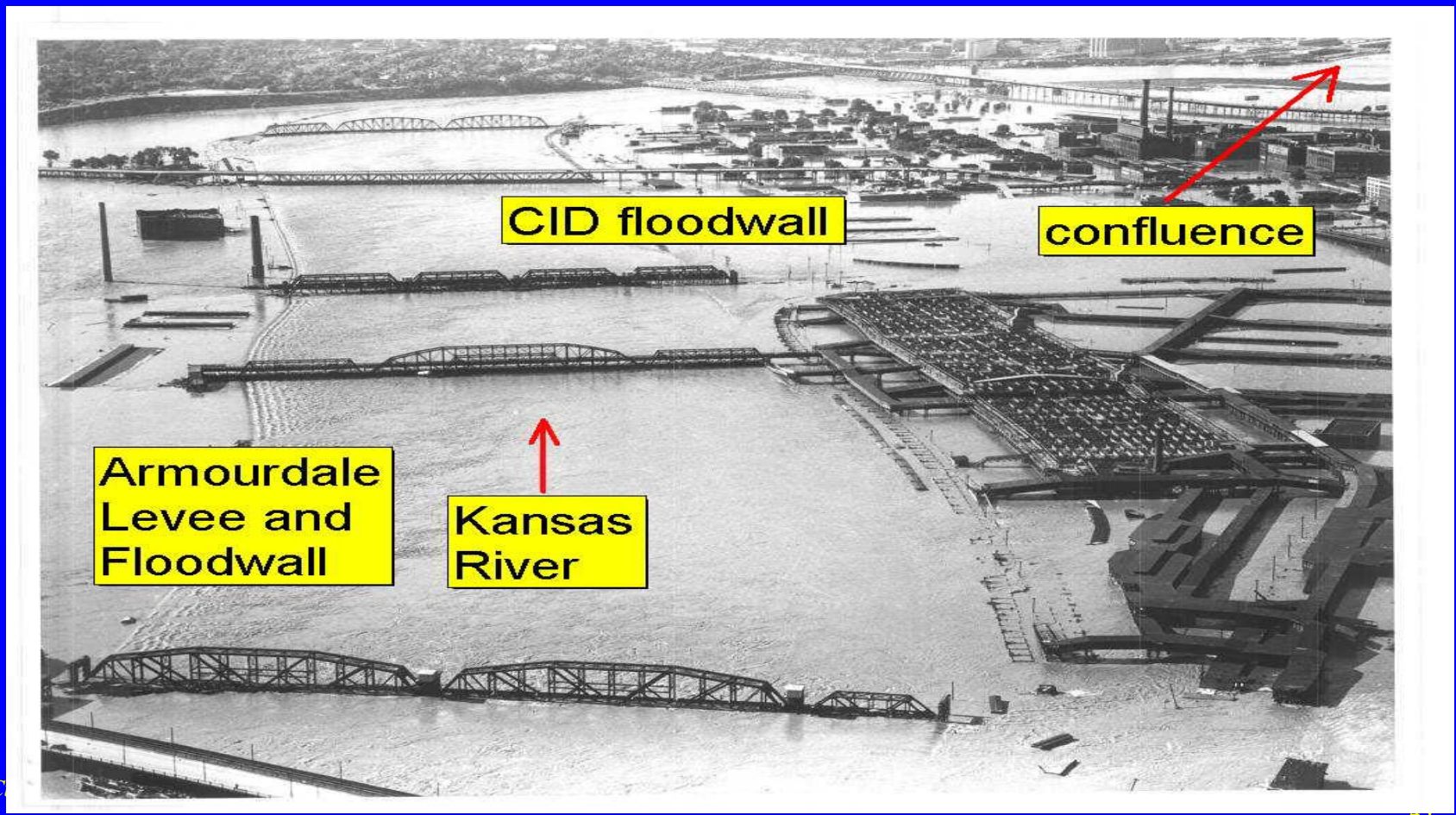
The Great Flood of 1951

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



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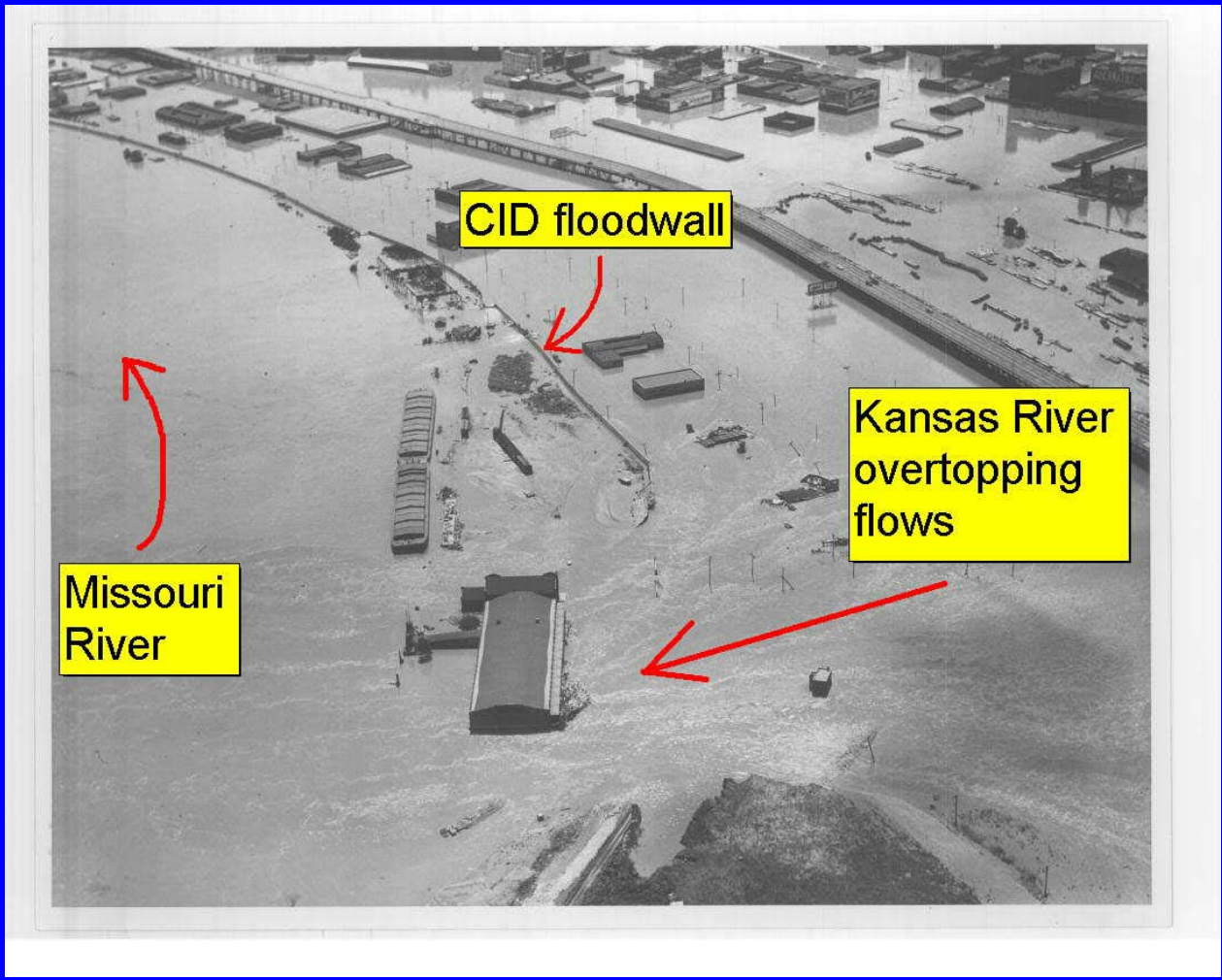
The Great Flood of 1951

Kansas River flowing through CID floodwall into the Missouri River



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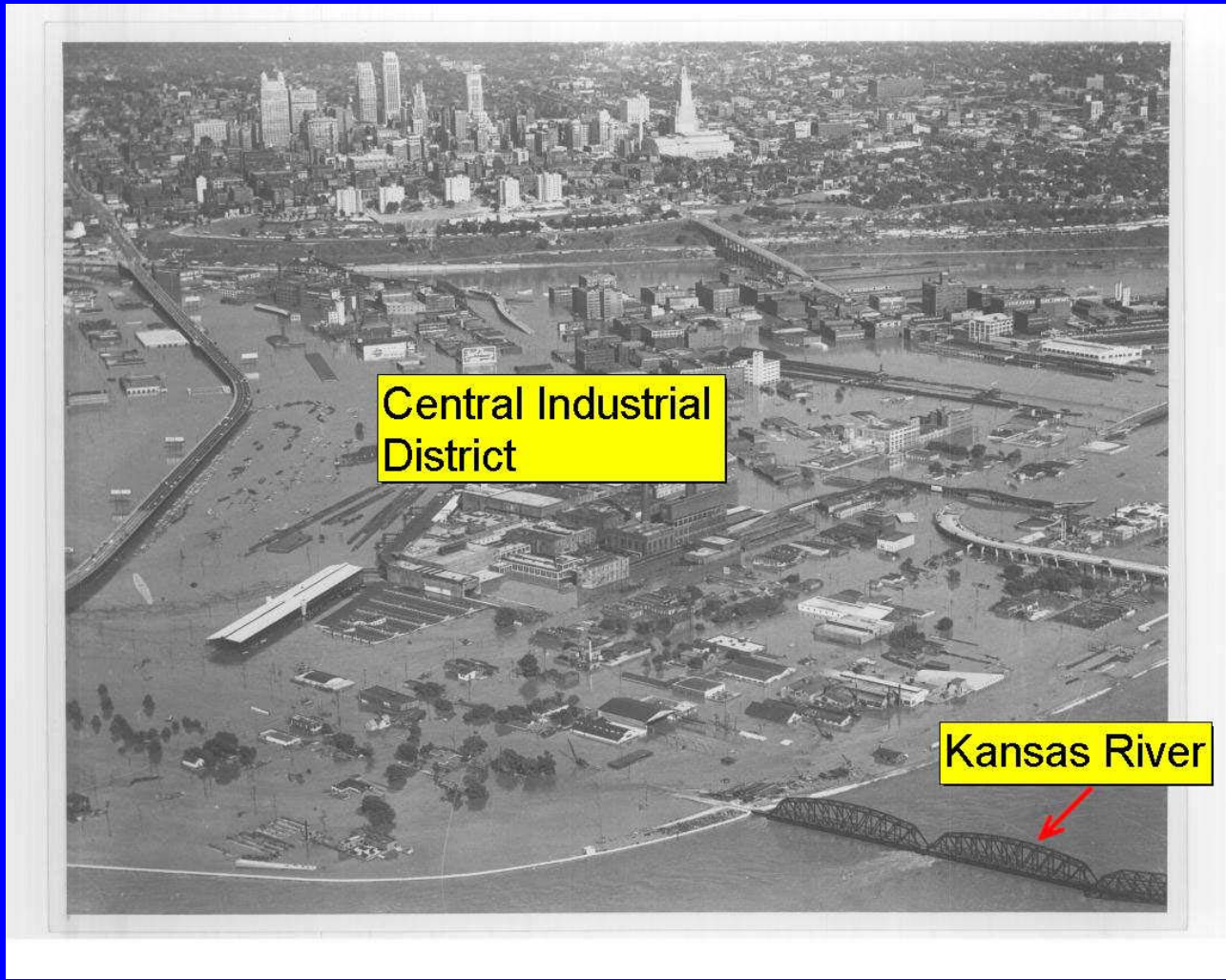
The Great Flood of 1951



