Mark Gonski, PE - New Orleans District

Topics:

Project, Overview

INNER HARBOR NAVIGATION CANAL (IHNC) LOCK REPLACEMENT

URS

A/E Team

U.S. ARMY CORPS OF ENGINEERS

NEW ORLEANS DISTRICT

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URS A/E Team

USACE New Orleans District

Agenda

- **Mark Gonski, PE - New Orleans District**
  - Topics: Project, Overview
- **David Lapene, PE - URS Corporation**
  - Topics: Team Overview, Design Criteria, Operational Design
- **Dale Miller, PE - INCA Engineers, Inc**
  - Topics: Float in Construction Sequence & Design
- **Mark Gonski, PE - New Orleans District**
  - Topics: Lessons Learned from Harvey Canal, IHNC CIP Study

Site Layout


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Lake Ponchartrain
GIWW
Graving Site
New Lock Location
Claiborne Ave. Bridge
Existing Lock
St. Claude Ave. Bridge
Mississippi River

Inner Harbor Navigation Canal Lock Replacement Project

Project Schedule

Feasibility Report Submitted	Mar 1997
Construction Authorization	
Design Report Complete	Nov 2005
P&S Completion	Jan 2007
Lock Construction Start	Oct 2007


Construction Status
Test Pile Contract
Completed Aug 2003
Galvez St. Wharf
Completed Feb 2003
9 Mooring buoys
Completed Apr 2003
T.E.R.C. Contract
Completed Dec 2004
Actual construction began in January, 2001 – T.E.R.C. Contract

Test Pile Contact

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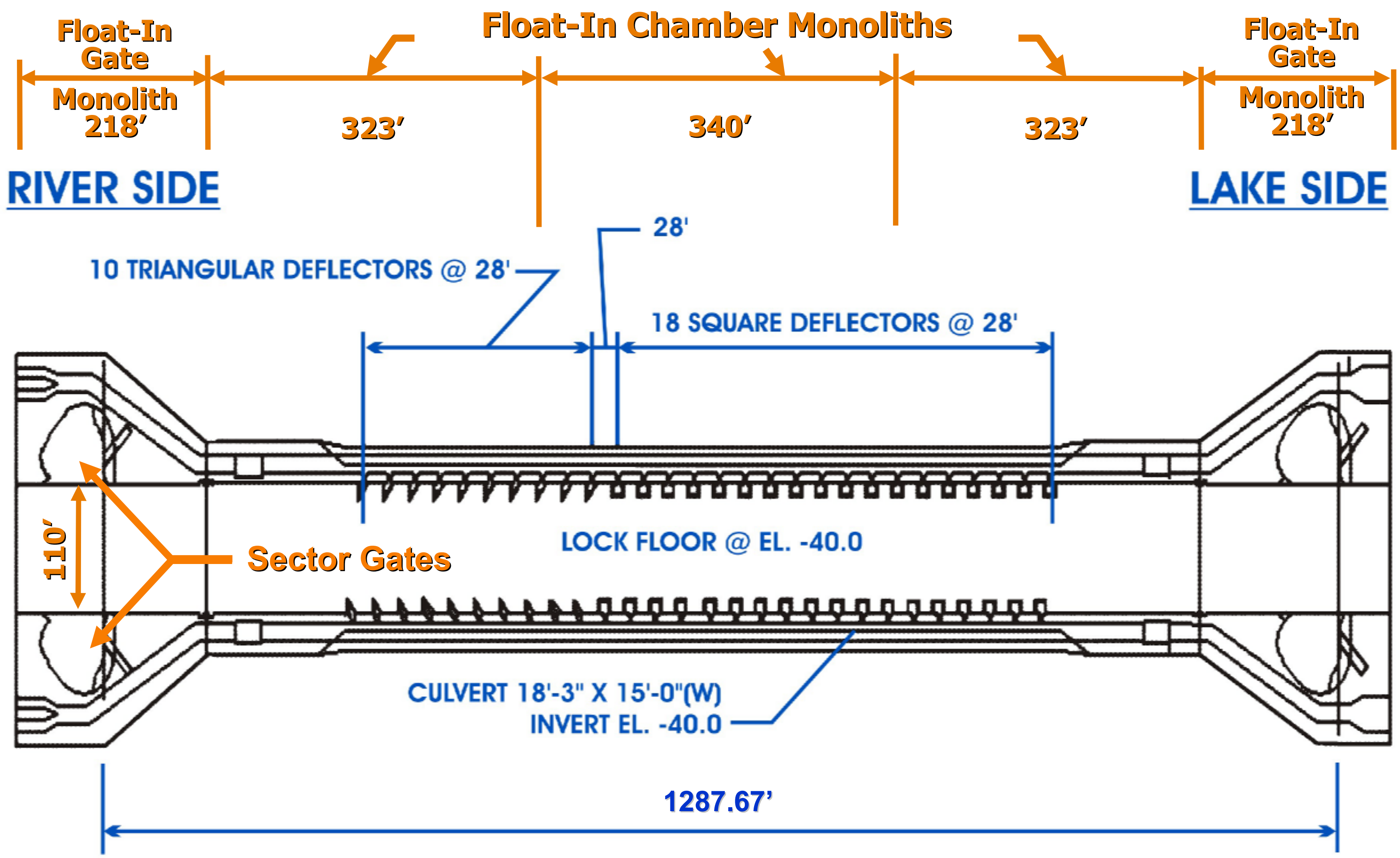
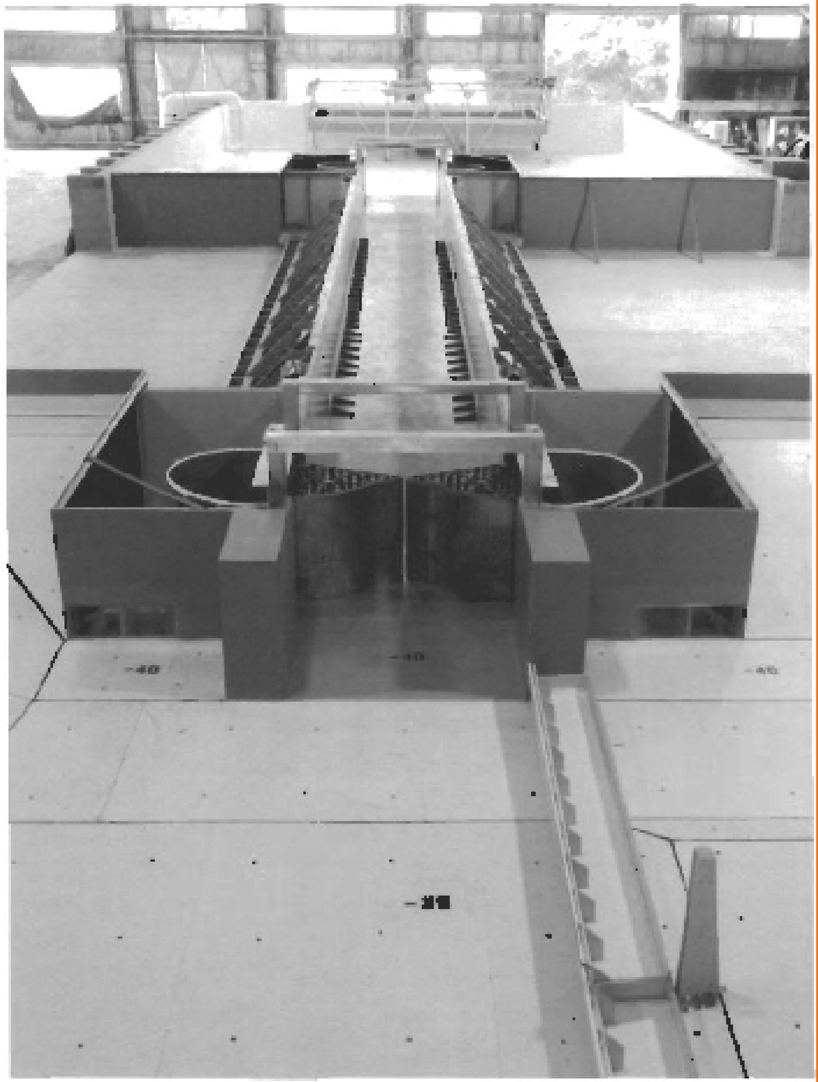


