

HERBERT HOOVER DIKE REHABILITATION PROJECT

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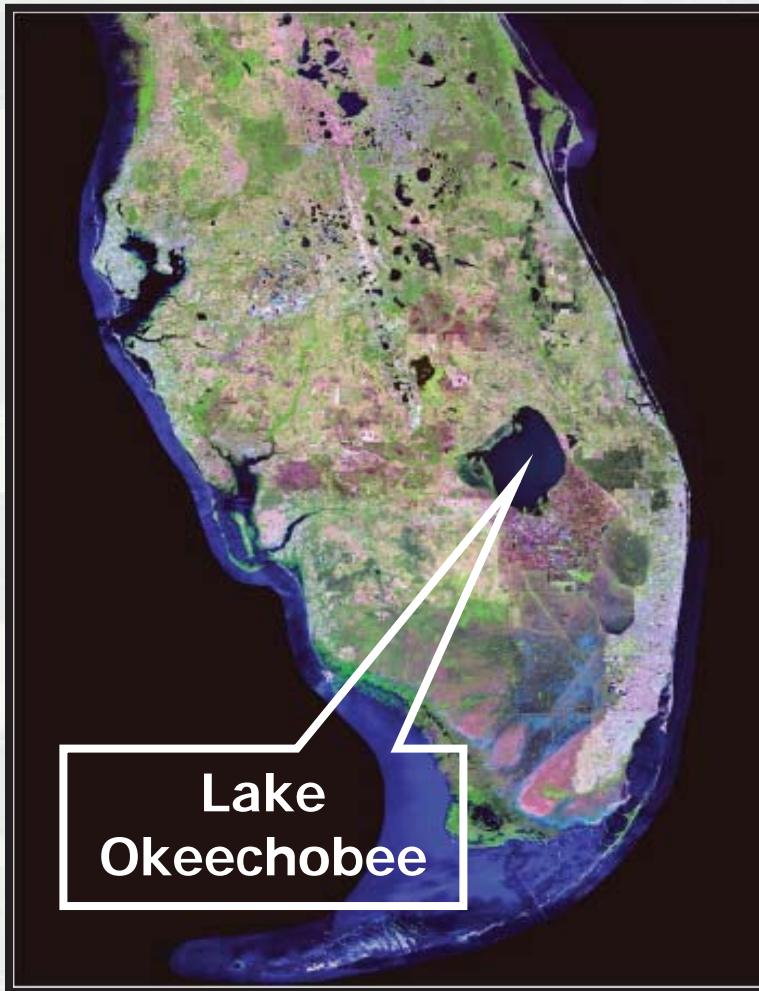


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Herbert Hoover Dike Overview



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- Lake Okeechobee is approximately 730 square miles
- Basin is over 5,600 square miles
- Average water depth is 9 feet
- One foot of rainfall runoff from the basin can result in a three to four foot rise of the lake
- During large flood events, water can flow into the lake much faster than it can be released



Congress Authorizes Herbert Hoover Dike in 1930



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- Over 3,000 lives were lost by the 1926 and 1928 hurricanes
- Significant economic impacts
- HHD first authorized in 1930
- Multiple authorizations



Herbert Hoover Dike Today



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143 miles of embankment around Lake Okeechobee

- 32 federal culverts
- 5 spillway inlets
- 5 spillway outlets
- 9 navigation locks
- 9 pump stations

No overflow capability

Built by hydraulic dredge and fill methods

- Not acceptable to today's construction standards





HHD Problems (Failure Modes)



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Internal erosion (seepage and piping)

- Through embankment
- Through foundation

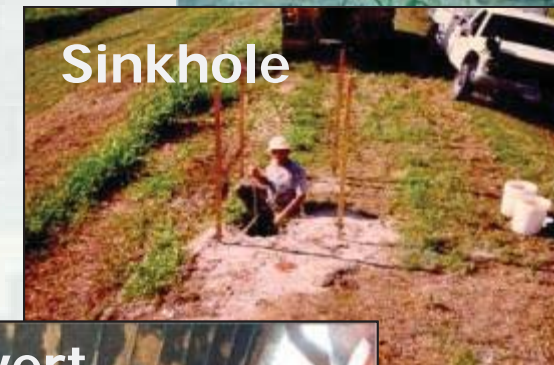
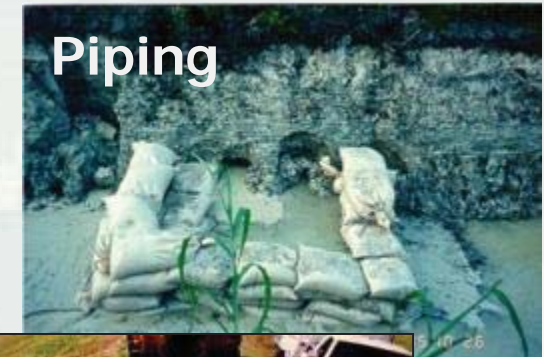
Culvert structures