All 3 Kansas River Units overtopped

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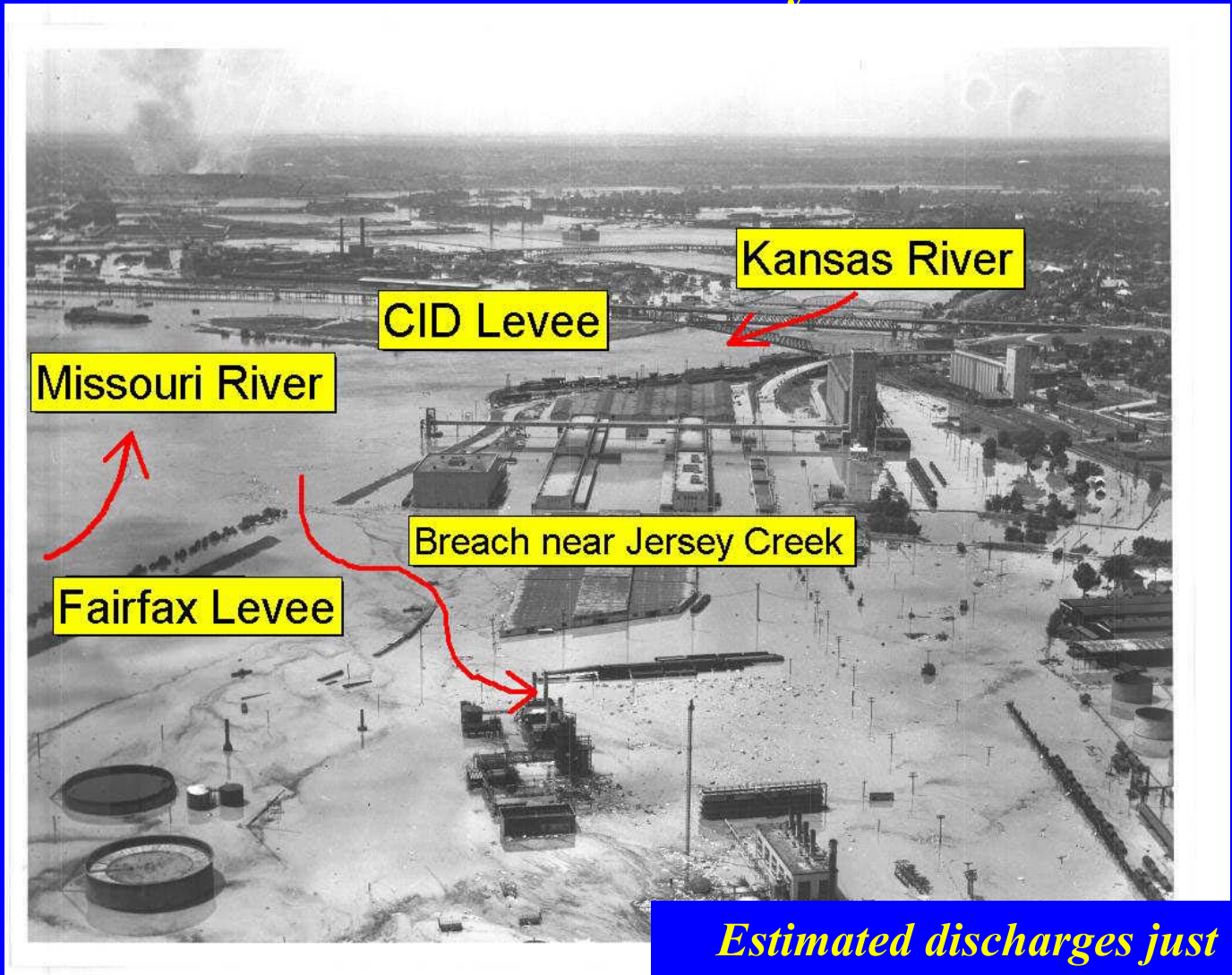
The Great Flood of 1951

Breach of the Fairfax-Jersey Creek Unit



Estimated discharges just prior to overtopping…

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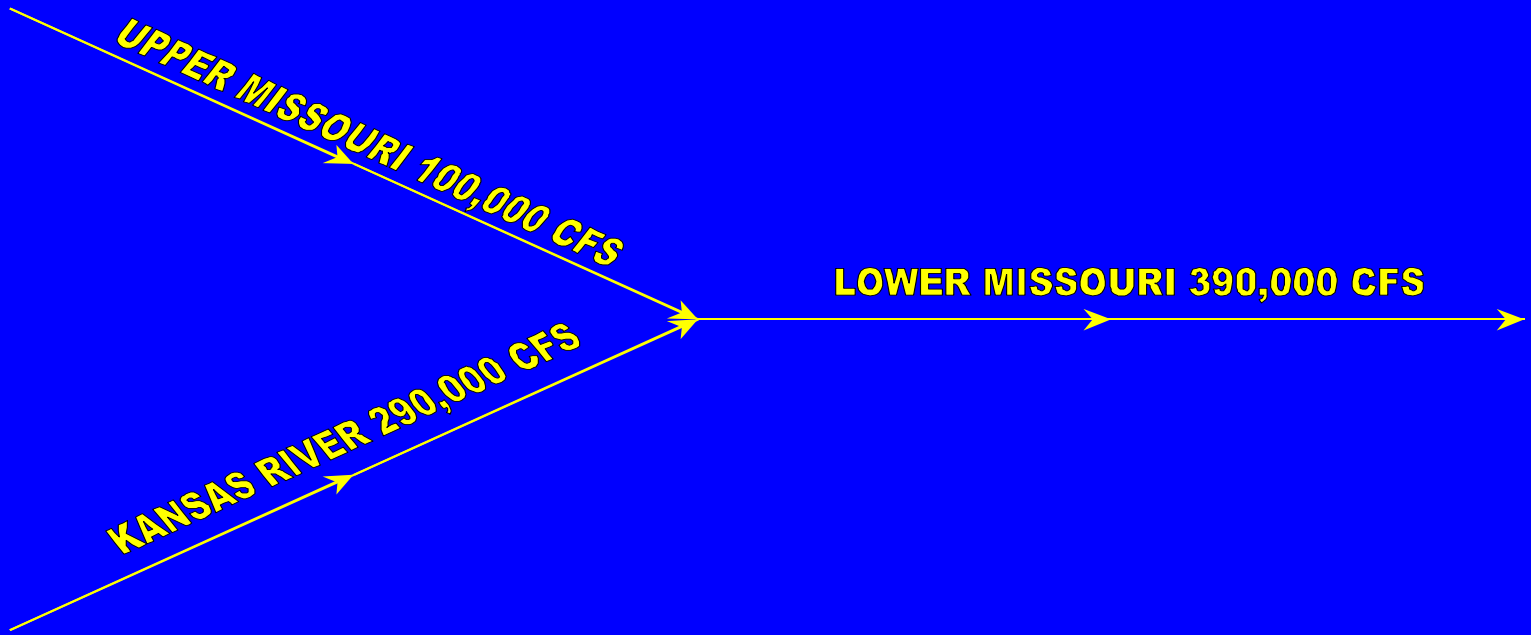
1951 Flood Event
(Estimated Flows Just Before Initial Overtopping)



Kansas River flow eventually peaked at 510,000 cfs

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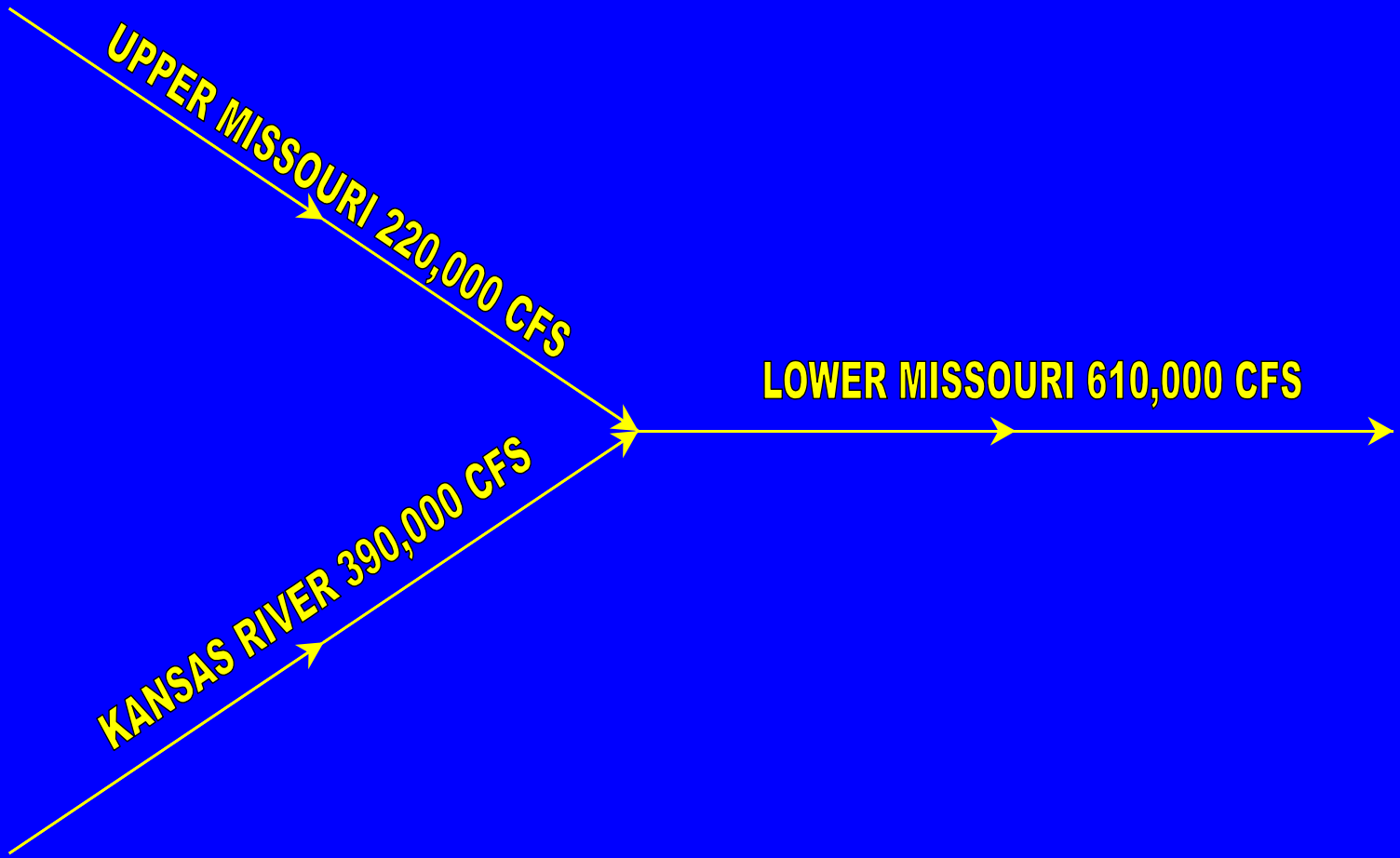
1962 Modified Design Flows
(Kansas River Levee Raises of 1970's)