FINAL LOCK LAYOUT



Model - Looking from river side

David Lapene, PE - URS Corporation

Topics:

Team Overview, Design Criteria, Operational Design, Module Draft Study

INNER HARBOR NAVIGATION CANAL LOCK REPLACEMENT

USACE New Orleans District

URS A/E Team Major Firms Include:

URS Group, Inc.,
Brown, Cunningham, & Gannuch, Inc.,
Jacobs Civil, Inc.,
INCA Engineers, Inc.,
Ben C. Gerwick, Inc.,
The Glosten Associates, Inc., and
Eustis Engineering Company, Inc.

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How Did URS Select Team Firms?

- What expertise does the project require?
  - Depth and breadth in project management
  - Staff with lock knowledge and experience
  - Float-in and naval architecture expertise
  - Intimate knowledge of local soil characteristics

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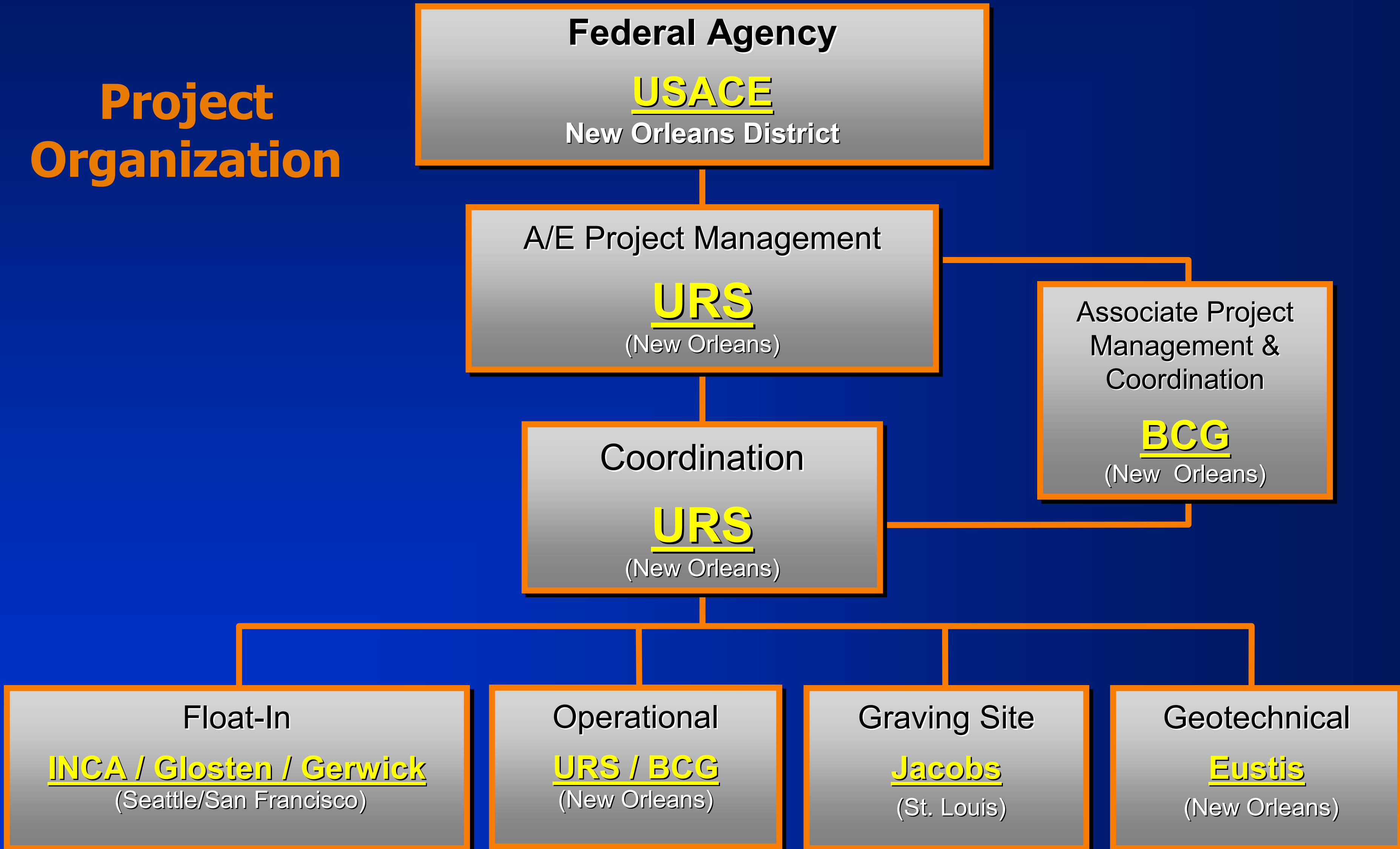
Project Organization



Coordination Process

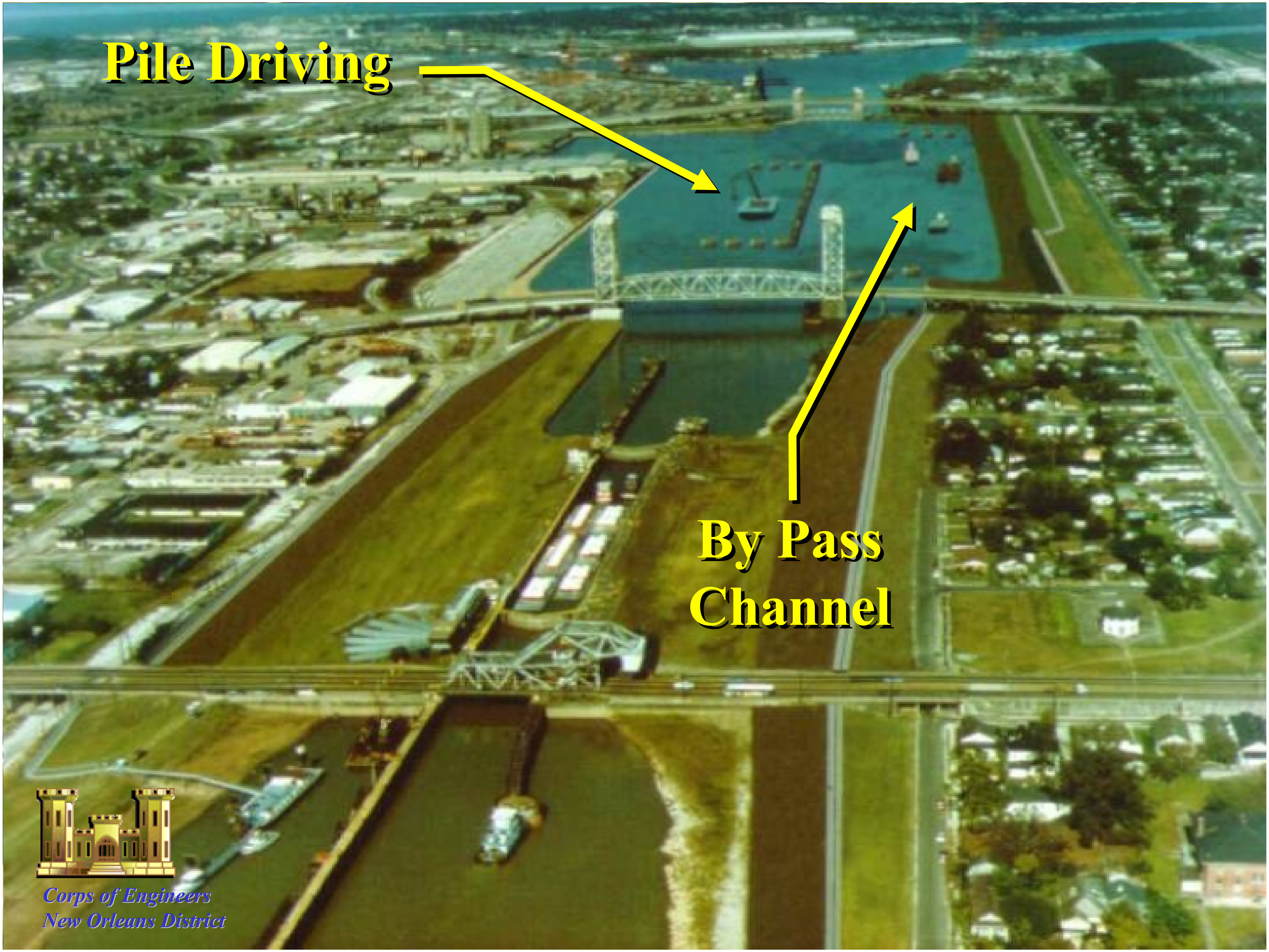
- Progress and coordination schedule
  - Developed on MS Project and distributed
- Team management teleconference every two weeks between PM's of all offices
  - Schedule / budget / technical quality / deliverables
- URS / BCG project management face to face meeting every two weeks (or as required)
  - Client relationships / contract obligation / budget / team directives