- Soil erosion into conduit
- Erosion/Piping around conduit

Overwash/Overtopping

- Erosion of downstream slope

Dam Safety Action Classification (DSAC) Level 1- Assigned 2006



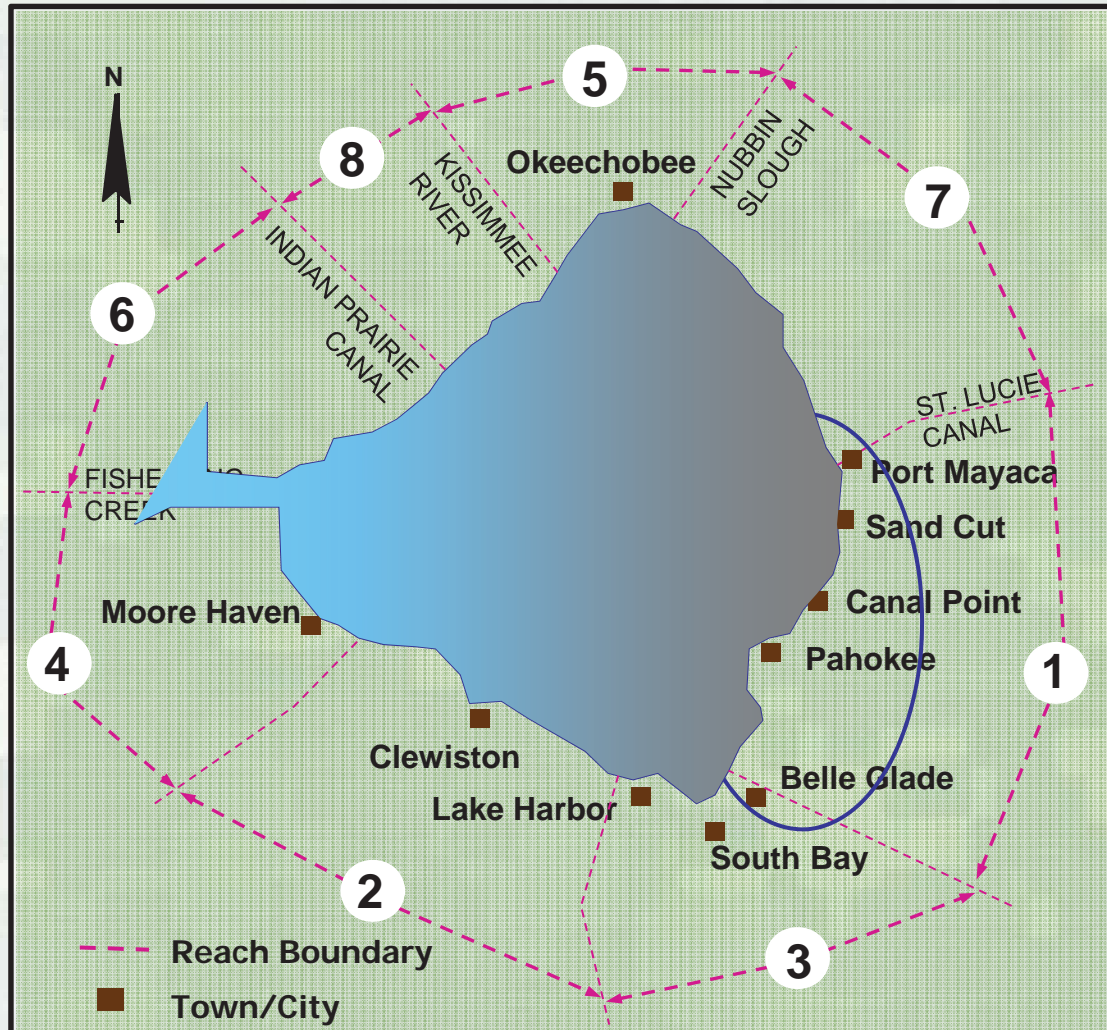


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Herbert Hoover Dike Solutions



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Major Rehabilitation Report (MRR) 2000

- Reach 1 initial phase
- Cutoff wall constructed

Federal Water Control Structure Culverts 2011

- 32 Federal Culverts within the entire HHD system
- Replacement or Removal

Dam Safety Modification Study (DSMS) 2016

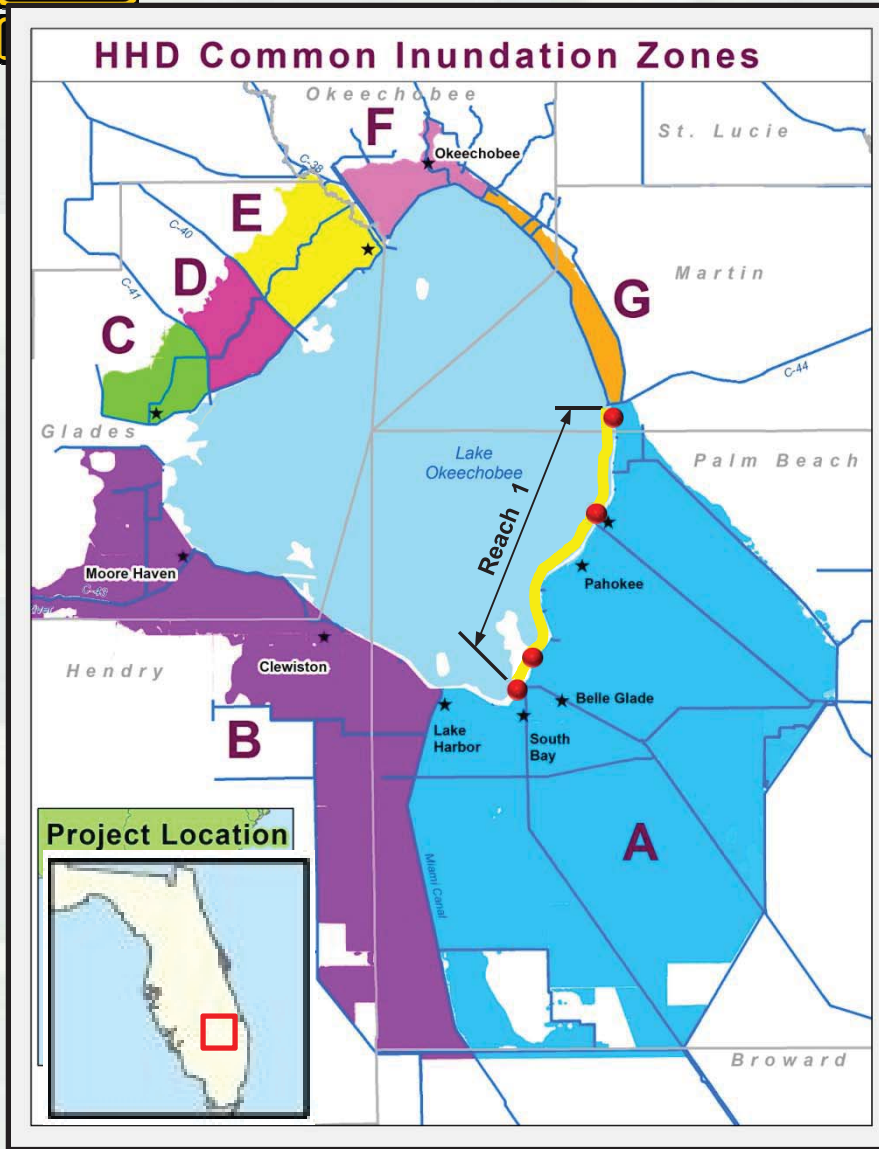
- System-wide approach
- Risk reduction measures below tolerable guidelines
- Prioritize Implementation



HHD Reach 1 Cutoff Wall



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Approval from 2000 HHD Major Rehabilitation Report

Completed – 21.4 miles of cutoff wall installed between 2007 and 2013

Planned – Cutoff wall tie-ins to 3 existing structures and 1 bridge with contract award in FY16