- Now let's look at 1993…

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Characterization of the 1993 Flood Event

- The 1993 event was primarily a Missouri River event
- 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 the 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

Corrections made to this slide 27Aug03

CENWK Civil Planning, 20Aug03

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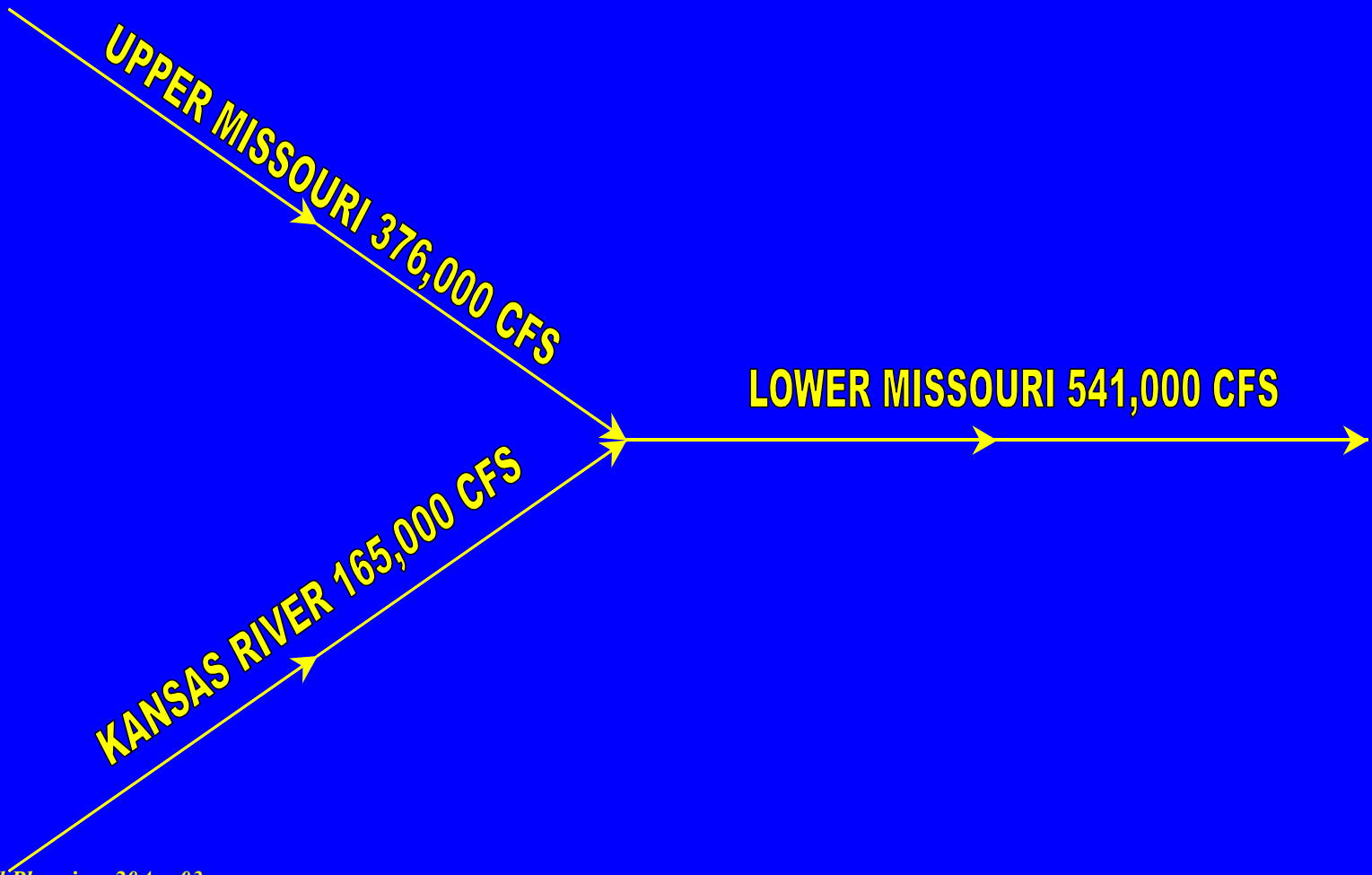
1993 Flood Event

(Flow Scenario – as occurred)



- What have we learned after looking at these various flood events…

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Hydrologic & Hydraulic Analysis: Early Indications

- The current ability of the Kansas River channel (within the study area) to carry the 1962 design discharges is questionable
- This requires further exploration of possible measures to:
  - Potentially increase carrying capacity of the channel
  - Potentially raise levee height on Kansas River Units
  - Other ?/ combination of measures

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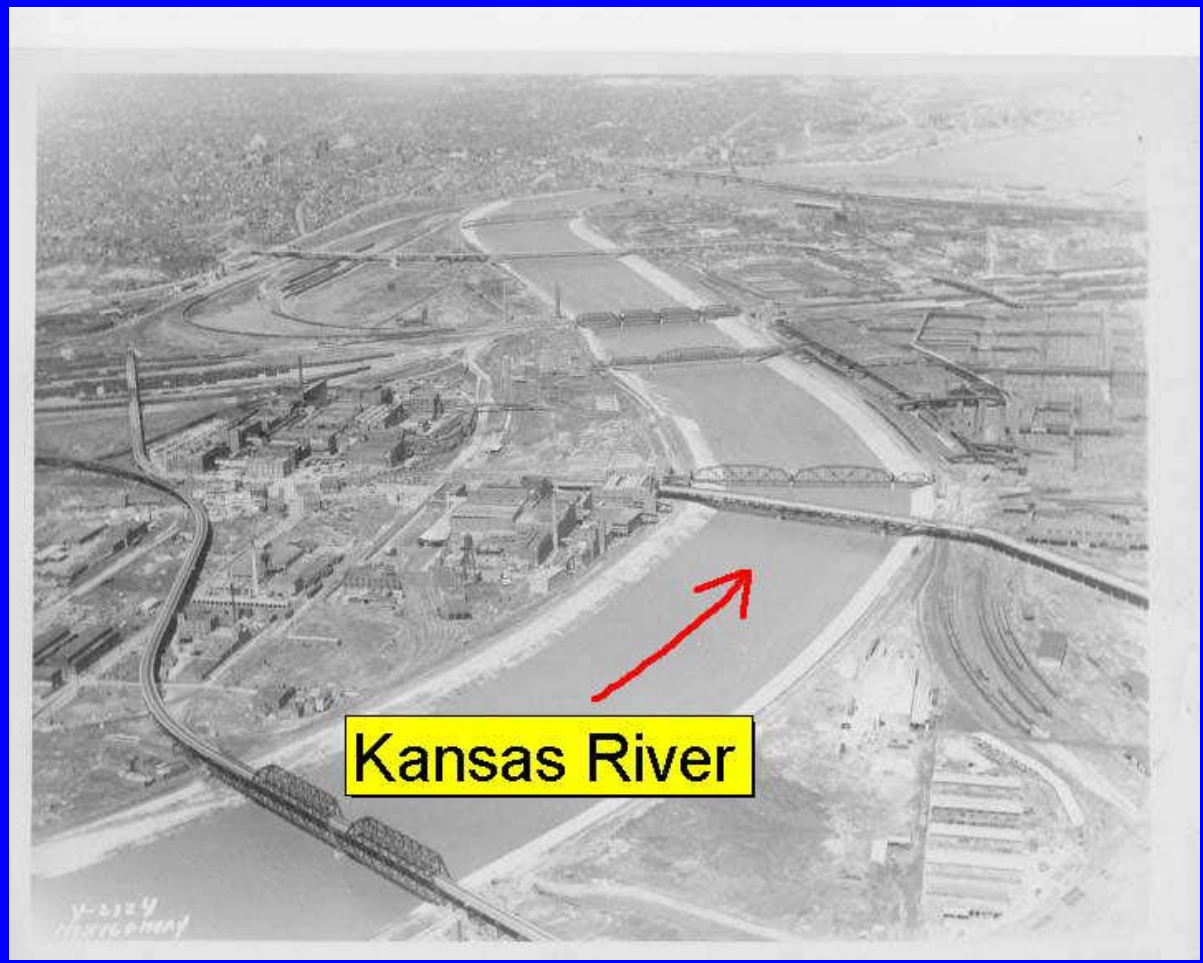
Kansas River, 1955

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-1951 Flood

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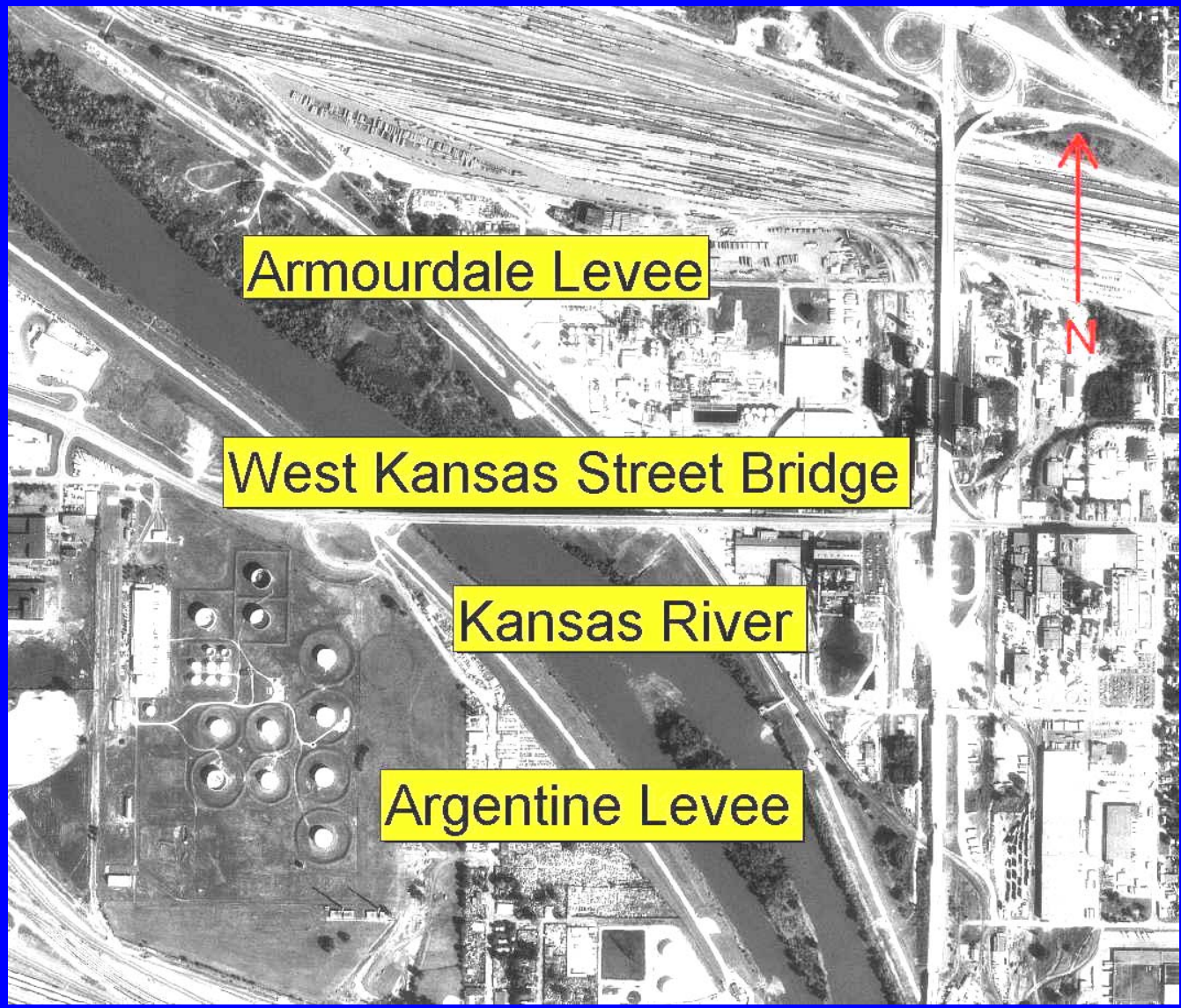
Kansas River, 1999



