



Levee Certification with Multiple Private Owners

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ENV SP

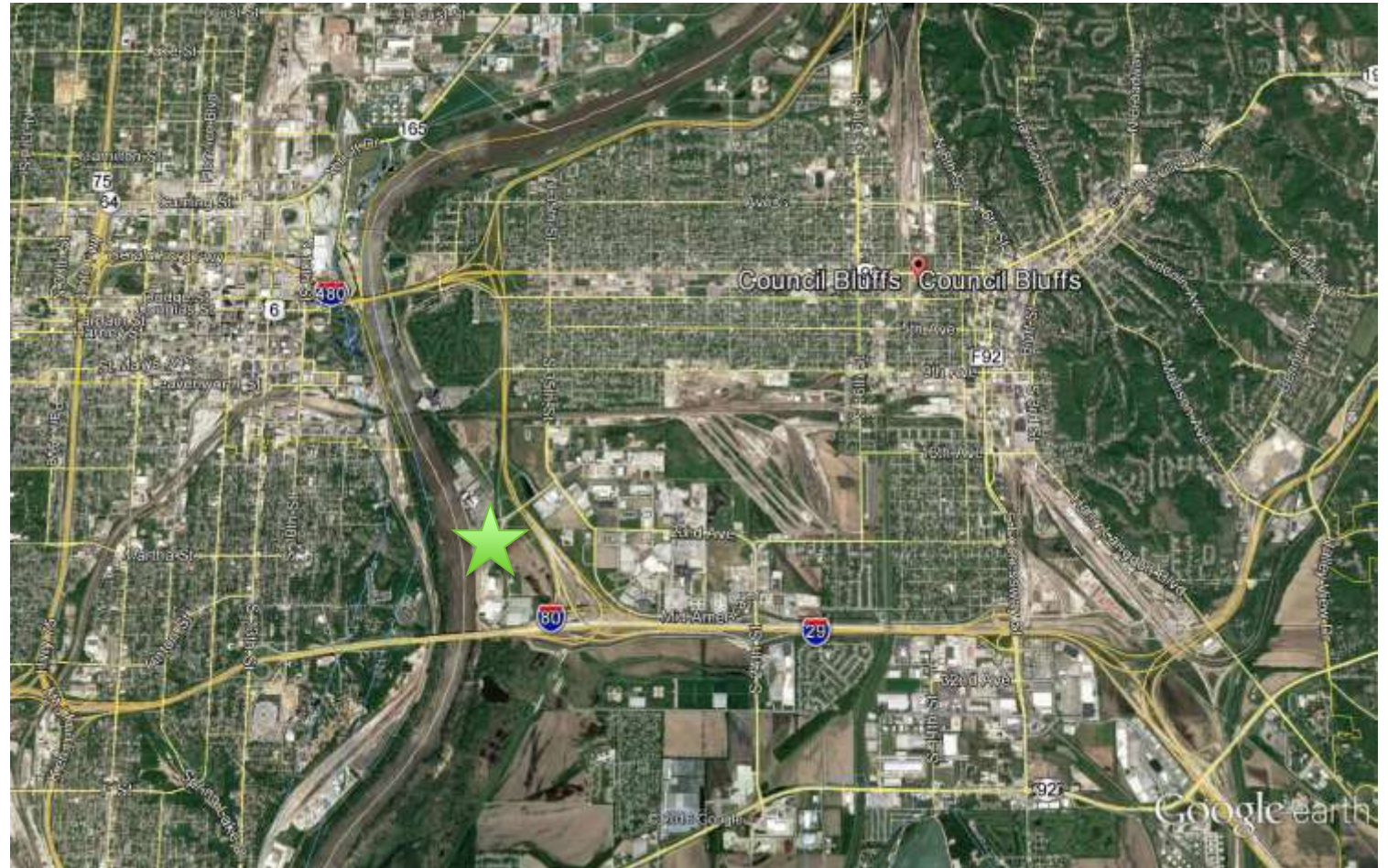
January 23, 2016



**CDM
Smith**

Agenda: Industrial Park Levee (IPL) – Council Bluffs, Iowa

- Site Background and History
 - Development
 - Regulations
- Levee Improvements and Certification Approach
 - FEMA Certification in Two Phases