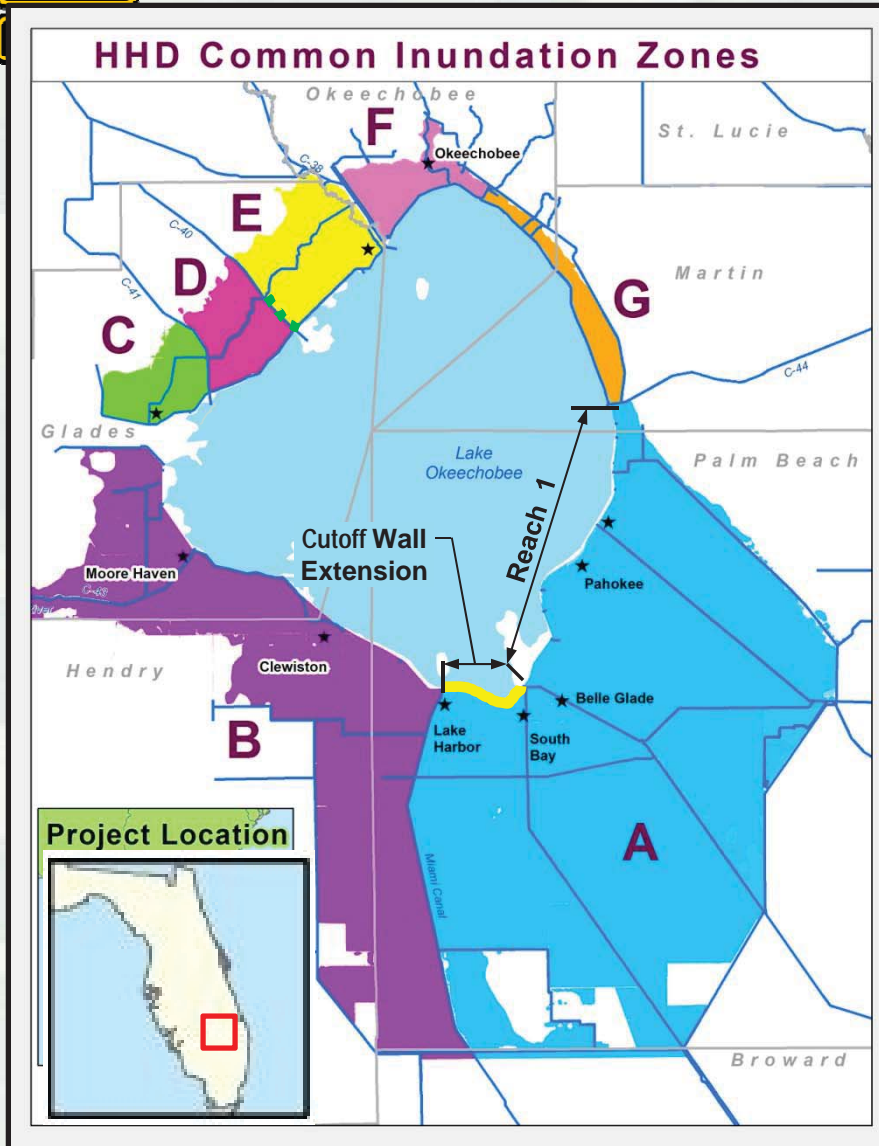
Complete the continuous seepage barrier through Reach 1 providing the risk reduction benefits to the adjacent communities



Reach 1 Cutoff Wall Extension



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Approval from 2015 HHD Major Rehabilitation Report Supplement

Planned – 6.6 miles of cutoff wall installed with contract award in FY17 and completion in 2020

Impact – Final embankment remediation project to complete repairs reducing risks to inundation Zone A

Complete the continuous seepage barrier through Inundation Zone A providing the risk reduction benefits to the adjacent communities and allow a recommendation for accreditation to FEMA for this area of HHD



Cutoff Wall Construction



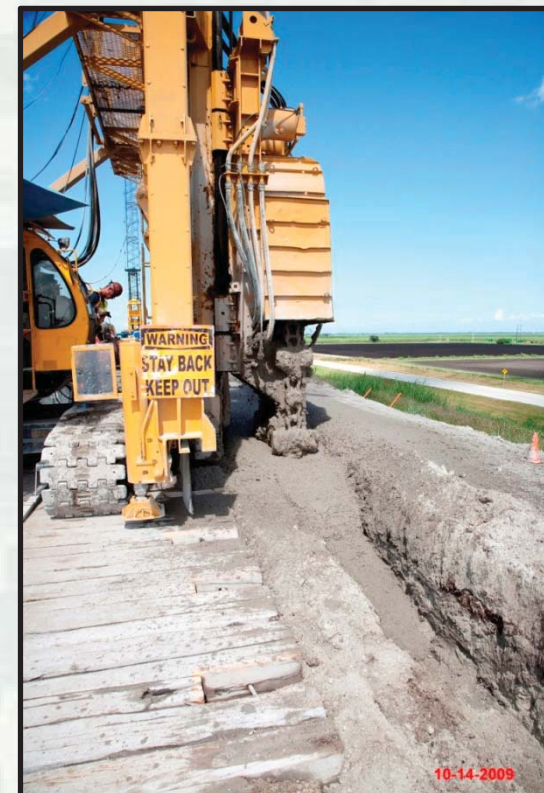
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Hydromill



Cutter Soil Mixer (CSM)



Trench Remix Deep (TRD)

Three different contractor methods achieved the same performance criteria for completed cutoff wall in Reach 1



HHD Culvert Replacements



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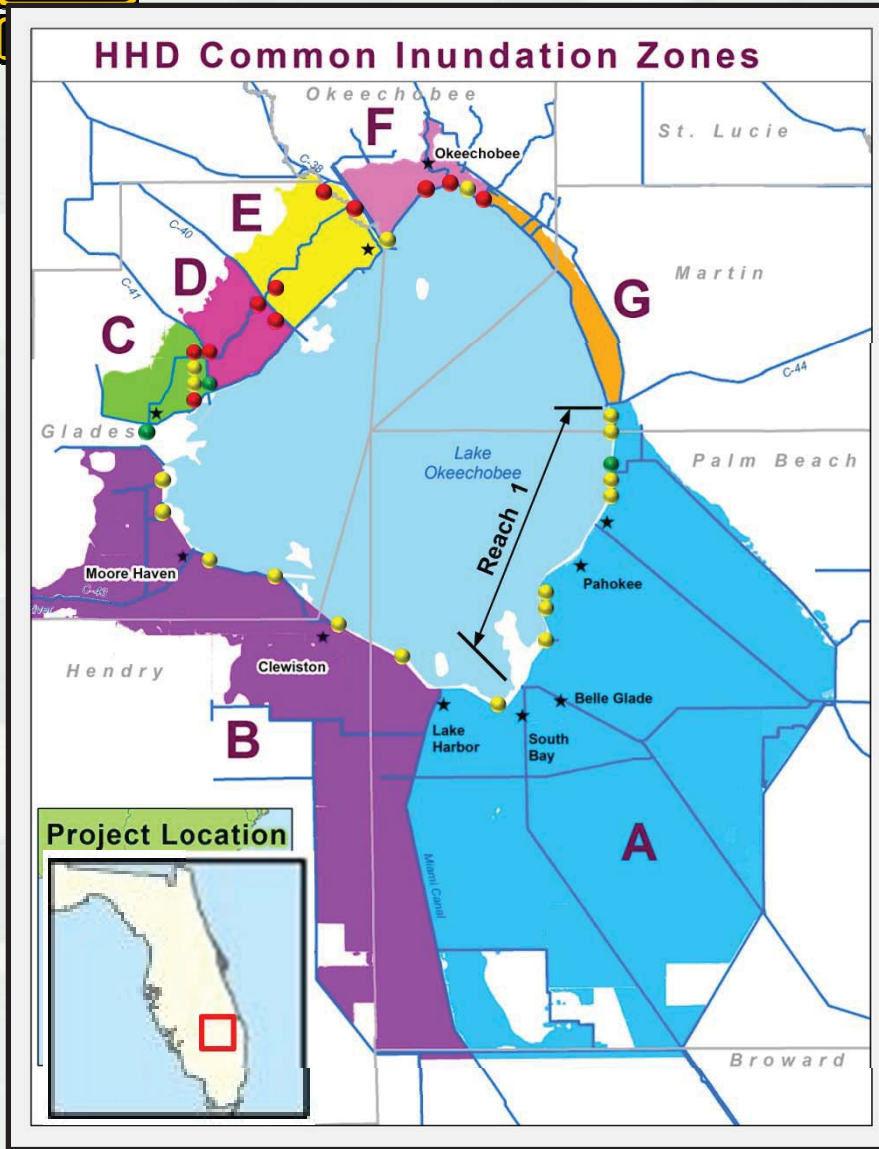
Approval from 2011 HHD Culvert Letter Report