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Summary: Preliminary Analysis of Overtopping Protection

- From a hydraulic overtopping standpoint, all of the 7 levees passed the 1993 event
- Preliminary analysis has identified the three Kansas river units as candidates for increased overtopping protection
- Other (minor) areas of the system may undergo some type of localized raise dependent on site conditions

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Initial Technical / Economic Analysis for Each Levee Unit

1. Hydrologic Reliability
2. **Geotechnical Reliability**
3. Structural Reliability
4. Economic Investment and Estimated Flood Damages

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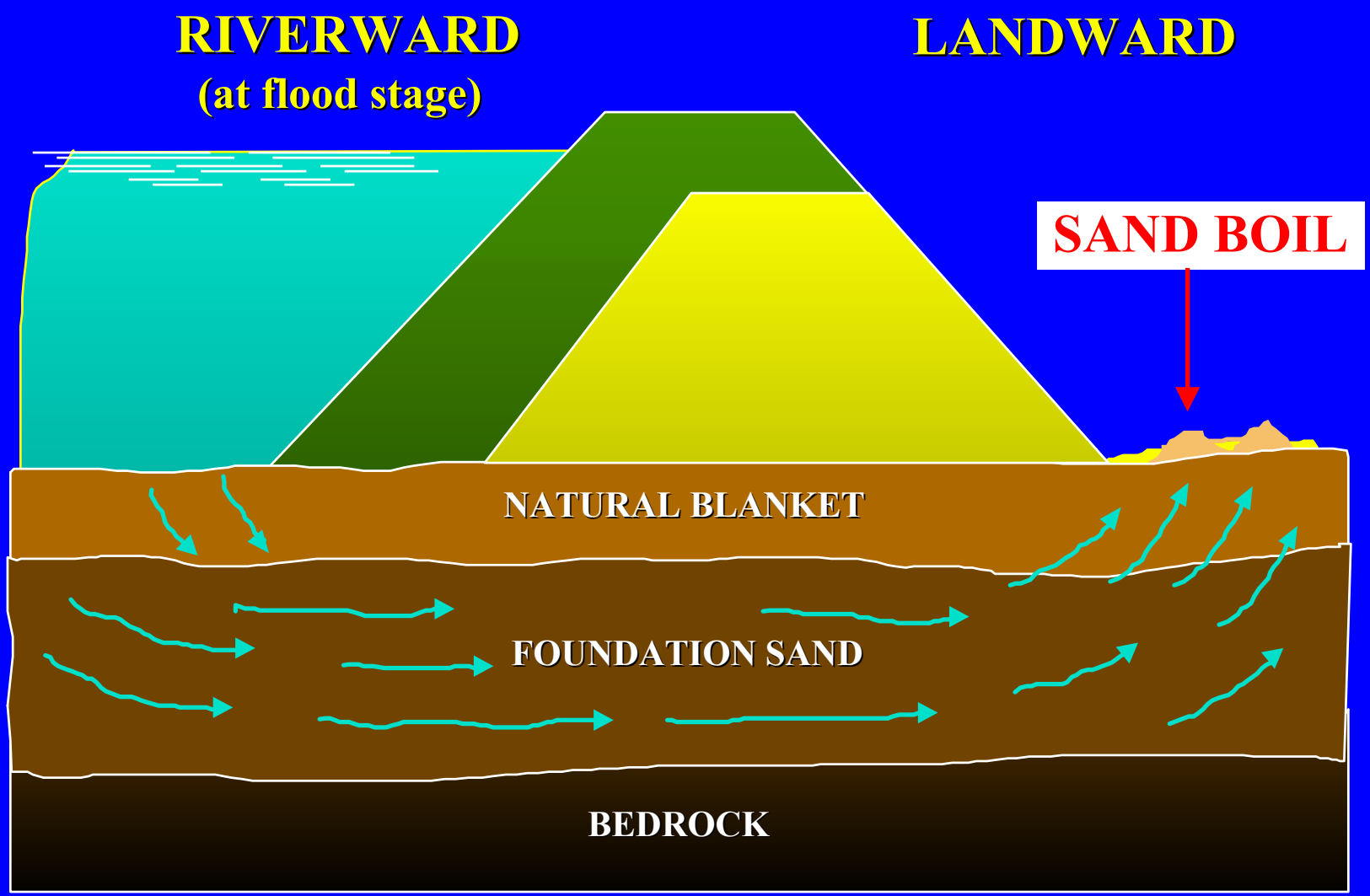
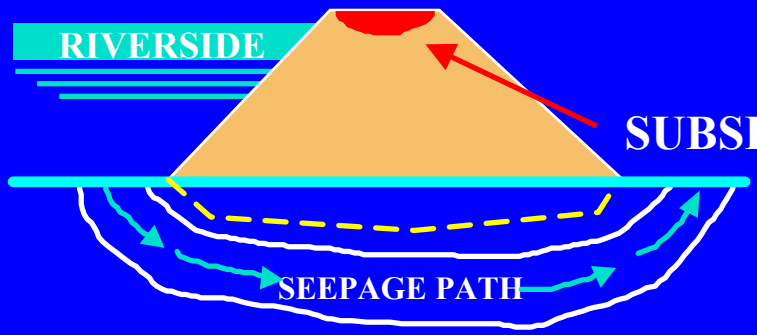
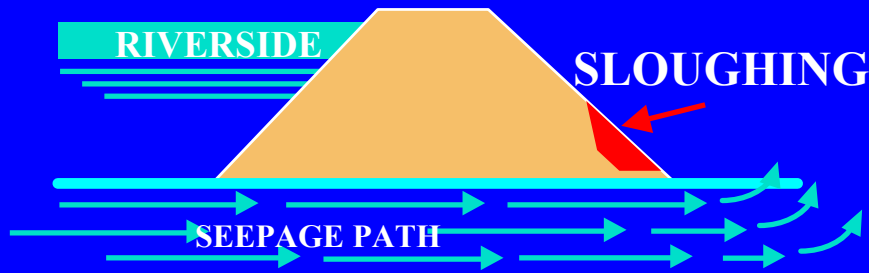
Sand Boil Formation



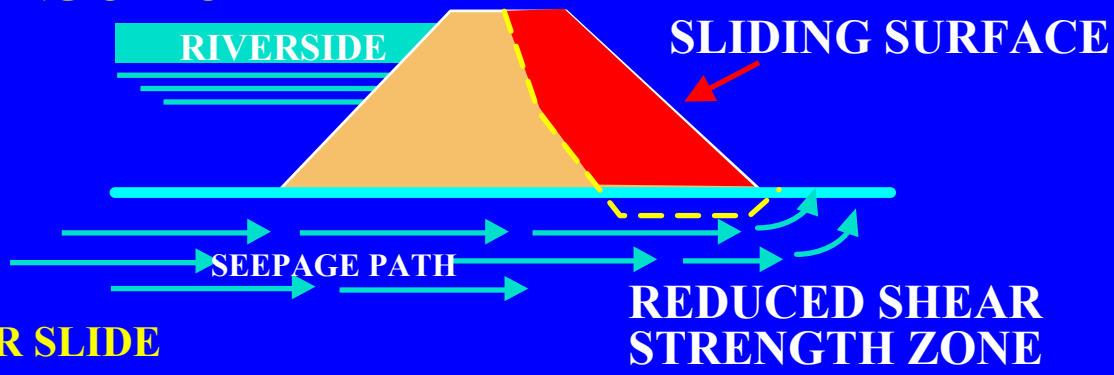
Effects of Sand Boils



DEVELOPMEMNT OF PIPE UNDER LEVEE



SLOUGHING OF LANDSLIDE SLOPE DUE TO RAVELLING AND UNDERCUTTING OF TOE



DEVELOPMENT OF SHEAR SLIDE

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Typical Levee Strengthening for Seepage Issues