Industrial Park Levee Site Background and History

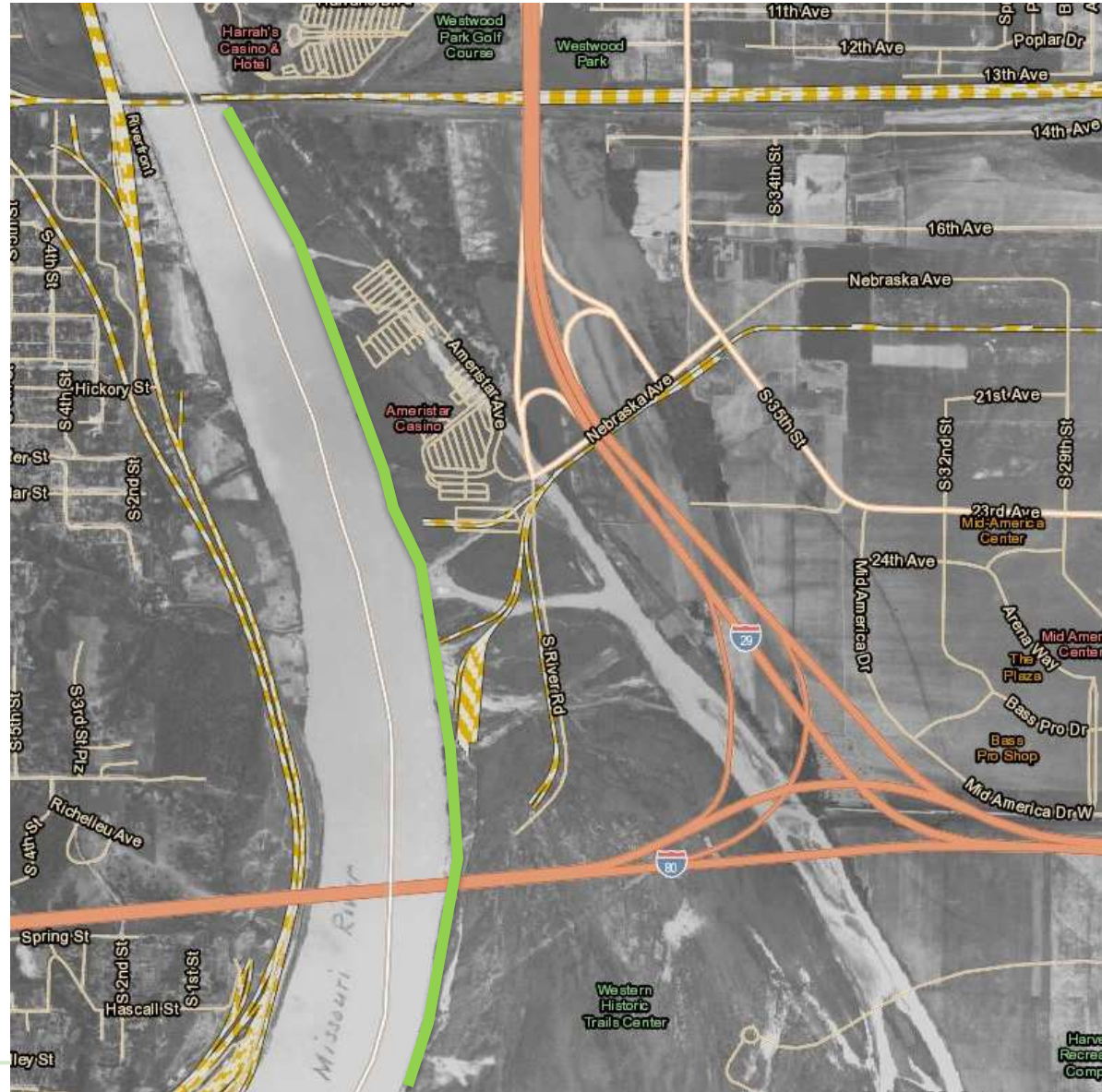
IPL Site Background

- Nearly 1-mile long private levee system
 - Constructed in the 1980s
- Historically tied in to federal system at its north and the Interstate to the south
- Area created by United States Army Corps of Engineers (USACE) Missouri River Navigation Project



Historical Site Conditions – 1930s Aerial Photography

- Missouri River Stabilization and Navigation Project began in the 1920s
 - Alignment represents modifications to channel
 - Control structures visible along green line



Effect of Wing Dikes – Indian Cave Bend, Missouri River

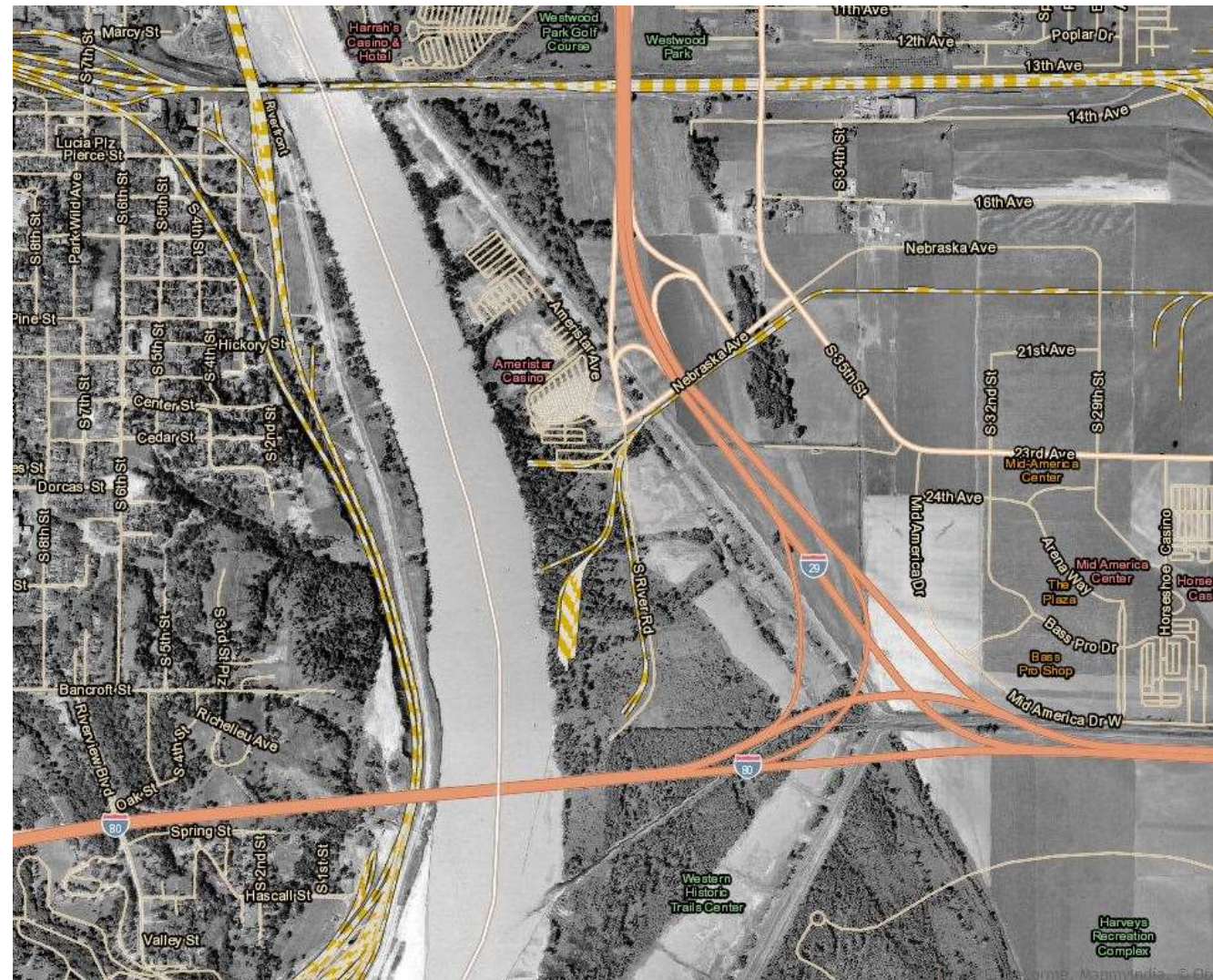
D. May 1946



A Brief History and Summary of the Effects of River Engineering and Dams on the Mississippi River System and Delta, United States Geological Survey <<http://pubs.usgs.gov/circ/1375/C1375.pdf>>