Completed – 1 removal and 2 replacements

Ongoing – 10 contracts with 18 replacements completed by 2020

Planned – 5 contracts with 8 replacements; 3 contracts with 3 abandonments to be scheduled and completed by 2022

Complete repairs at the highest points of failure through the HHD system



Water Control Structure (Culvert) Status

- Construction Contract Complete ●
- Construction Contract Ongoing ●
- Construction Contract Planned ●



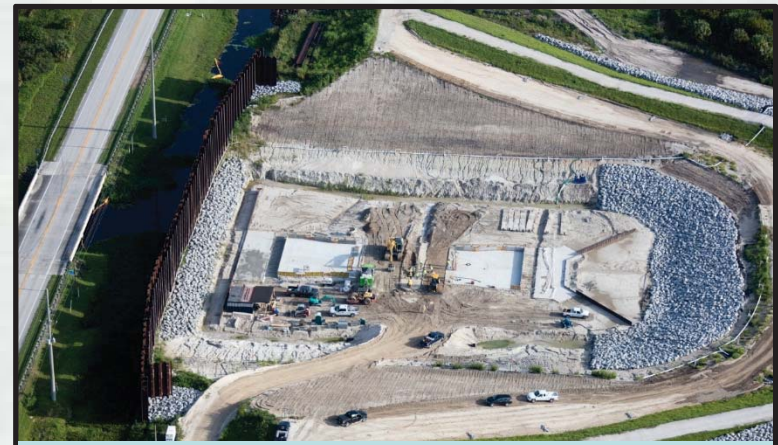
Culvert Replacement Phases



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Culvert 12 (S-275) - Excavation



Culvert 5A (S-281) - Foundation



Culvert 13 (S-272) - Reconstruction



Culvert 11 (S-269) - Completion

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Dam Safety Modification Study



Risk Assessment – Analysis performed on 32 dam segments within the 7 common inundation zones to identify and prioritize remediation

Modification Report – TSP in December 2015 with final report by the end of summer 2016

Impact – Final measures to reduce the risks for the entire system around the lake

- Recommendation for FEMA accreditation by inundation zone to begin in 2016
- Construction project implementation in 2019
- Opportunity to begin regulation schedule study





What is Risk?



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Risk is function of the hazard, performance and consequences

Hazard = frequency and magnitude of a lake stage or loading event

Performance = probability of failure or breach for a given hazard
(loading event)

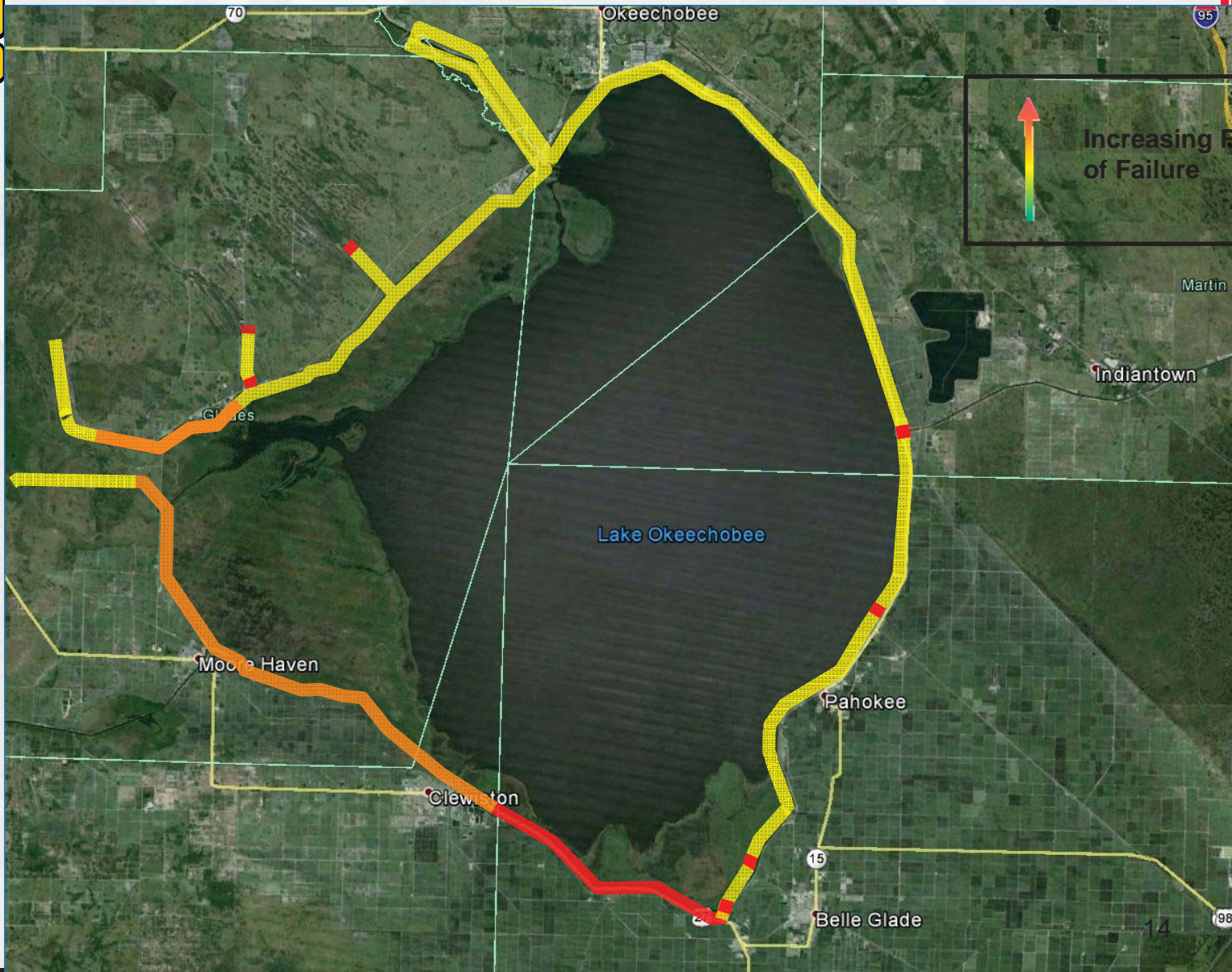
Consequences = the effect of a failure on people, property, economy
and the environment

Risk = f(Hazard, Performance, Consequences)