Coordination Process Continued

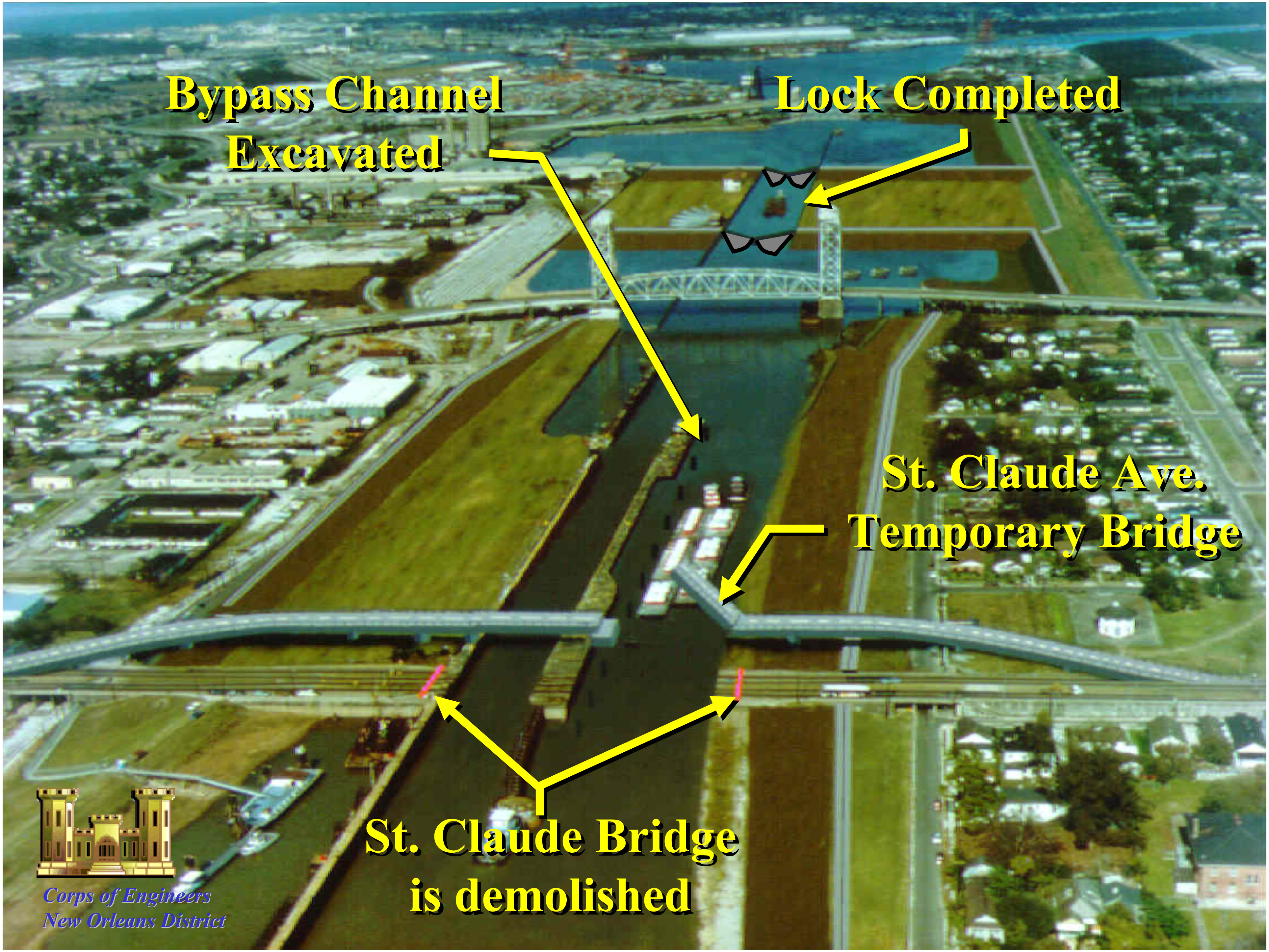
- **Design coordination teleconferences biweekly**
  - Design methodology and philosophy / exchange of data / schedule / drawing standards / DCD / construction methodology
- **Progress and coordination drawing reviews**
  - Approximately every three months