- Underseepage Berms
- Relief Wells

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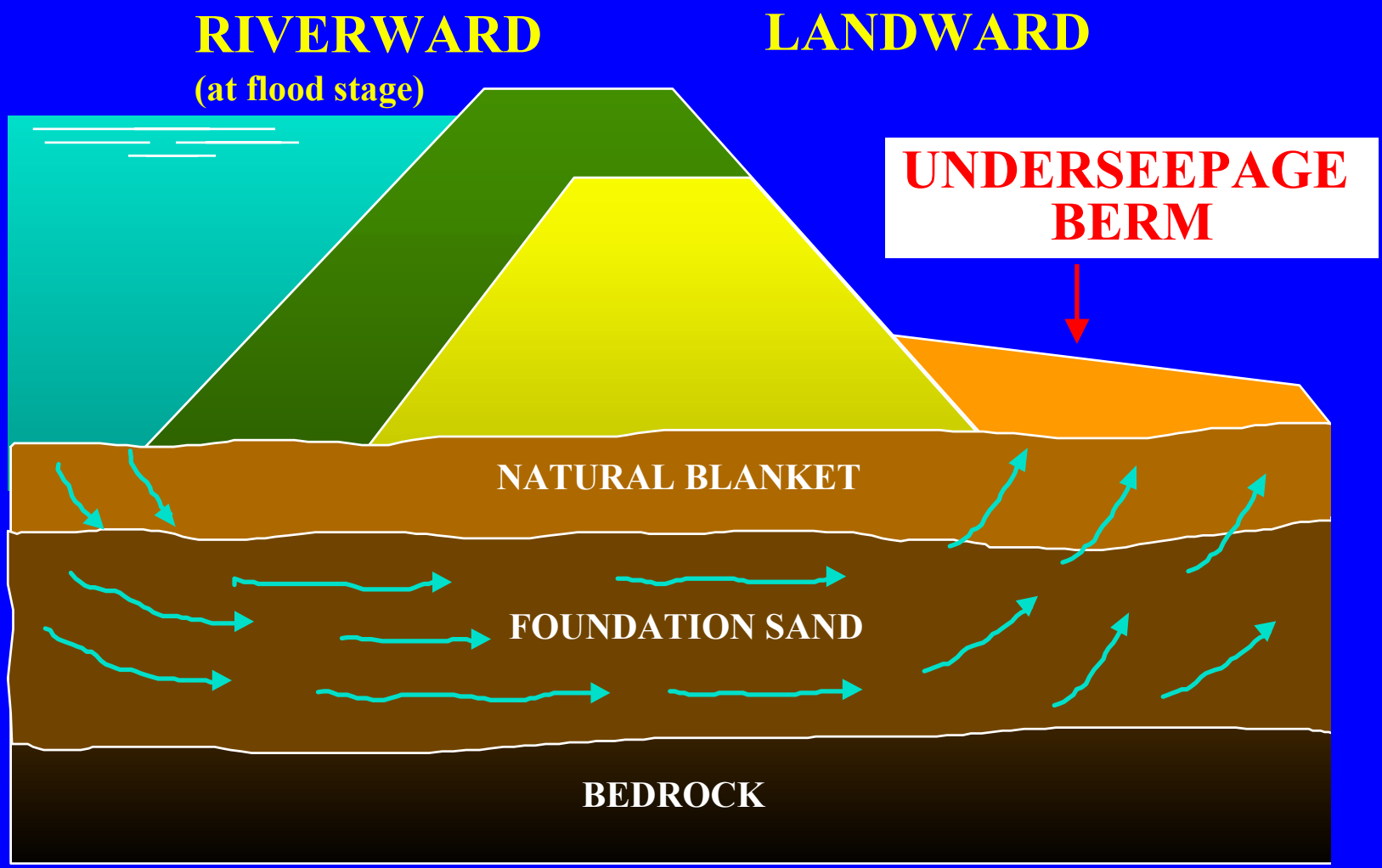
Underseepage Berm



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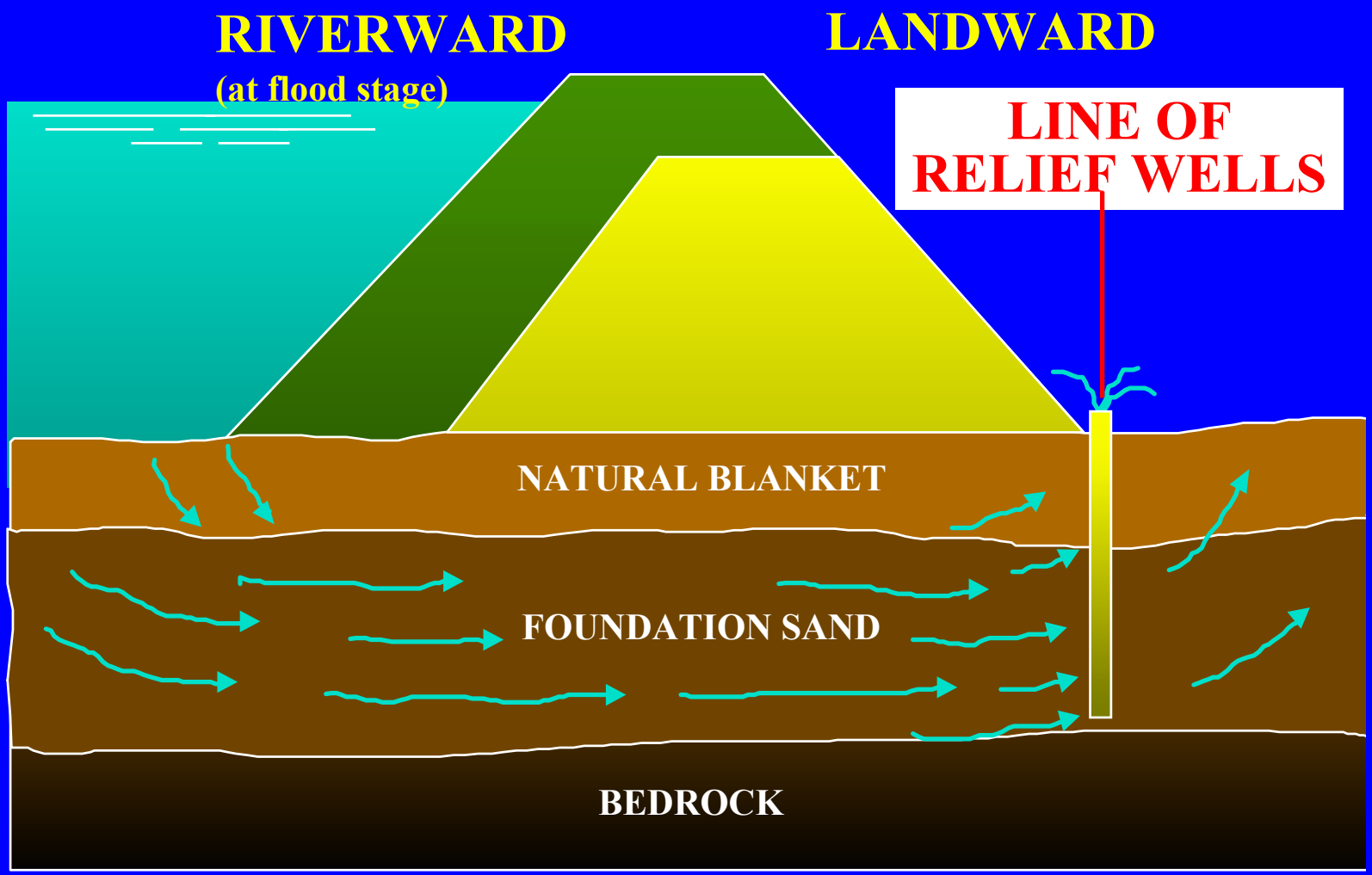
Relief Well System



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Areas to be Considered for Geotechnical Strengthening

Harlem Area on the Lower Section of the North Kansas City Levee Unit

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

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Initial Technical / Economic Analysis for Each Levee Unit

1. Hydrologic Reliability
2. Geotechnical Reliability
3. **Structural Reliability**
4. Economic Investment and Estimated Flood Damages

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Levee and Floodwall Features within the Overall System

- 51 miles of flood protection comprised of:
  - 44.6 miles of Earthen Levee
  - 6.4 miles of floodwall
  - Exposed floodwall heights = 2 to 16 ft

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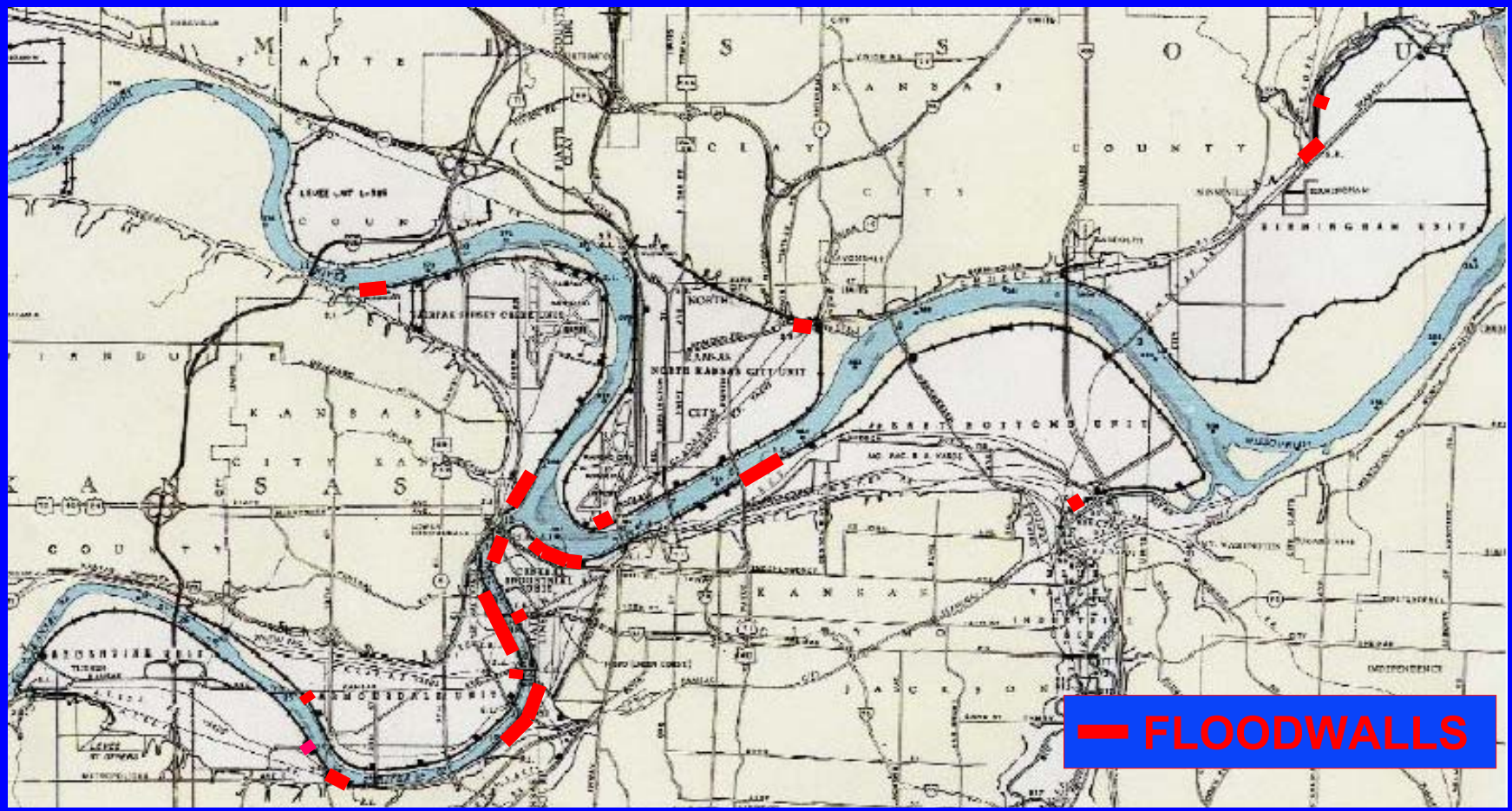
Floodwall Locations