Historical Site Conditions – 1950s Aerial Photography

- Riparian vegetation
- No development



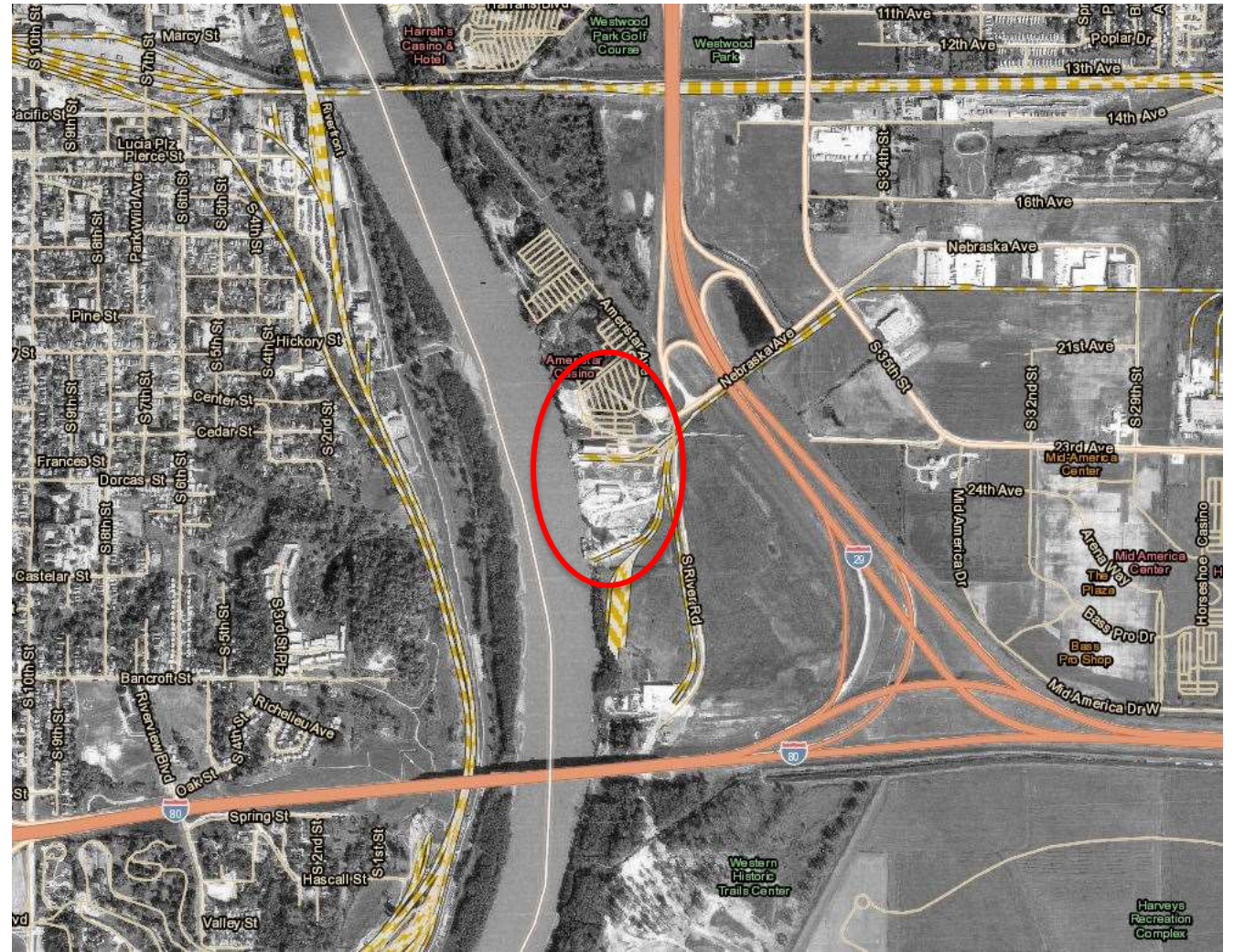
Historical Site Conditions – 1960s Aerial Photography

- Further development of riparian vegetation
- New docks



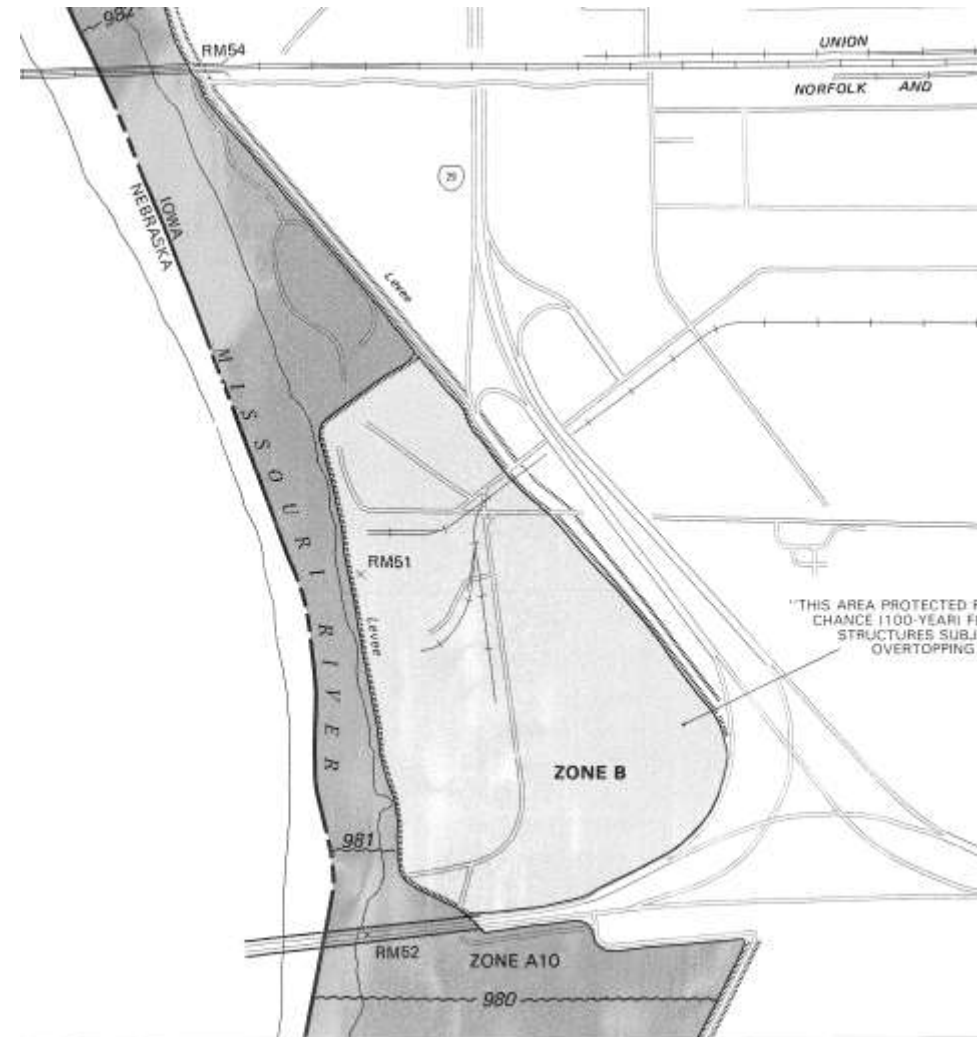
Historical Site Conditions – 1970s Aerial Photography