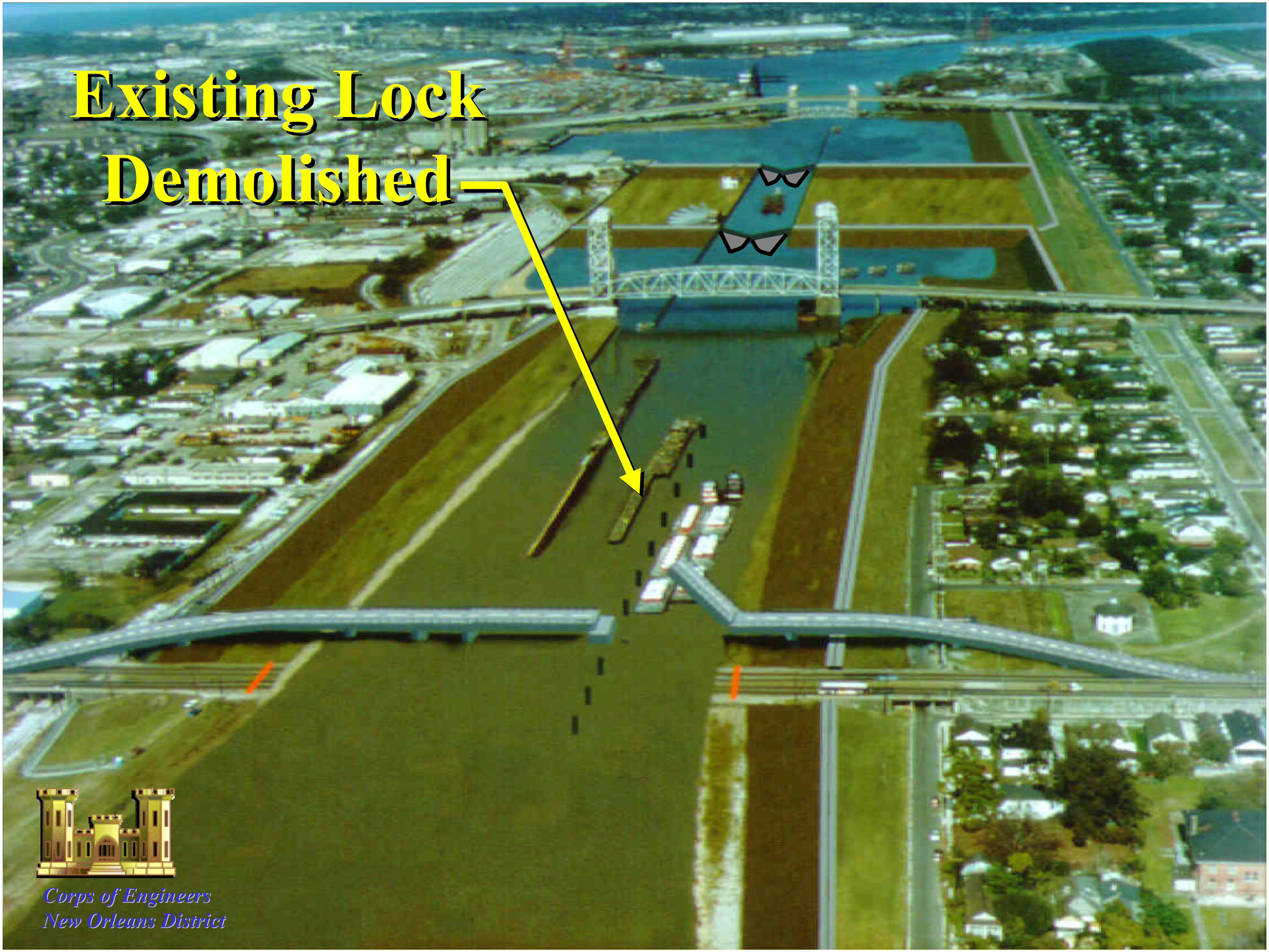
Quality Control and Quality Assurance
(Every Submittal)