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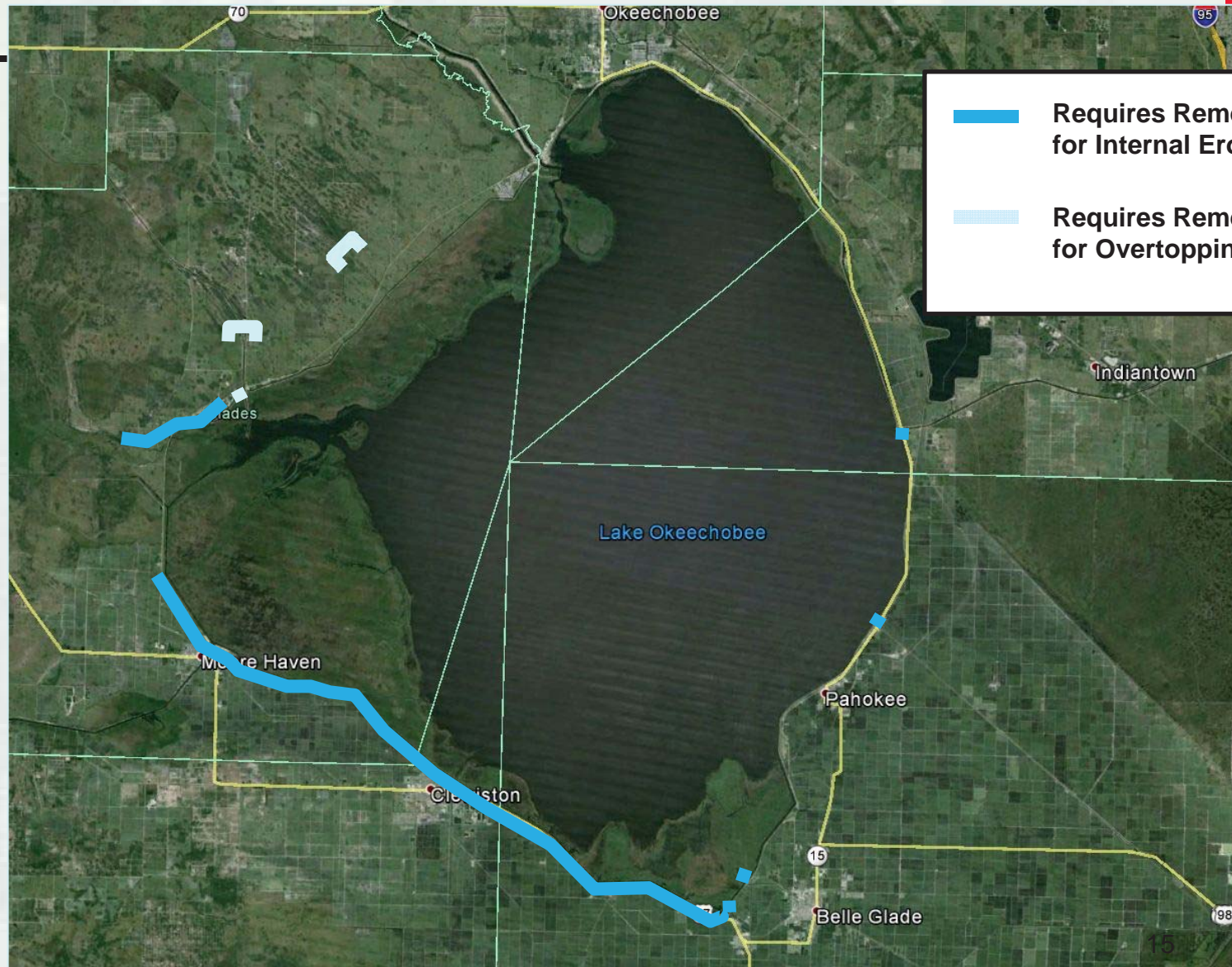
Relative Probability of Failure





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Intolerable Risk Areas



-  Requires Remediation for Internal Erosion Risk
-  Requires Remediation for Overtopping Risk

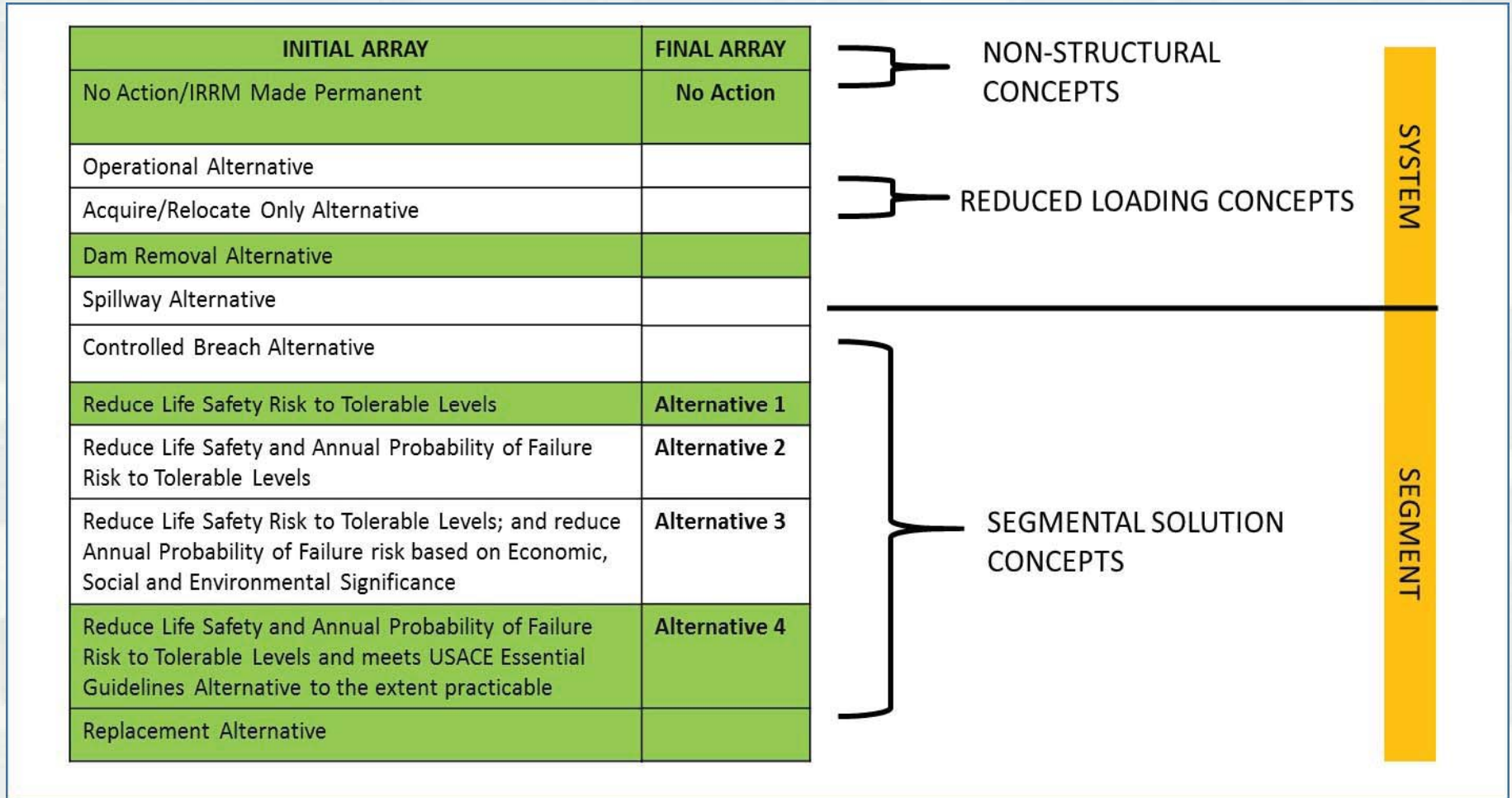


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Alternative Formulation



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****Green shading reflects alternatives required by policy**