- Buildings first constructed
- NFIP flood hazard initial identification dates 1974 to 1976



Historical Site Conditions – Historical 1987 FIRM

- IPL Protected by Levee in 1980s FIRM



Effective FEMA Mapping

- IPL providing protection
- IPL provisionally accredited 2011 through May 2013
- Map revisions expected in 2020s



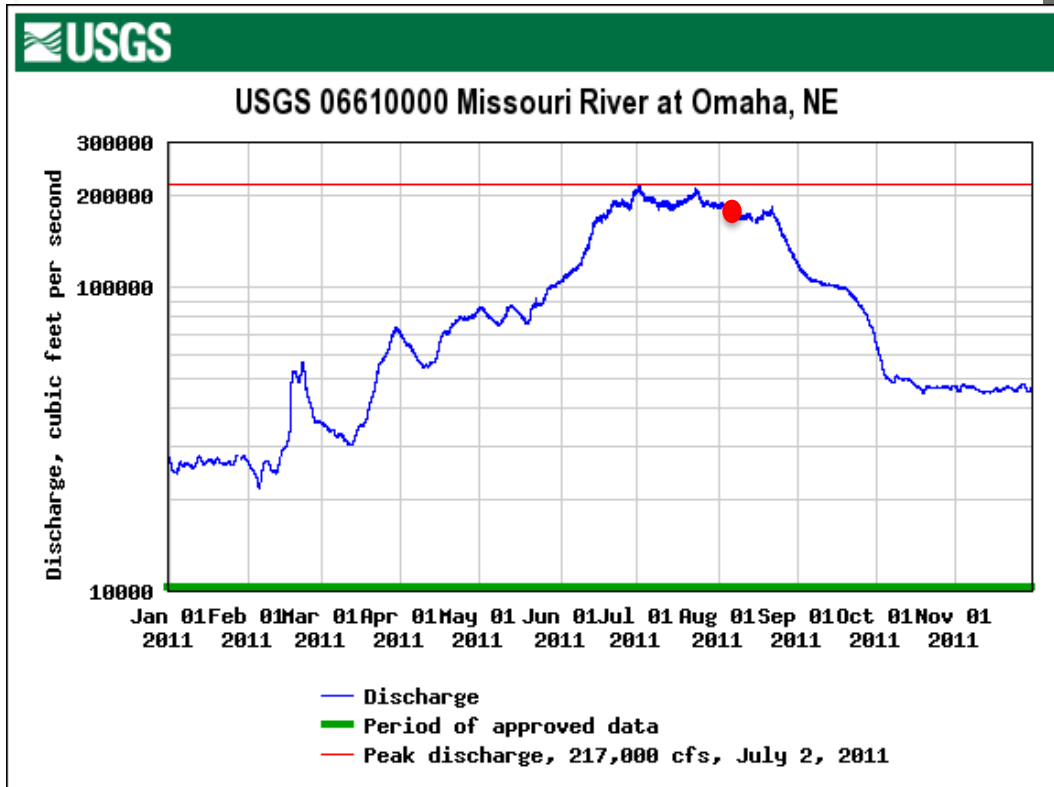
Current Site

- Ameristar – 1995
 - Constructed over levee crest
- Cargill and Warren Distribution – sites developed in 1970s
- Absentee Owner