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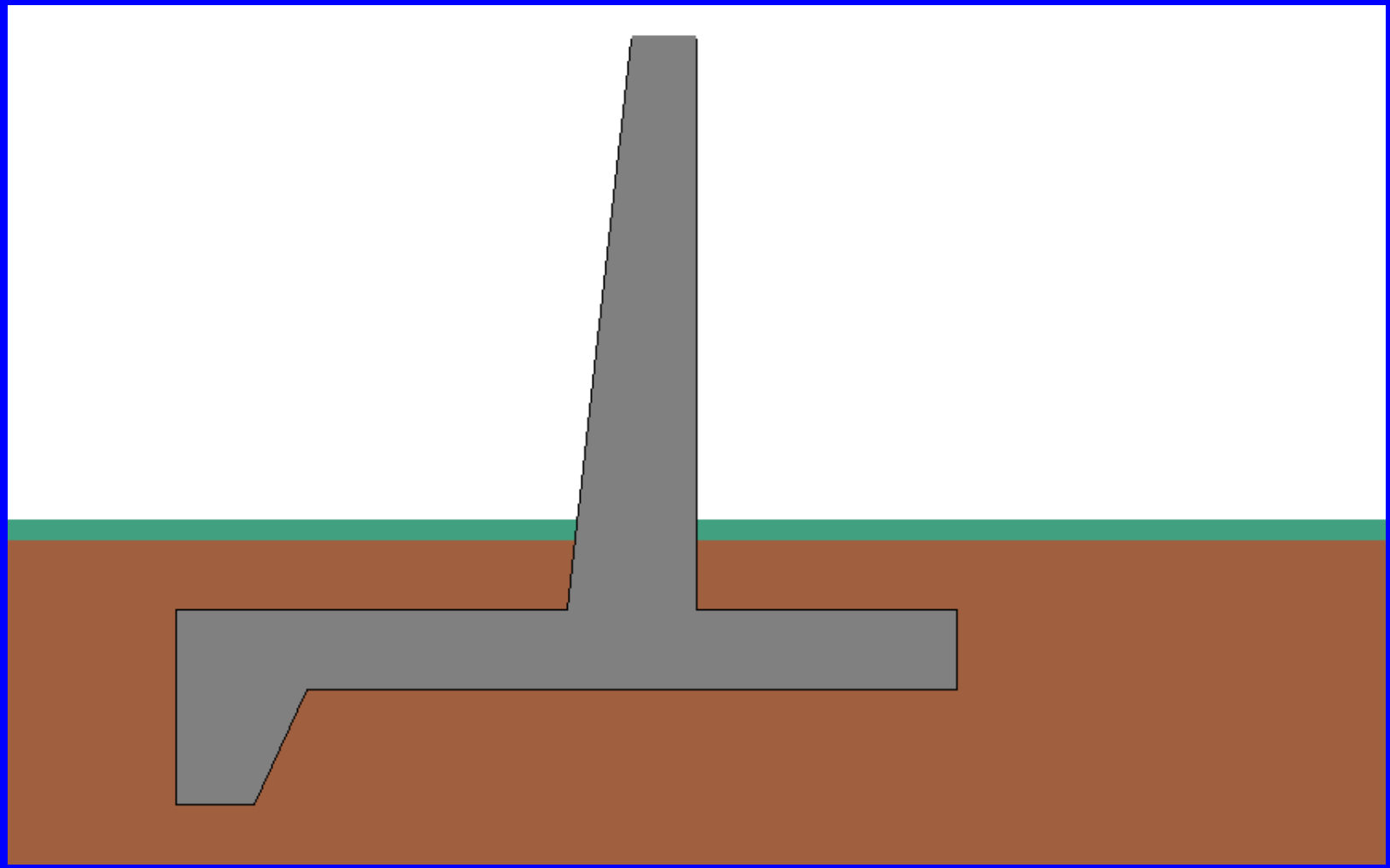
Floodwalls vs. Levees
Use Often Depends on Location