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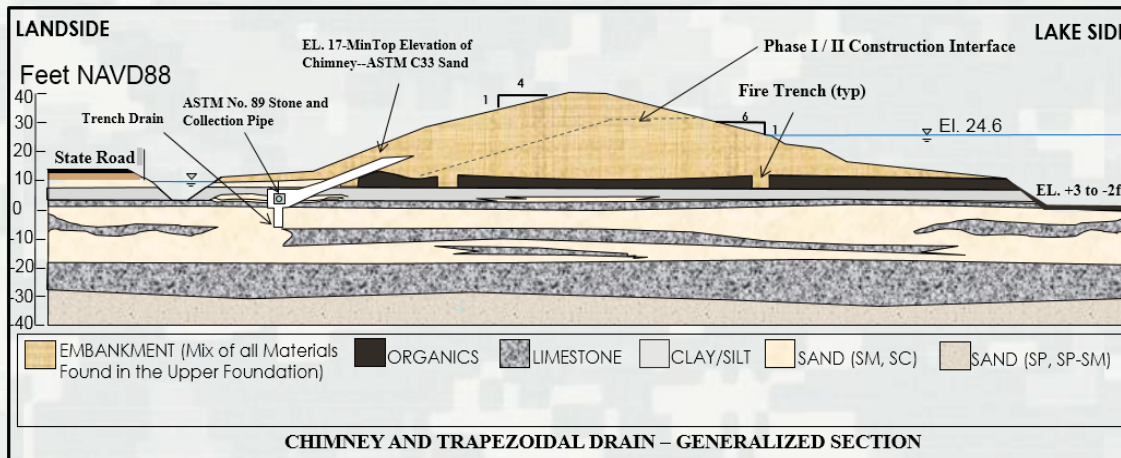
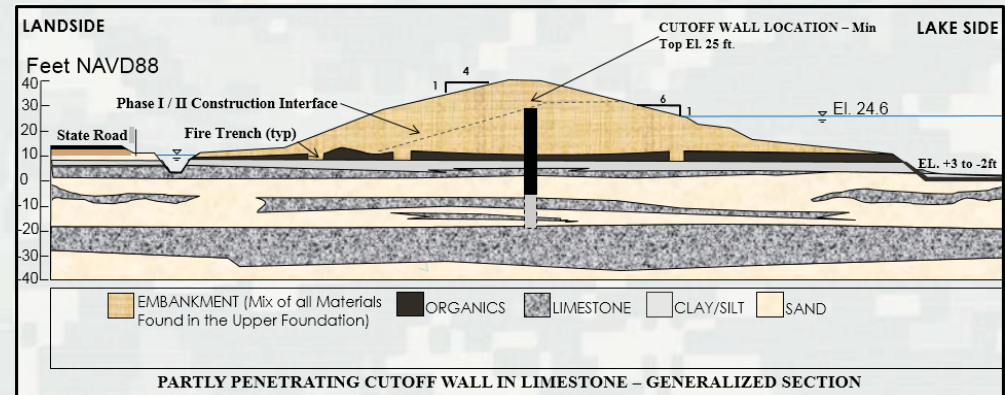
Final Measures Considered



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Seepage Cutoff Wall

- 2 variations were considered
- Centerline cutoff wall configuration carried forward – least cost and avoids lake littoral impacts



Internal Drainage System

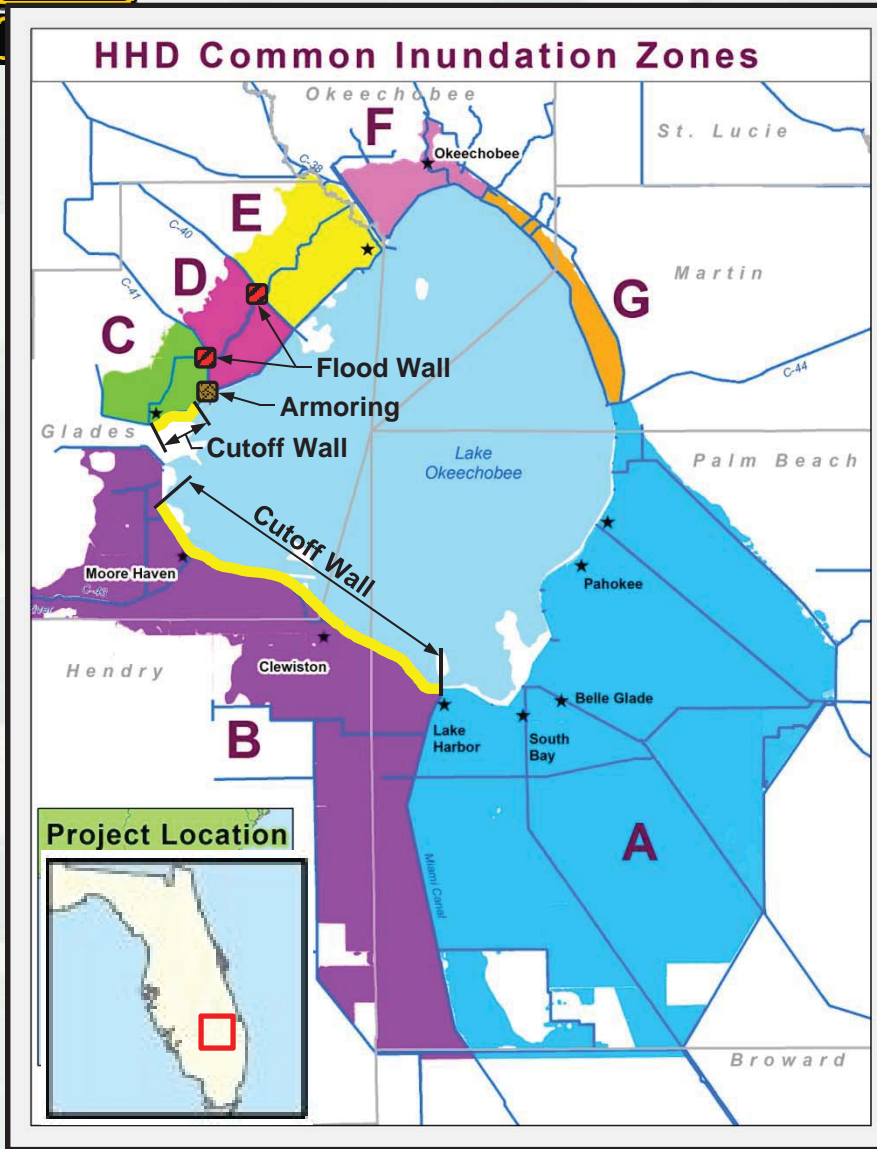
- 3 variations were considered
- Pumped drainage system carried forward – provides greatest risk reduction