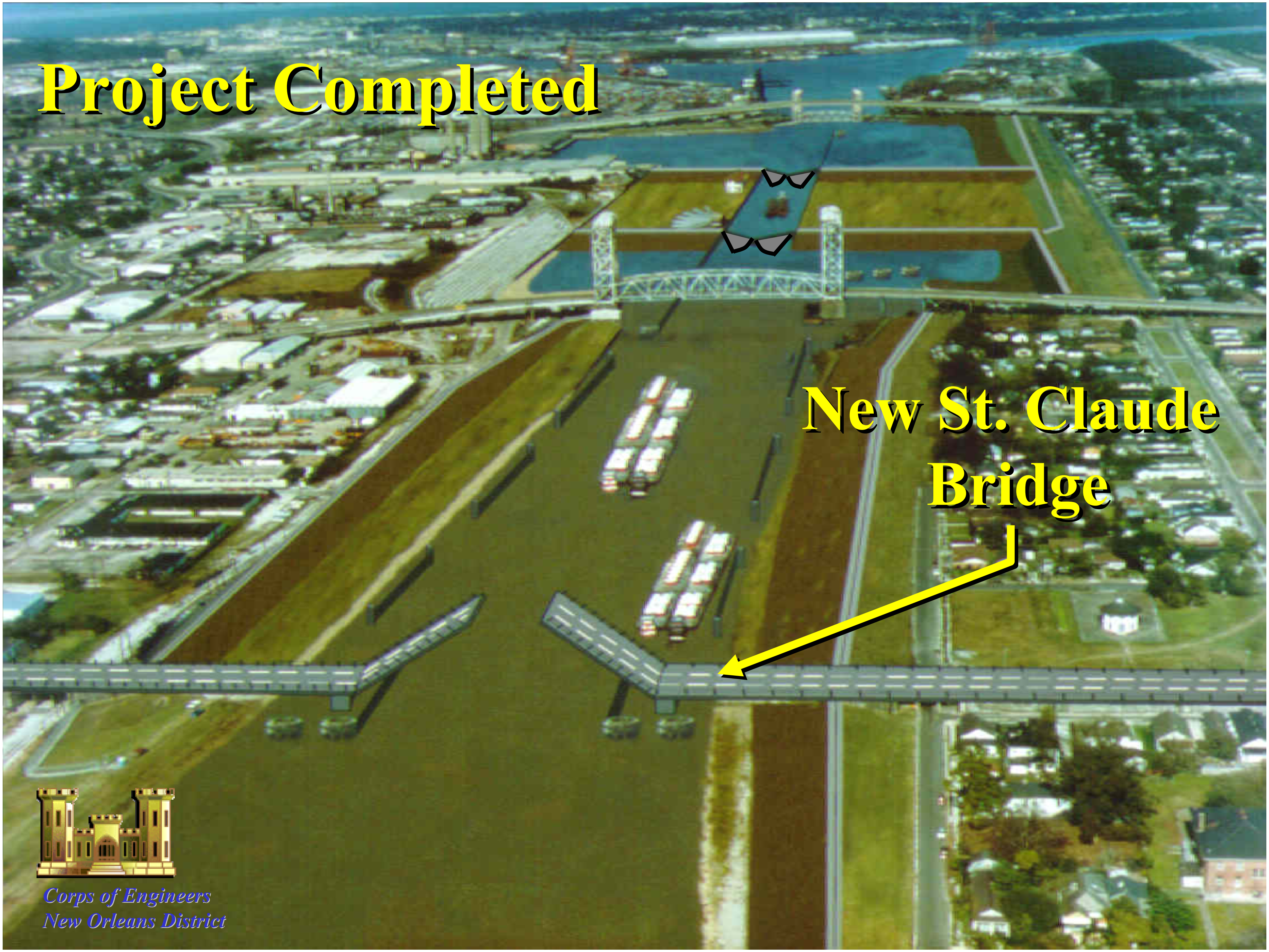
- Page by page quantitative check by each firm
  - Documentation provided to USACE
- Independent Technical Review
  - Qualitative review by each firm for design philosophy and methodology
  - Documentation provided to USACE
- Project-wide ITR
  - Qualitative check of all disciplines and designs as a whole by senior personnel with USACE lock experience
  - Documentation provided to USACE


Pile Driving
By Pass Channel
Corps of Engineers
New Orleans District


Lock Modules
Floated In
Corps of Engineers
New Orleans District


Bypass Channel
Excavated
Lock Completed
St. Claude Ave.
Temporary Bridge
St. Claude Bridge
is demolished
Corps of Engineers
New Orleans District


Existing Lock
Demolished
Corps of Engineers
New Orleans District


Project Completed
New St. Claude Bridge
Corps of Engineers
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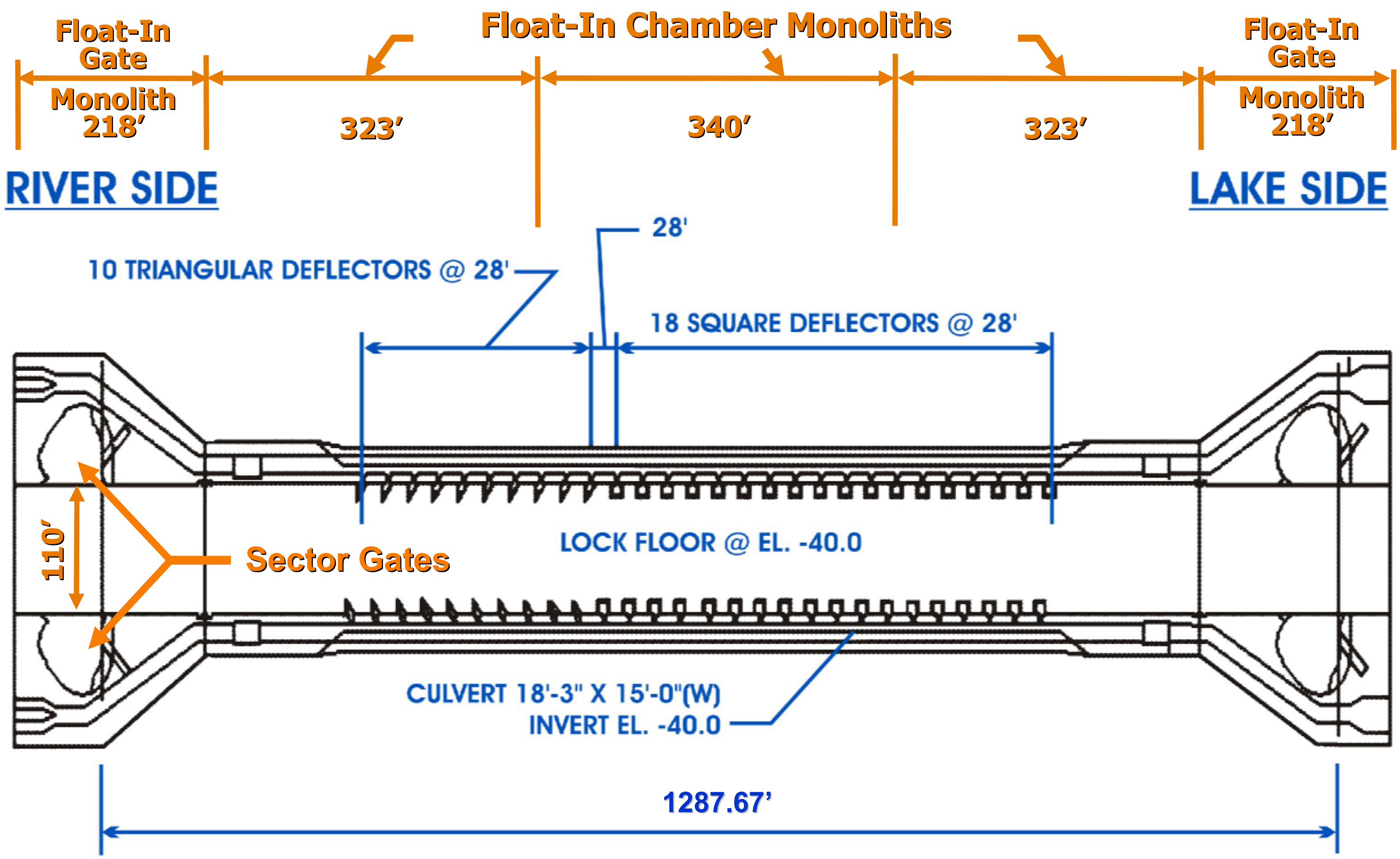