Historical Flooding - 2011

- IPL held with some damages in 2011 flood
 - Prior to improvements





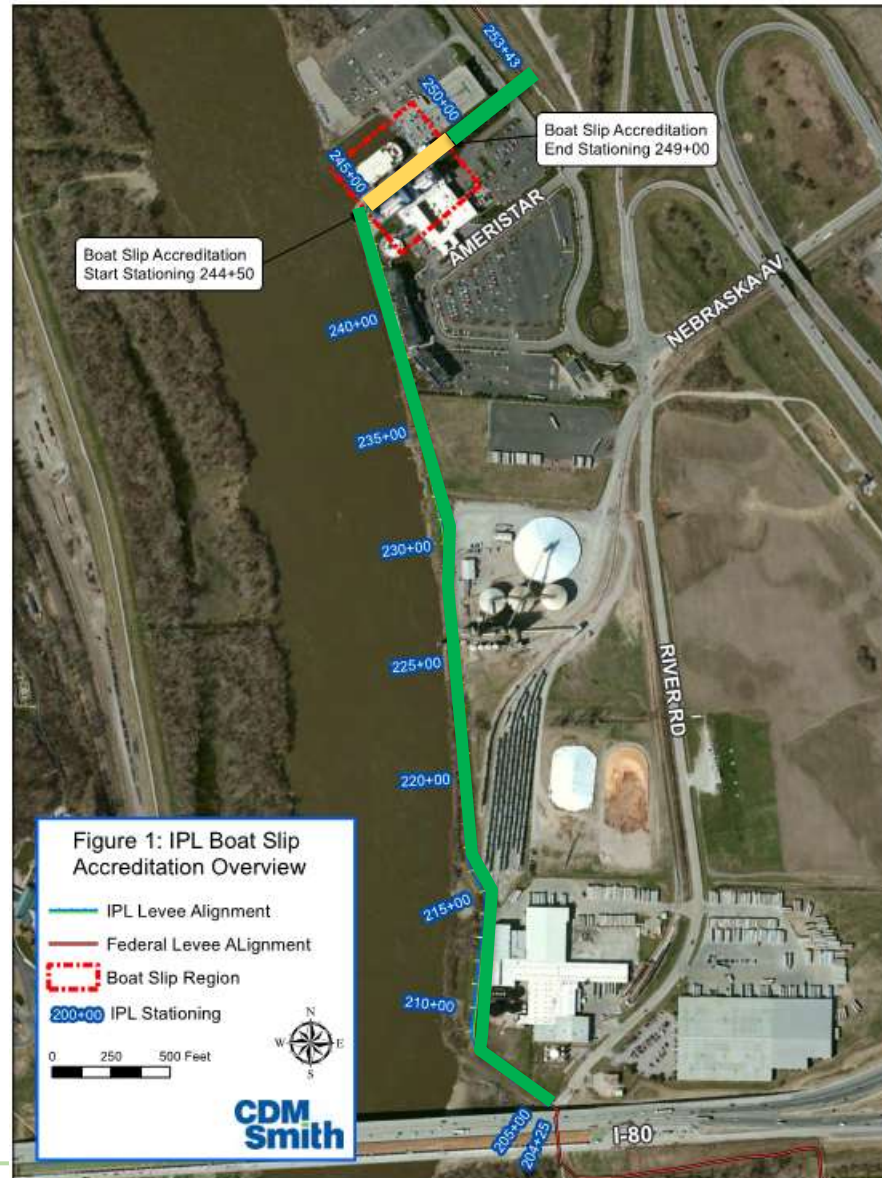
Levee Improvements and Accreditation Approach


Project Goals


- Obtain FEMA accreditation for IPL
 - Prevent requirement for flood insurance
 - Assess levee according to FEMA criteria
- Assess USACE PL 84-99 eligibility
 - Federal flood fight efforts
 - Repairs to levee federally funded after flood
- Design and construct improvements to levee
 - Repair damage from 2011 flood
 - Meet FEMA requirements



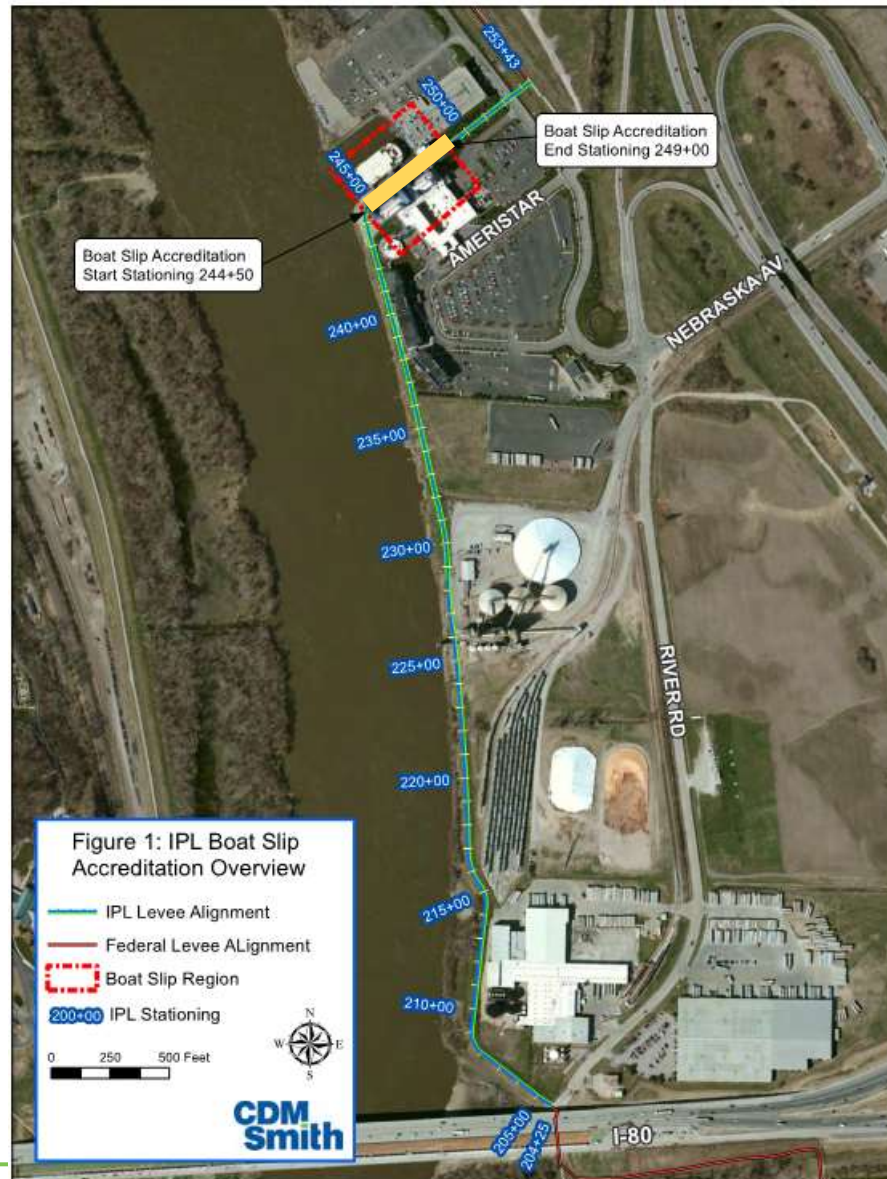
Two-Phase Approach to FEMA Accreditation



Phase 1 

Phase 2 

Two-Phase Approach to FEMA Accreditation



■ Benefits

- Construction improvements were needed on remainder of levee
 - New culverts, outfall structures
 - Remove plugged penetrations
 - Restore levee
 - Increase levee height
 - Install under-seepage controls
 - Stabilize bank
 - Re-establish rock/vegetation
- Boat slip area
 - Breezeway, buildings on levee