Earthen levee slopes are broad 1v:3h or 1v:4h

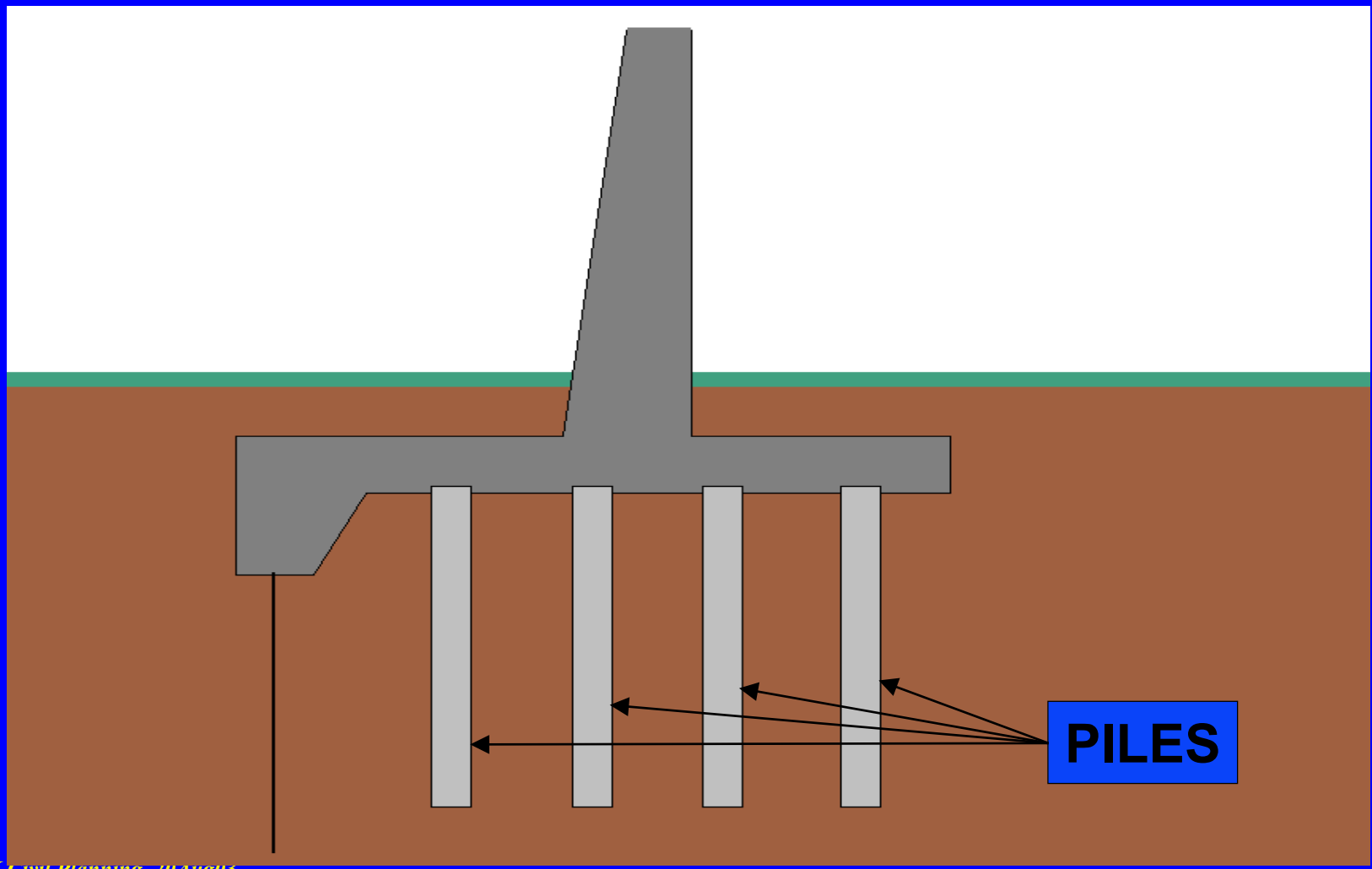
Floodwalls are essentially vertical

TYPICAL FLOODWALL CONFIGURATION

Spread Footing



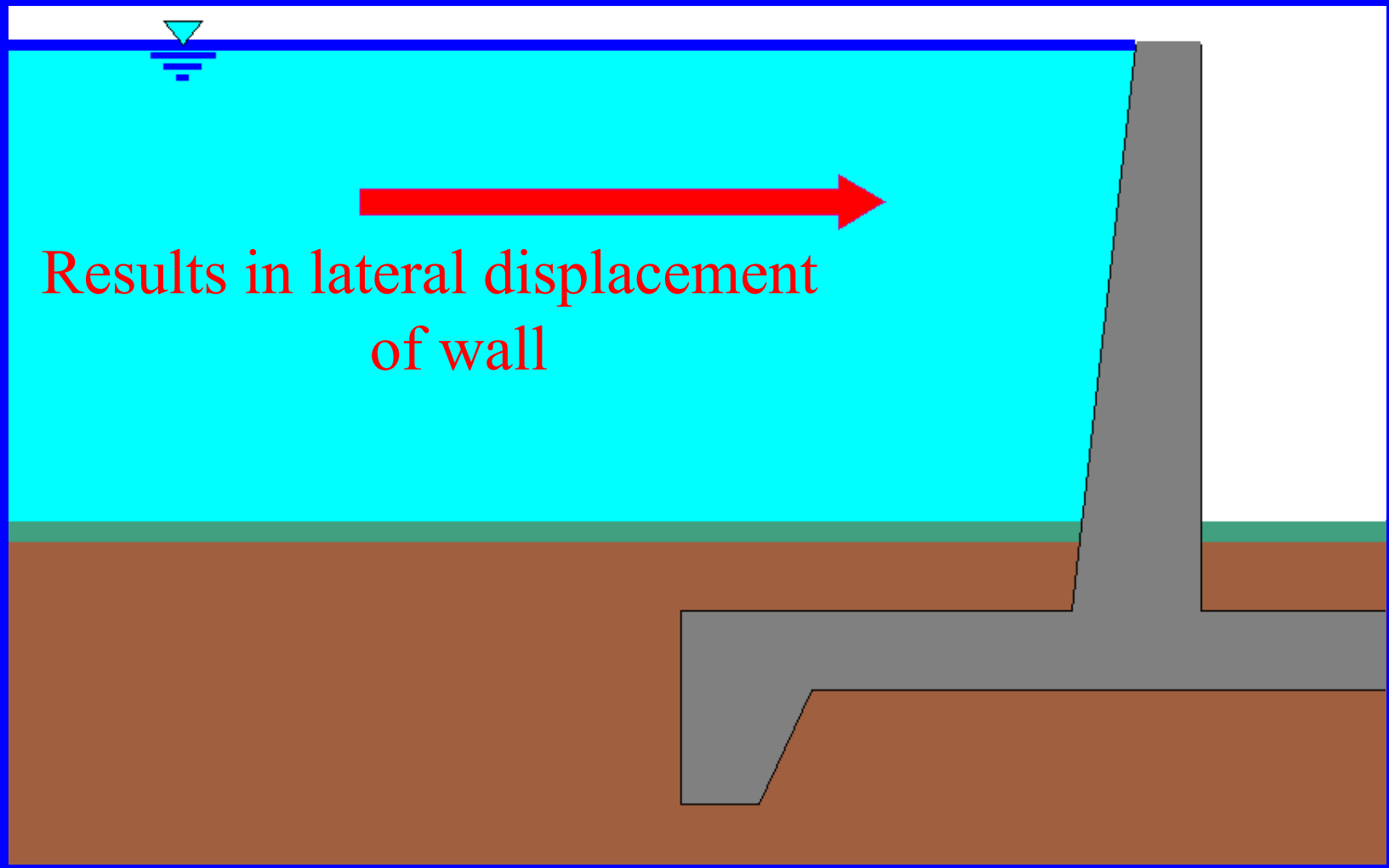
Footing on Piles



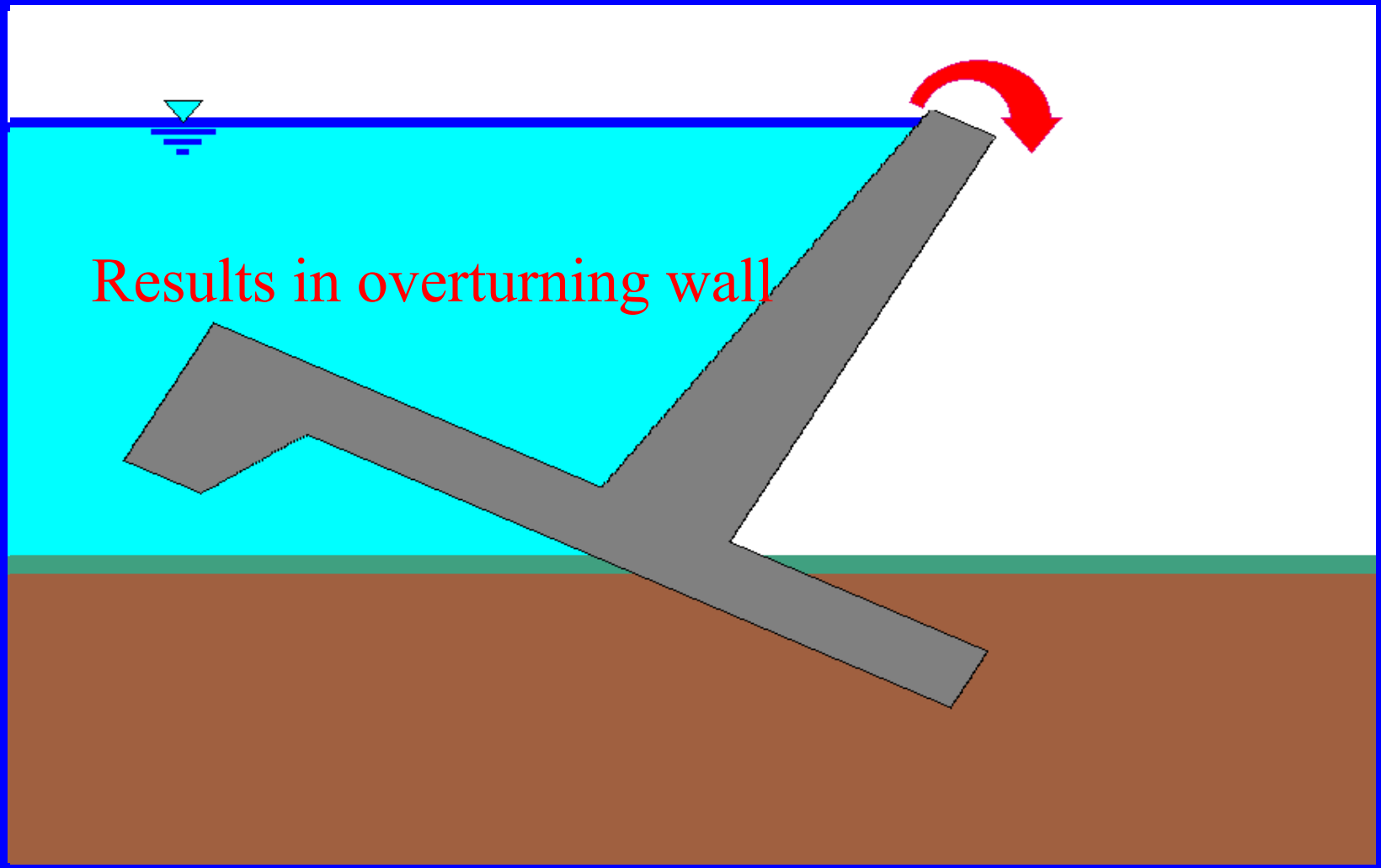
Potential Floodwall Failure Mechanisms

Our study will include an analysis of various potential floodwall failure mechanisms…