FINAL LOCK LAYOUT

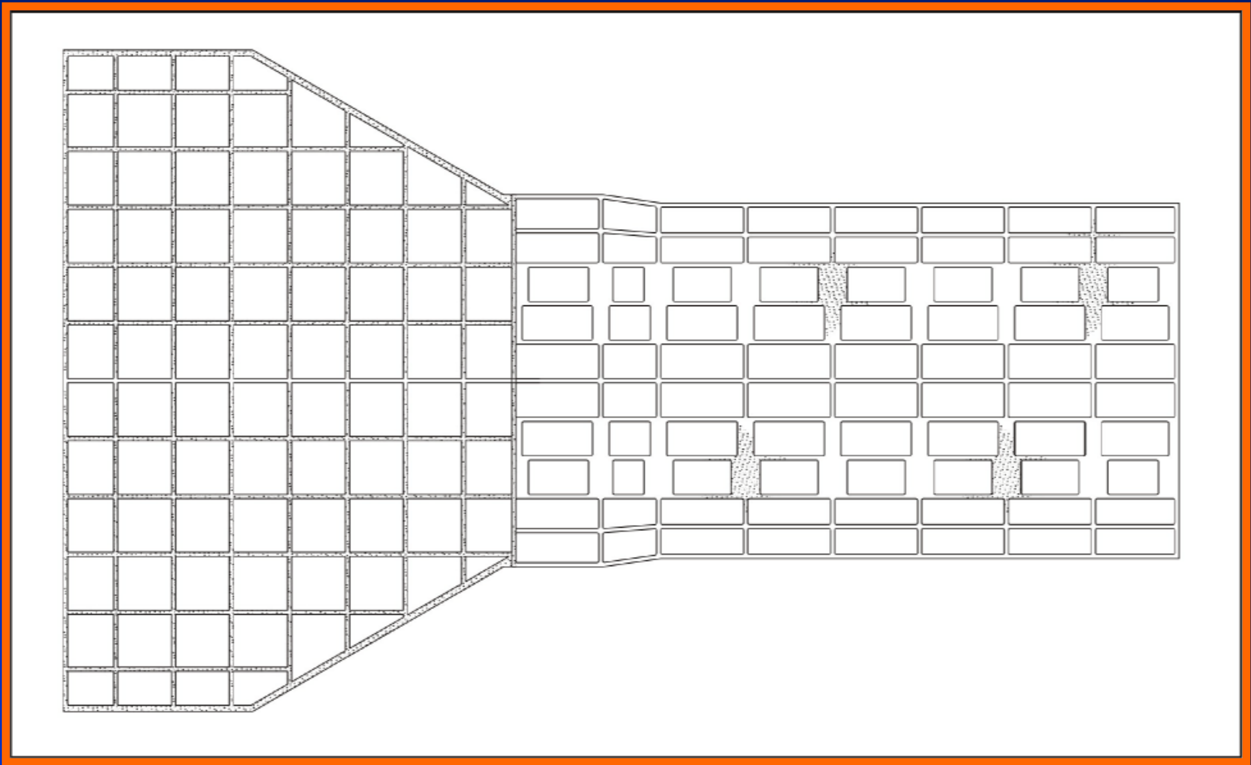
Water Stages

Case	Riverside	Lakeside	Head Difference
Normal Range (Transport & Construction)	EL. 0.0 to 3.0	EL 0.0 to 3.0	
Normal Operation	EL. 10.0	EL. 1.0	9’
Direct Head (Governs)	EL. 18.0	EL. 0.0	18’
Hurricane	EL. 0.0	EL. 13.0	13’ (Reverse Head)
Maintenance Dewatering (Governs)	EL. 10.0	EL. 5.0	64’ (Uplift Head)