FEMA Certification Submittal Requirements

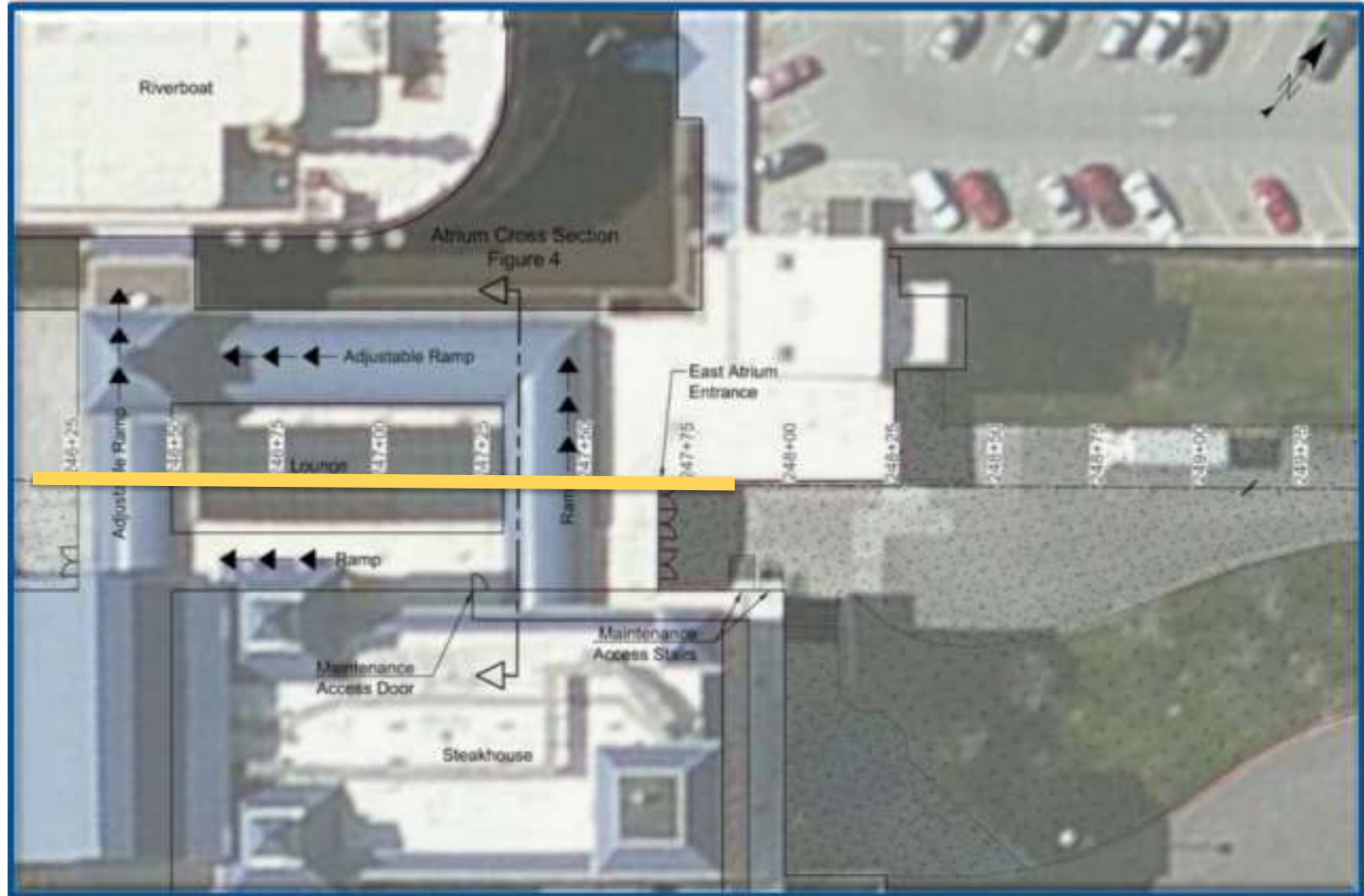
Phase 1 Items of Note

- **Freeboard**
- Closures
- Embankment Protection
- **Embankment and Foundation Stability Analysis**
- Settlement Analysis
- Interior Drainage
- Other Design Criteria