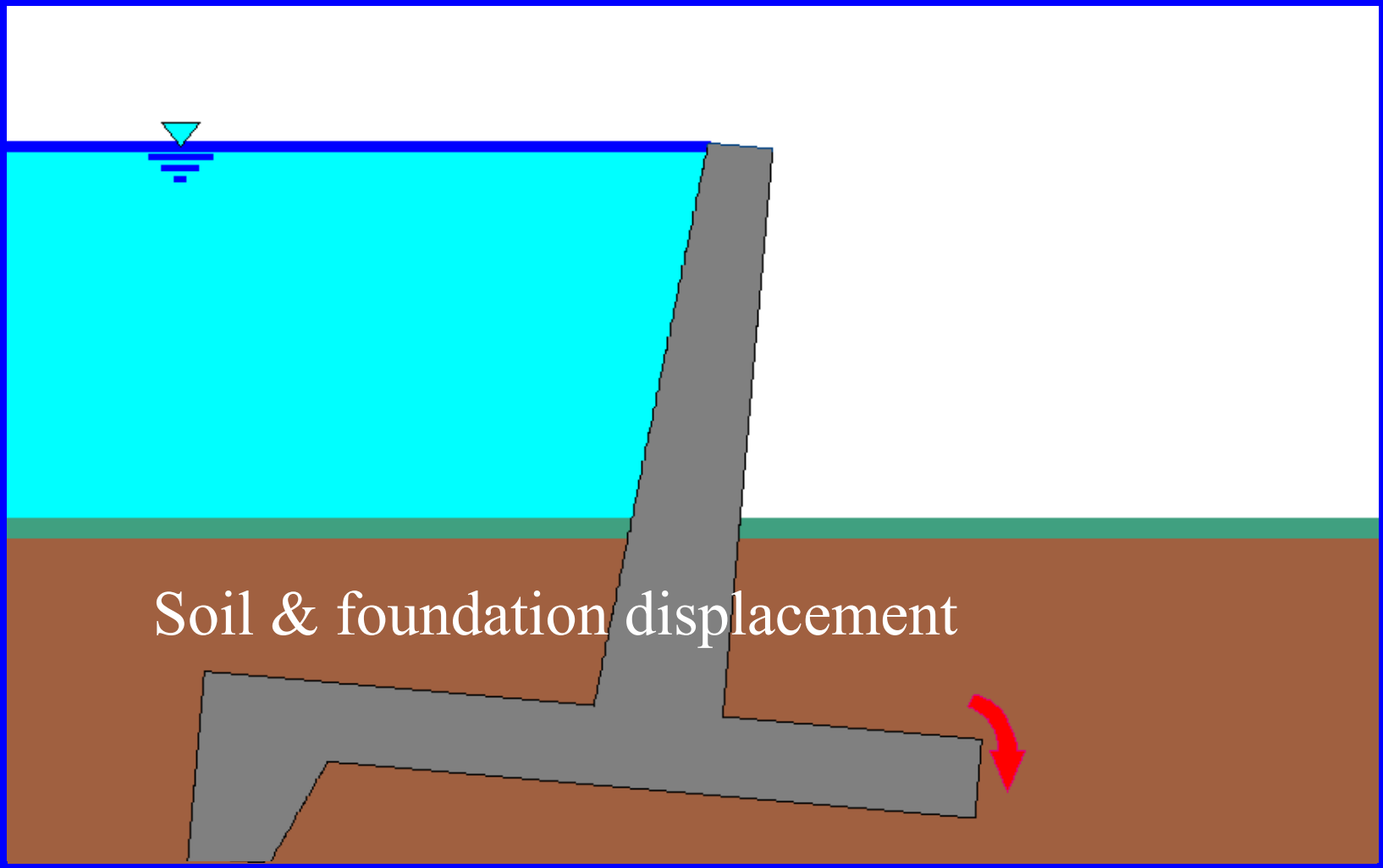
Sliding Failure



Overturning Failure



Bearing Failure



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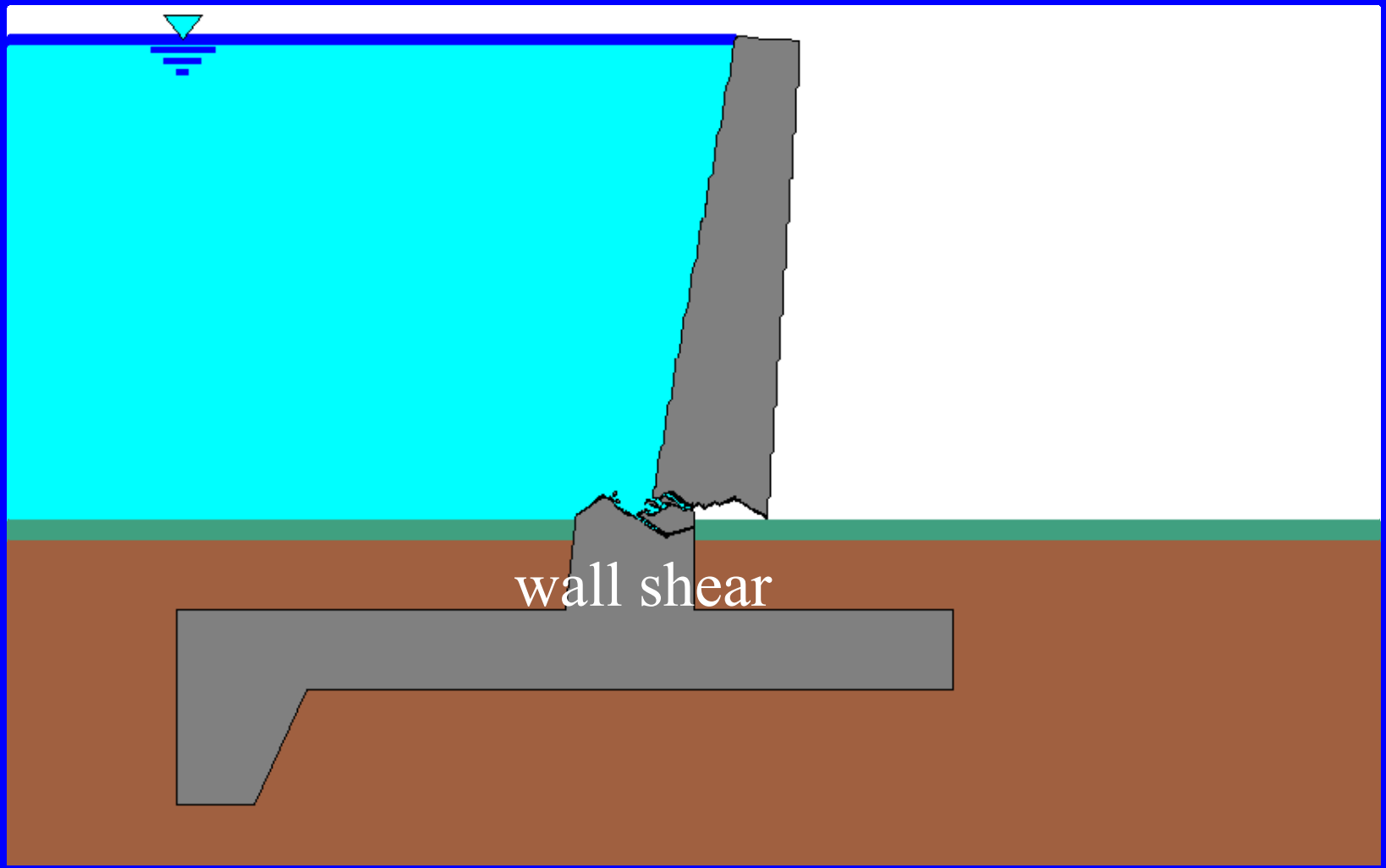
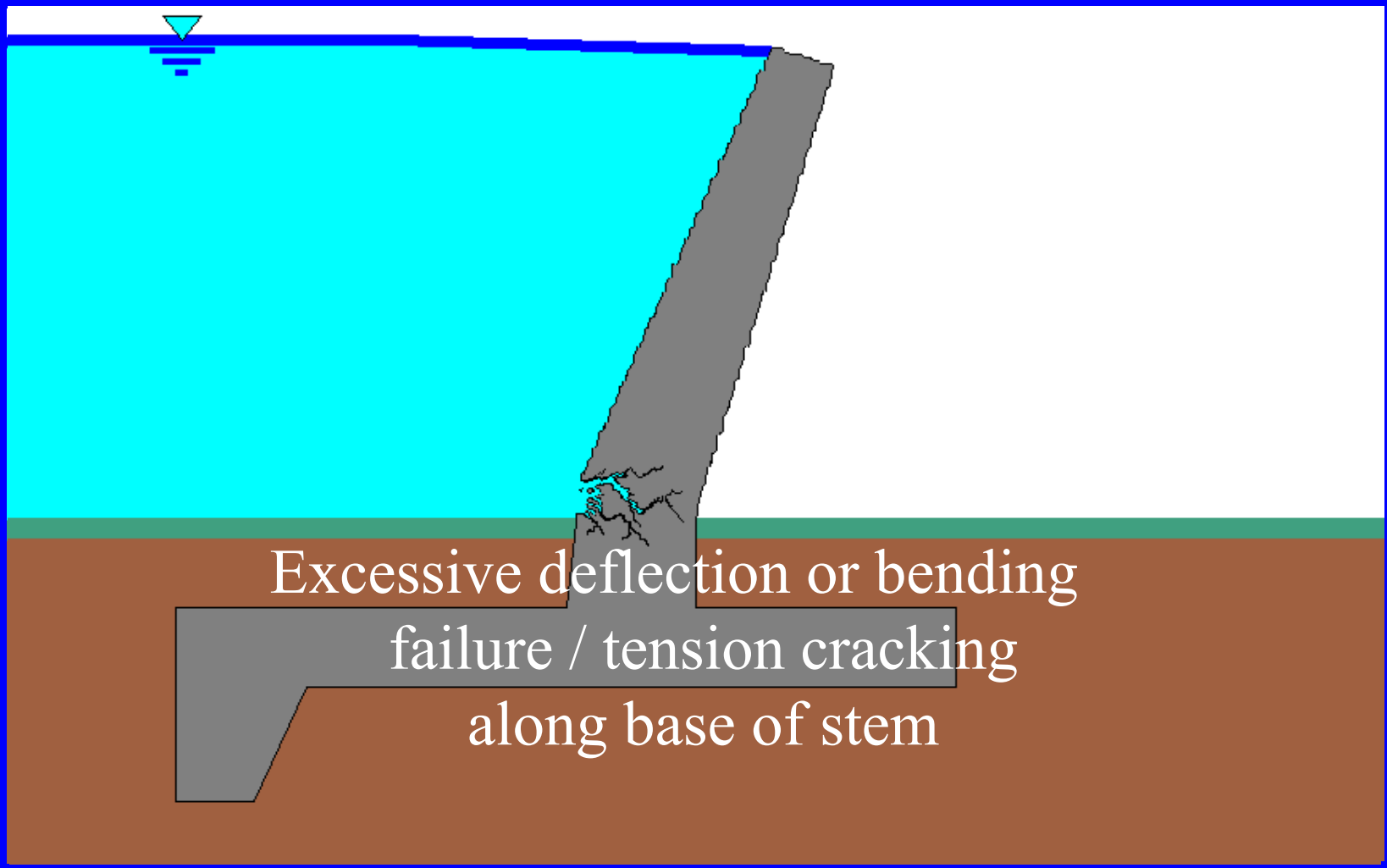
Structural Failure



Structural Failure



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Initial Technical / Economic Analysis for Each Levee Unit

1. Hydrologic Reliability
2. Geotechnical Reliability
3. Structural Reliability
4. **Economic Investment and Estimated Flood Damages**

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Economic Importance of the Existing System

- System protects over 5000 structures
- 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 Performance of Existing Project

Completed Project
Construction Cost: $42.4 million*

Cumulative Damages
Prevented Through 2002: $8.8 billion**

***U.S. Army Corps of Engineers Annual Report FY 2001, Kansas City District**
****Kansas City District, Annual Report, Flood Damages Prevented**

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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.

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Looking Ahead: Potential Reliability Improvement Measures

- Depending on the variables involved at each area of interest... will probably look at:
  - No Federal Action
  - channel and bank line modifications
  - increased levee height
  - improved underseepage control
  - improved levee foundation
  - improved structural performance
  - flood proofing (initial look at the KCMO BWWT plant)
  - various pump station improvements/replacements for interior ponding near toe of levee and underseepage concerns
  - Etc…

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National Environmental Policy Act of 1969, As Amended
NEPA

- Consider the environmental consequences of an action equally with economics and technical factors early in the planning stages and prior to decision.
- Undertake the NEPA process concurrently with feasibility studies, economic analyses, and other analyses of alternatives.
- Take actions that protect, restore, and enhance the environment.
- Provide decision-maker with a comparison of environmental impacts resulting from alternative actions.
- Provide opportunity for public input to the decision-making process.

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Goals of Initial Public Meeting

- Provide information to the public on the proposed project and potential alternatives
- Identify any significant issues concerning potential alternatives or resources that may be impacted by the proposed action
- Identify any unknown alternatives or variations on alternatives

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EIS/Evaluation Report Process

- Corps will prepare an Evaluation Report and Environmental Impact Statement (EIS)
- Reports will address hydrologic, geotechnical and structural reliability of the levee system, resources in the project area, and the economic and environmental impact of proposed alternatives.
- Preliminary public/agency input through September 22, 2003.
- Early-2005 Draft Reports – Public Review/Meeting.
- Mid-2005 Final Reports – Public Review.
- Approved Reports and Formal Decision in Late 2005.

Evaluating Impacts

- Human Safety
- Economics
- Recreation
- Fish & Wildlife
- Water Supply
- Navigation
- Flood Control
- Transportation
- Wetlands
- Water Quality
- Agricultural Activity
- Cultural Resources
- Threatened & Endangered Species
- Aesthetics
- Public Service
- Land Use
- Vegetation

Coordinating Agencies

- Held Agency Information/Scoping Meeting on August 7, 2003
- Coordinating agencies include local, state and Federal – Kansas & Missouri
- Purpose - Gain input for the environmental review process on areas that these agencies have special expertise

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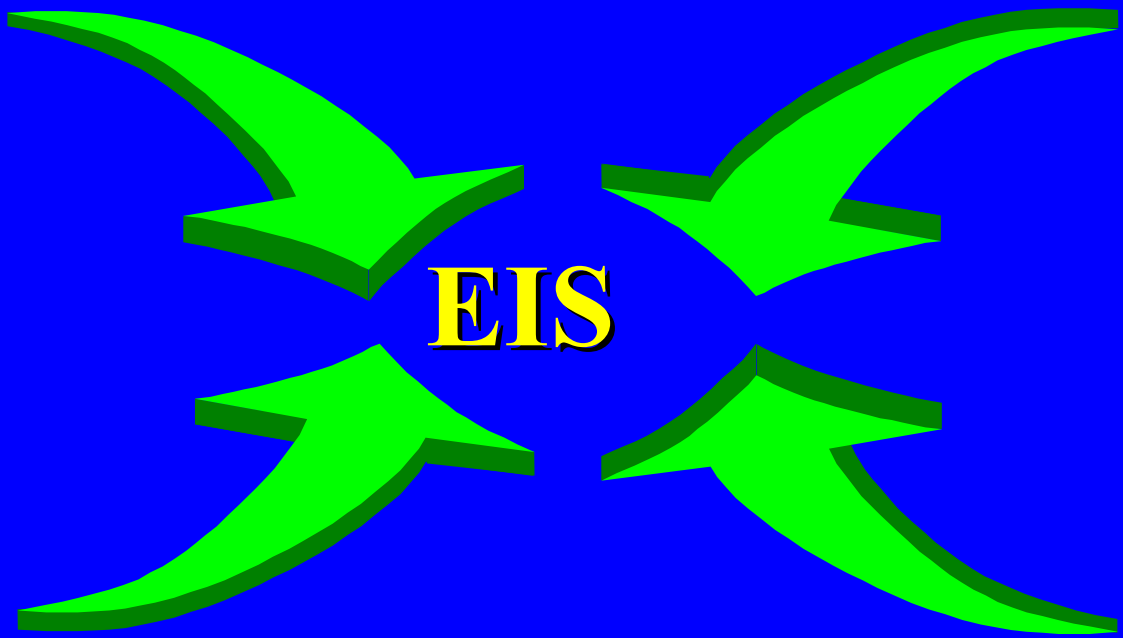
Agency and Public Input into Process

- We need your help, cooperation, coordination, and input to make this process work.



Input to Study

1. Request your input **by Sep. 22, 2003**
2. Impacts to Resources
3. Comments on Concepts + or -
4. Additional Concepts

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Kansas Citys, Missouri & Kansas Flood Damage Reduction Project

Kansas Citys Levees Public Involvement P.O.C.s:

Scott Gard, Public Involvement Coordinator

David Hoover, Environmental Resources Specialist

e-mail us at: KClevees@nwk02.usace.army.mil

WEBSITE

www.nwk.usace.army.mil/projects/7levees

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Kansas Citys, Missouri & Kansas Flood Damage Reduction Project

Verbal Comments?

When called please step to the microphone and state your name for the record

Please limit your comments to 3 minutes (comments may also be submitted by mail or e-mail)

The proceedings are being recorded and all comments become part of the public record

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THANK YOU

Kansas Citys, Missouri & Kansas
Flood Damage Reduction Project

Public Information/Scoping Meeting
August 20, 2003
North Kansas City Community Center
1999 Iron St., North Kansas City, Missouri
6:30-8:00 p.m.

Don't forget, initial comments should be submitted NLT
September 22, 2003