Tentatively Selected Plan (TSP)



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Approval by USACE Dam Safety Officer Required

Common Inundation Zone B

- 24.5 miles of cutoff wall

Common Inundation Zone C

- 4.1 miles of cutoff wall
- HP bridge abutment armoring

Common Inundation Zone D

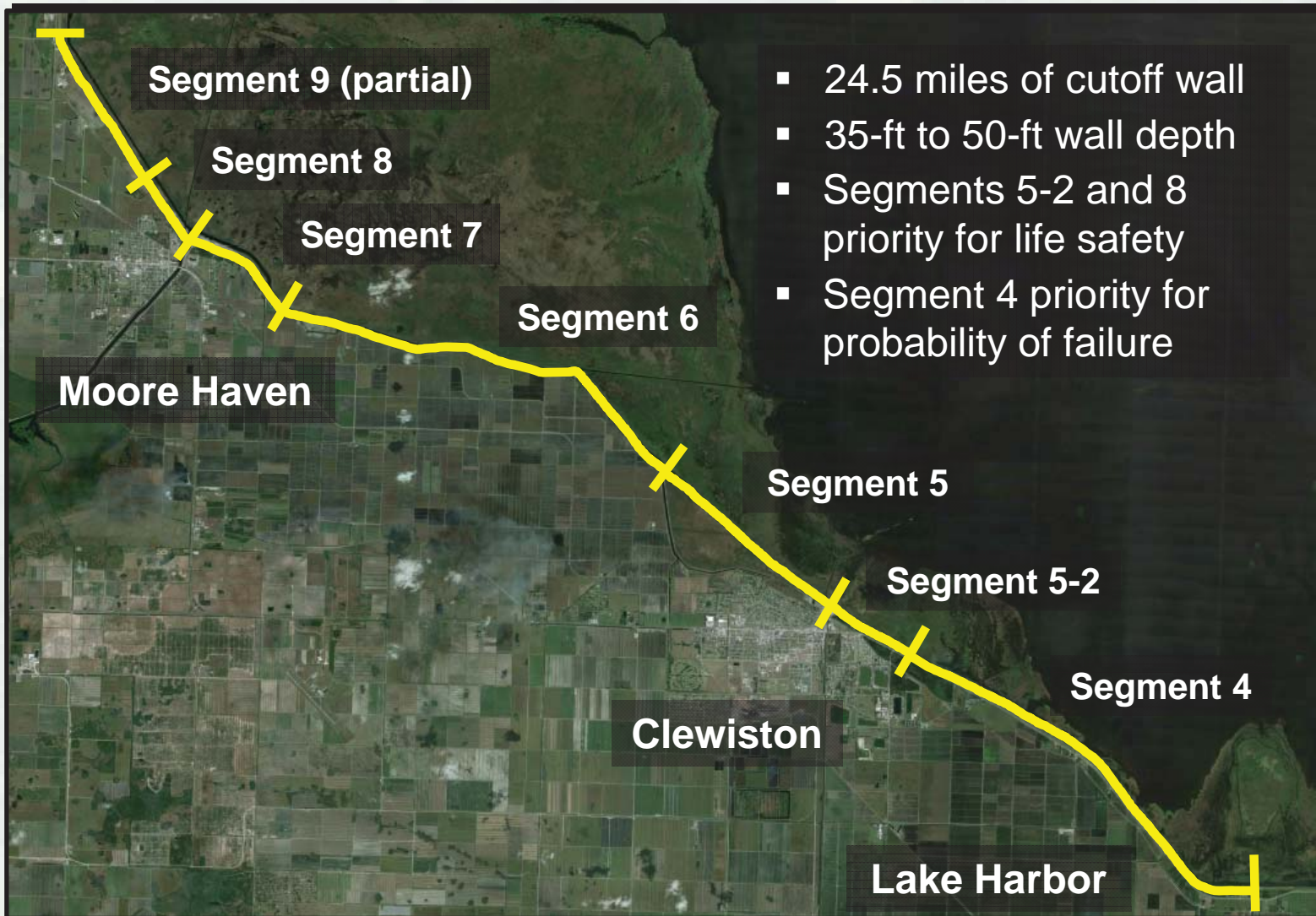
- S-71 embankment flood wall
- S-72 embankment flood wall

Draft DSMR Tentatively Selected Plan

Cutoff Wall Locations	
Embankment Armoring Locations	
Embankment Flood Wall Locations	



Common Inundation Zone B



- 24.5 miles of cutoff wall
- 35-ft to 50-ft wall depth
- Segments 5-2 and 8 priority for life safety
- Segment 4 priority for probability of failure



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Common Inundation Zone C

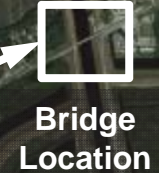


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- Armoring of the Harney Pond Canal bridge abutments
- Protect embankment from over wash and overtopping
- Future bridge replacement is the permanent fix



Harney Pond Bridge (SR-78)



Bridge Location

Lakeport

Segment 12

Segment 13 (partial)

- 4.1 miles of cutoff wall
- 35-ft wall depth
- Segments 12 and 13 priority for life safety