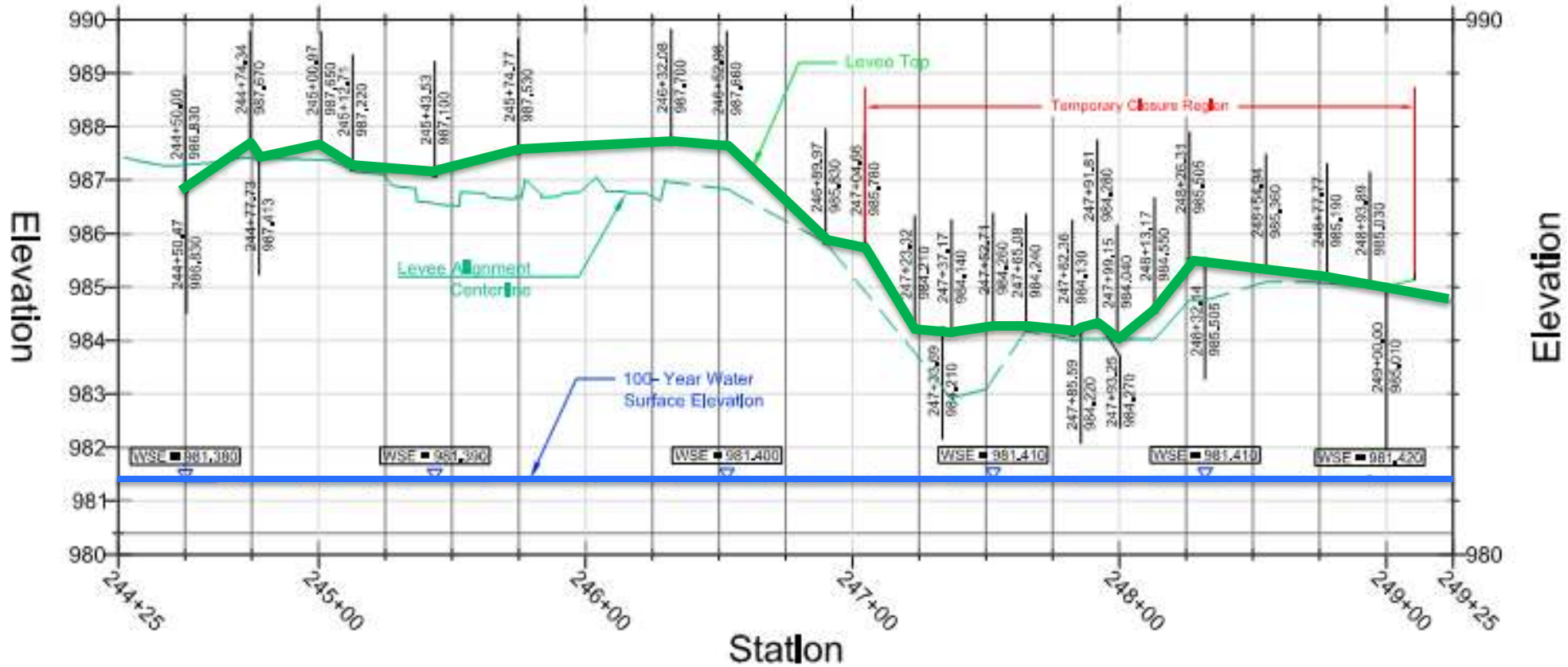
Phase 1 - Freeboard

- Casino building straddles the levee through an atrium area



Phase 1 - Freeboard

- Levee Crest Profile (solid green)