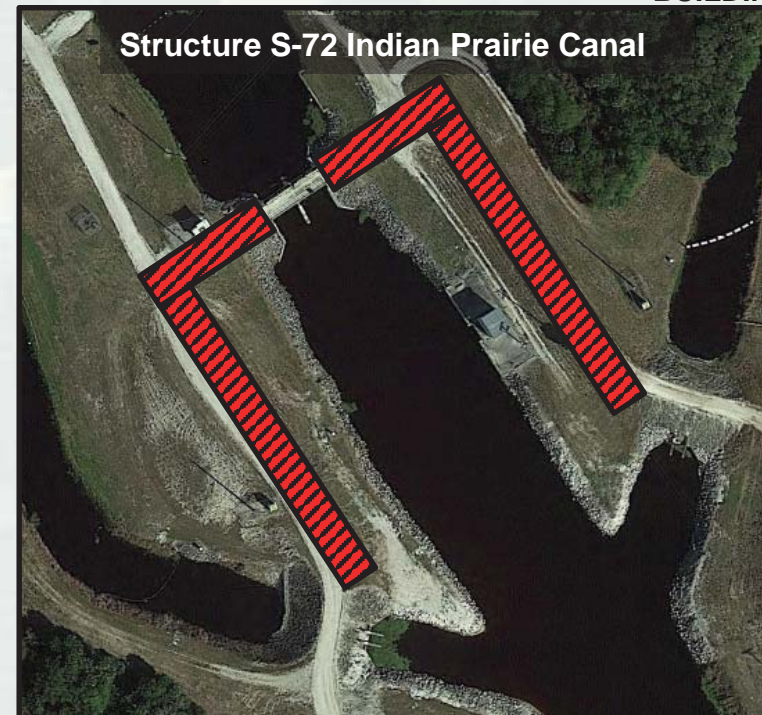
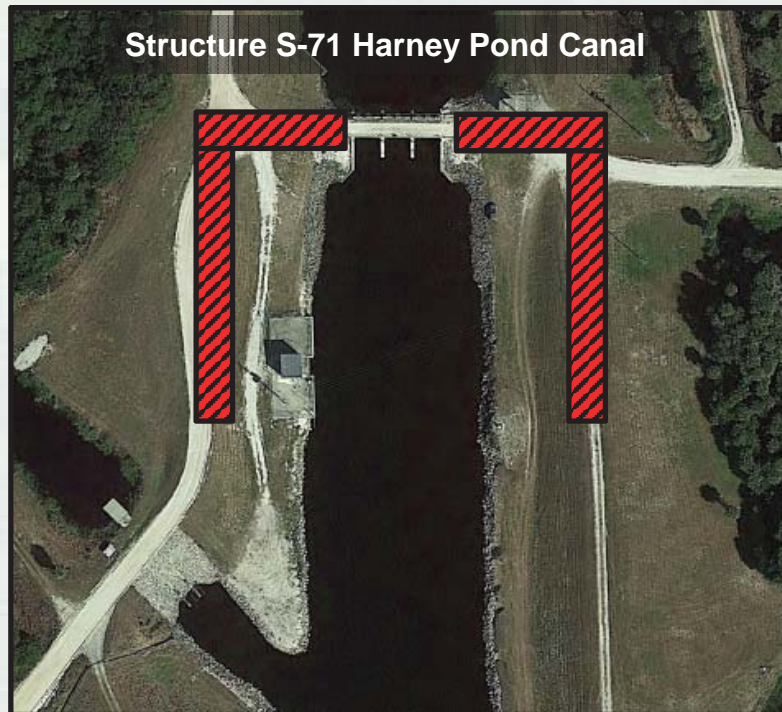


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Common Inundation Zone D



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- Average 4-ft high and 600-ft length of flood wall adjacent to Structure S-71
- Average 4-ft high and 700-ft length of flood wall adjacent to Structure S-72
- Protect embankment from over wash and overtopping



Implementation Timeline



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Water Control Structures (Culverts)

- Southern part of HHD completed by 2020
- Northern part of HHD completed by 2022

Reach 1 Cutoff Wall Gap Closure

- Construction from 2016 to 2018

Reach 1 Cutoff Wall Extension

- Construction from 2017 to 2020

Dam Safety Modification Report (DSMR)

- Draft EIS public review period started on 24 Dec 2015 and ends on 23 Feb 2016
- DSMR approval by the summer of 2016
- Construction start in 2019 with expected duration of 5 to 7 years (prioritization and funding dependent)

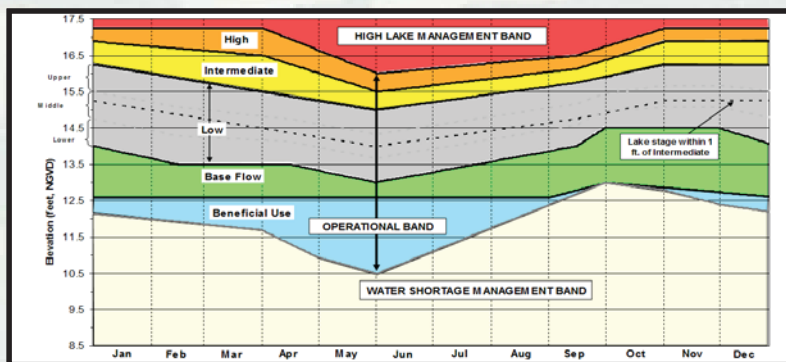




Lake Regulation Schedule



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- Dam Safety Modification Study Risk Assessment utilized the current Lake Okeechobee Regulation Schedule (LORS)
- Proposed revisions to the current LORS will require an updated risk evaluation and a future lake regulation study for informed decision making
- A study for a new regulation schedule could be undertaken concurrently while risk reduction features identified in the DSMR are constructed
- A revised regulation schedule is not expected before 2020 and the timeline for implementation of any new regulation schedule will depend on the magnitude of change from the current LORS



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National Environmental Policy Act (NEPA)



National Environmental Policy Act



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NEPA is a Federal law requiring Federal agencies to consider the environmental impacts of a proposed project that are:

- **Major Federal actions that may have a significant affect on the quality of the human environment**



Goals of NEPA



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- **Requires Federal agencies to consider environmental consequences before making final decisions**
- **Solicit and consider public views on proposals**
- **Consult with Tribal, state, and local governments concerning plans**
- **Provide agencies with a mechanism to coordinate overlapping, jurisdictional responsibilities**



Components Analyzed



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The following components were analyzed in the Draft Environmental Impact Statement (EIS):

- Climate
- Geology & Soils
- Hydrology
- Water Quality
- Flood Control
- Wetlands
- Vegetation
- Fish & Wildlife
- Protected Species
- Air Quality
- Noise
- Aesthetics
- Recreation
- Land Use
- Socioeconomics
- Agriculture
- Hazardous, Toxic & Radioactive Waste
- Cultural Resources
- Cumulative Effects
- Unavoidable Adverse Impacts
- Irreversible & Irretrievable Commitments of Resources



Environmental Effects



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Threatened and Endangered Species Informal Consultation

- Everglades Snail Kite (and its Critical Habitat)
- Wood Stork
- Eastern Indigo Snake
- Florida Panther
- Florida Manatee

Recreation

- Temporary closures of the Lake Okeechobee Scenic Trail (LOST) while under construction

Aesthetics

- Floodwall may cause permanent aesthetic effects, however, access to the Lake will still be available



Environmental Compliance



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Endangered Species Act Consultation

- Informal Consultation with USFWS submitted on 24 December 2015

Coastal Zone Management Act, Magnuson-Stevens Act, Marine Mammal Protection Act

- Full compliance anticipated after agency review of draft EIS



NEPA Path Forward



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Draft Environmental Impact Statement (December 2015)

- 60 day public review period (24 Dec 2015 – 23 Feb 2016)
- Comments will be addressed and incorporated into the Final EIS

Final Environmental Impact Statement (Spring 2016)

- 30 day public review

Hard copies of the draft EIS can be accessed at local libraries:

- Glades County Library
- Hendry County – Barron Library, Harry T. Vaughn Library
- Martin County – Blake Library, Elisabeth Lahti Library
- Okeechobee County Public Library
- Palm Beach County Library – Main Branch, Belle Glade Branch, Loula V. York Branch, Clarence E. Anthony Branch

An electronic version of the draft EIS is available by selecting Glades, Hendry, Martin, Okeechobee or Palm Beach Counties using the following link:

<http://www.saj.usace.army.mil/About/DivisionsOffices/Planning/EnvironmentalBranch/EnvironmentalDocuments.aspx>



Comment Opportunities



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Public Comment Cards

Mail:

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P.O. Box 4970
Jacksonville, FL 32232-0019

E-mail:

HHDEnvironment@usace.army.mil

Additional Information Available at:

<http://bit.ly/1NEh0UV>