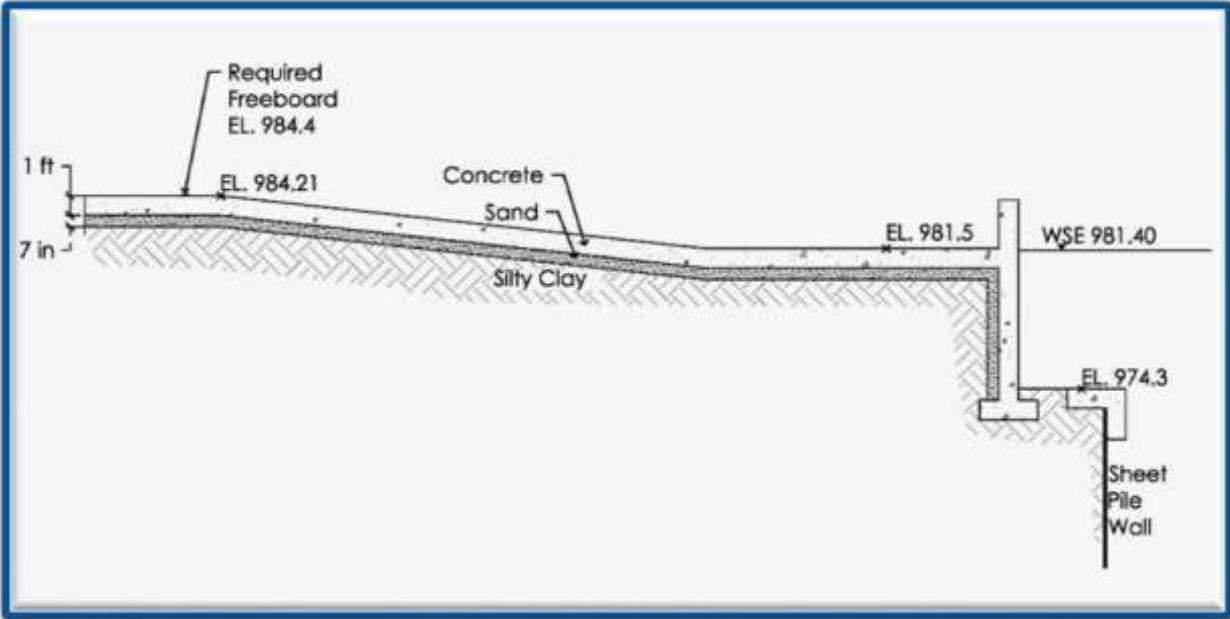


Phase 1 – Boat Slip Certification

- Freeboard



Figure 4: Ameristar Atrium Cross Section



FEMA Certification Submittal Requirements

- Embankment and Foundation Stability Analysis



FEMA Certification Submittal Requirements

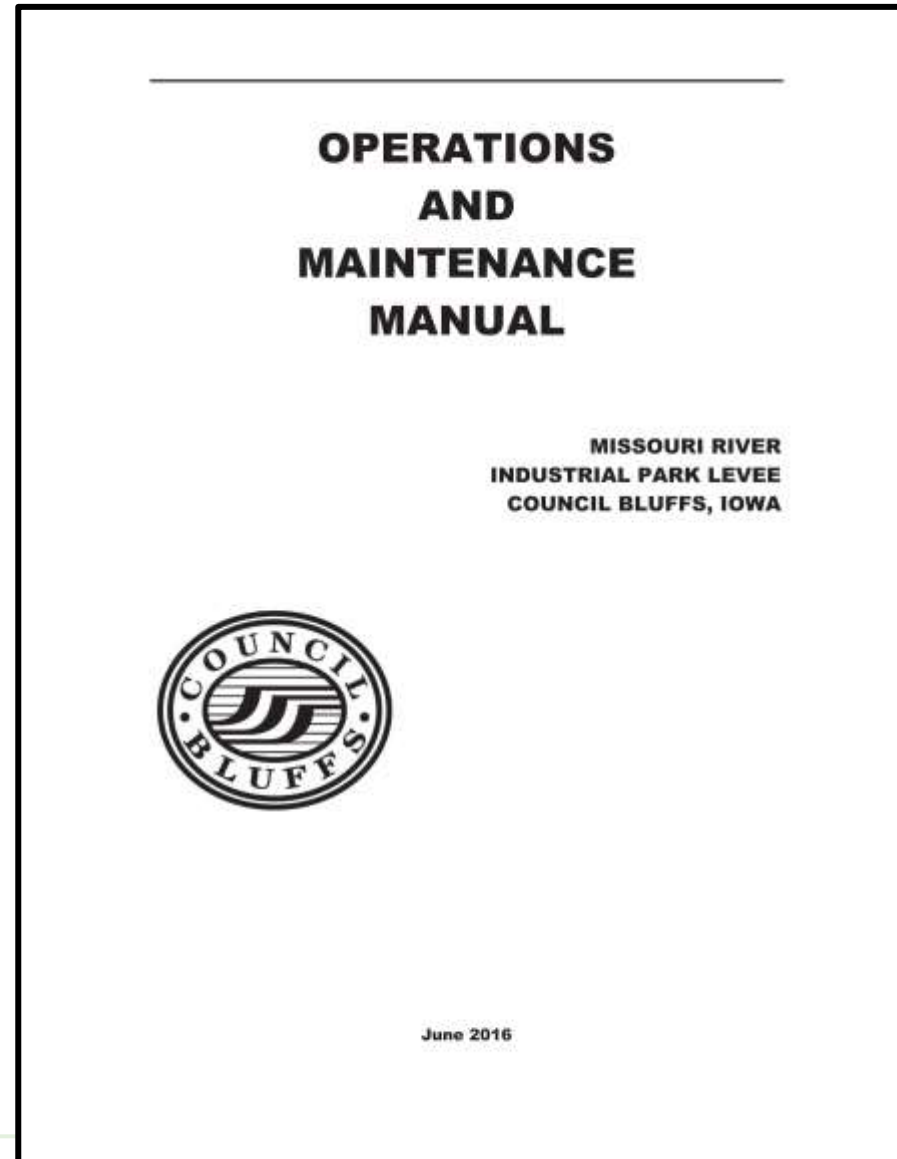
Phase 1 Items of Note

- Freeboard
- Closures
- Embankment Protection
- Embankment and Foundation Stability Analysis
- Settlement Analysis
- Interior Drainage
- Other Design Criteria
 - **Operations and Maintenance**



Phase 1 – Operations and Maintenance Manual

- One central, responsible party
- Define temporary closures
 - Sandbagging
 - Gate closures
- Inspections
- Coordination between levee owners
 - Regular meetings



FEMA Certification Submittal Requirements - Phase 2

- **Freeboard**
- Closures
- Embankment Protection
- **Embankment and Foundation Stability Analysis**
- Settlement Analysis
- Interior Drainage
- Other Design Criteria
 - Operations and Maintenance

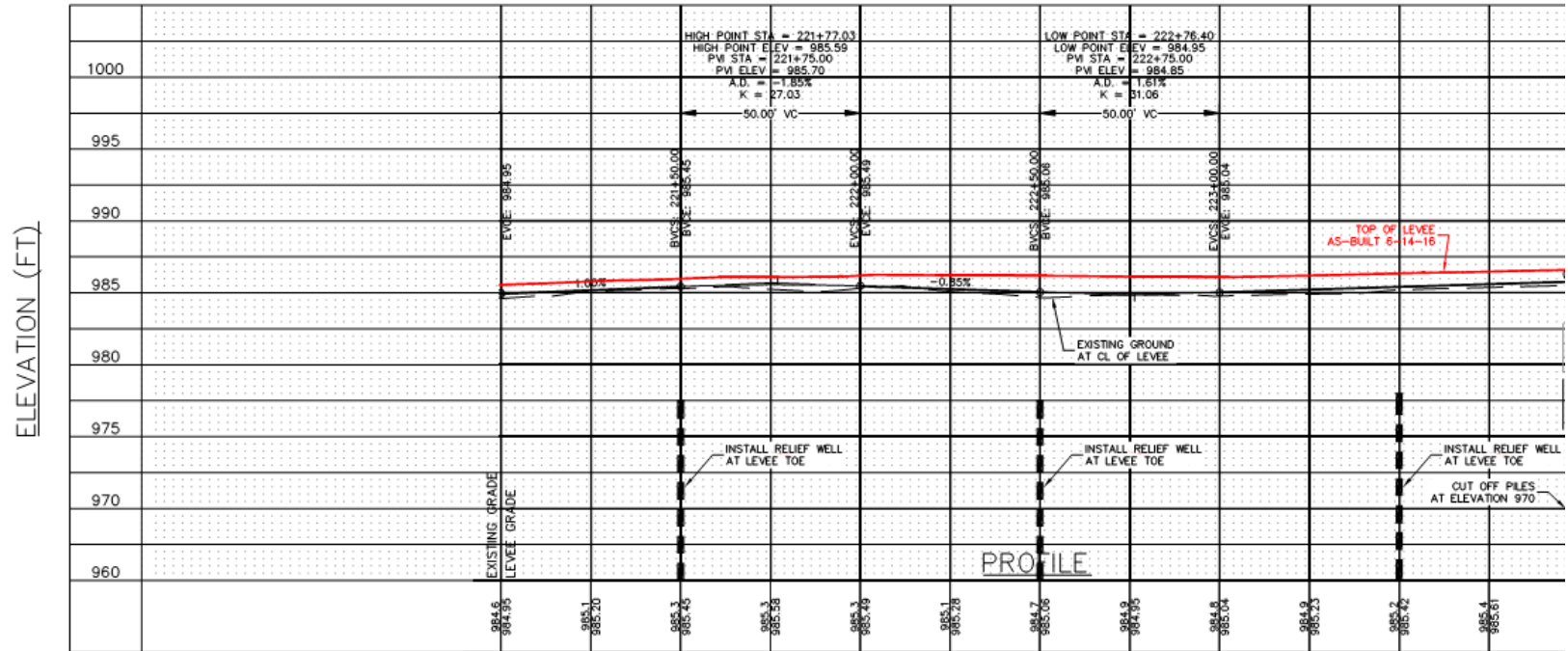


Phase 2 – Freeboard & Embankment Stability

- Construction to meet FEMA requirements (3-feet of freeboard with additional 6-inches at upstream end)

- 6,600 cubic yards of fill
- Raised levee crest as much as 3-feet
- Repaired damages from 2011 flood
- Created stable slopes
- No-rise analysis required for floodplain permit

- As-built survey to capture constructed freeboard
- USACE Missouri River model to calculate water surface elevations



FEMA Certification Submittal Requirements - Phase 2

- Freeboard
- **Closures**
- Embankment Protection
- Embankment and Foundation Stability Analysis
- Settlement Analysis
- **Interior Drainage**
- Other Design Criteria
 - Operations and Maintenance



Phase 2 – Closures and Interior Drainage

- Four main outfalls (red dots)
- Gate closures based on Omaha gage levels
- Drainage area behind levee less than 1-square mile



Conclusions / Lessons Learned

- Communication – monthly meetings
- Cooperative levee owners were key
- One entity responsible for all operations and maintenance
- Final guidance on levee accreditation is still recent



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