Operational Monolith Design Criteria

- EM 1110-2-2104 / ACI 318
- No load transfer between monoliths
- Shell f'_c = 5000psi
  - Structural infill = 3000psi
  - Nonstructural infill = 2000psi
  - Fy = 60ksi
- Normal-weight concrete
- Overstress factors
  - O/S = 1.167 → construction / usual maintenance dewatering
  - O/S = 1.33 → max. direct head / unusual maintenance dewatering
- Service load displacements
  - Settlement ≤ 0.5”
  - Lateral displacement (usual cases) ≤ 0.5”
  - Lateral displacement (unusual cases) ≤ 1.5”

Infill Concrete in Base



- 24” bottom slab is not adequate to take beam shear from piles
- Considering half height structural infill concrete in cells
- Upper half to be nonstructural infill

Foundation Piles

- 48" ϕ X 120' pipe piles selected
  - 900k compressive capacity
  - 320k tensile capacity
  - 14' X 14' grid at walls / 14' X 20' grid at chamber floor
  - Average compressive pile load → 75% capacity
  - Approximate cost in place = $47,000,000
- Alternative pile study
  - Considered 36" X 120' pipe piles
  - Approximately $4,000,000 more than 48" piles

Module Draft Study

Evaluate Two Drafts for the Float-in Modules

- Shallow Draft
  - 25' allowable draft
  - Build to EL. (-) 19.75 in graving site and transport with attached cofferdam
  - Graving site invert EL. (-) 28.00

- Deep Draft
  - 32' allowable draft
  - Build to minimum EL. 6.00 – no cofferdam needed at set down
  - Graving site invert EL. (-) 38.00

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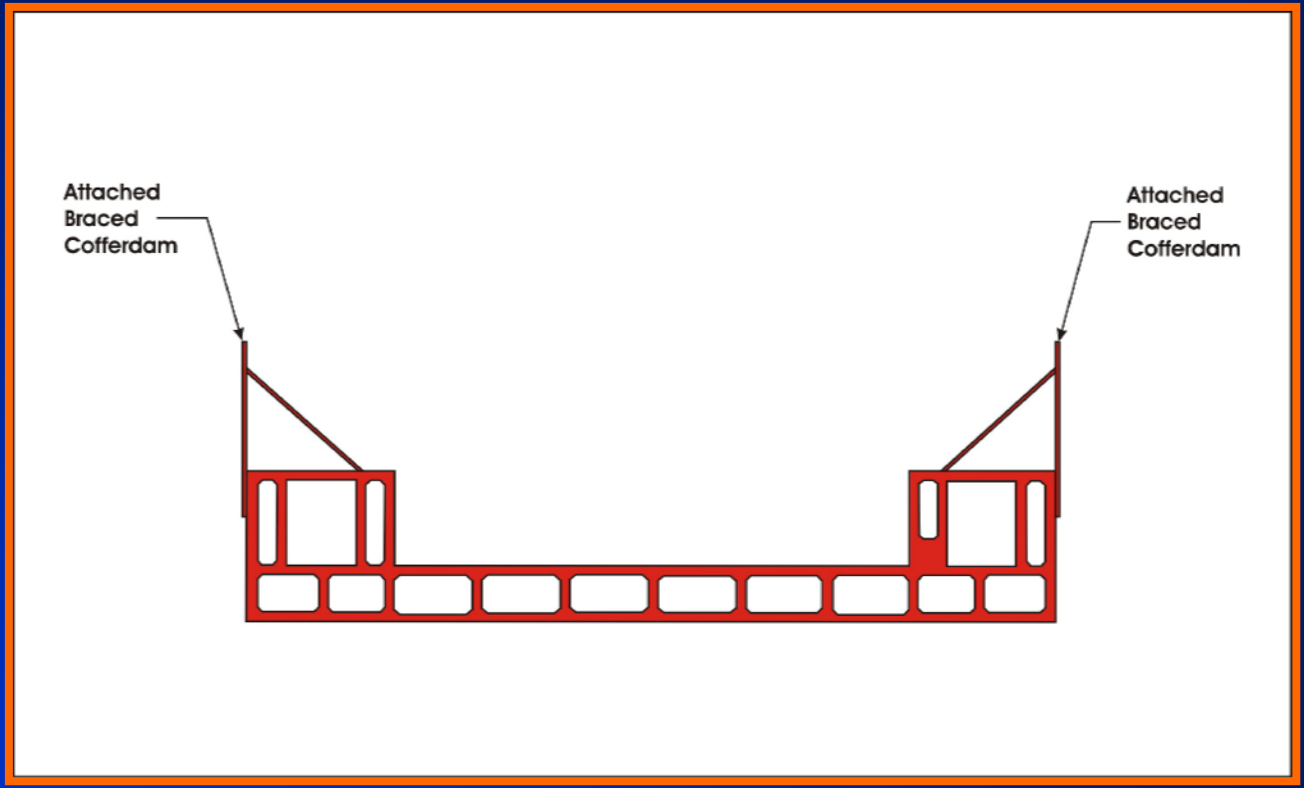
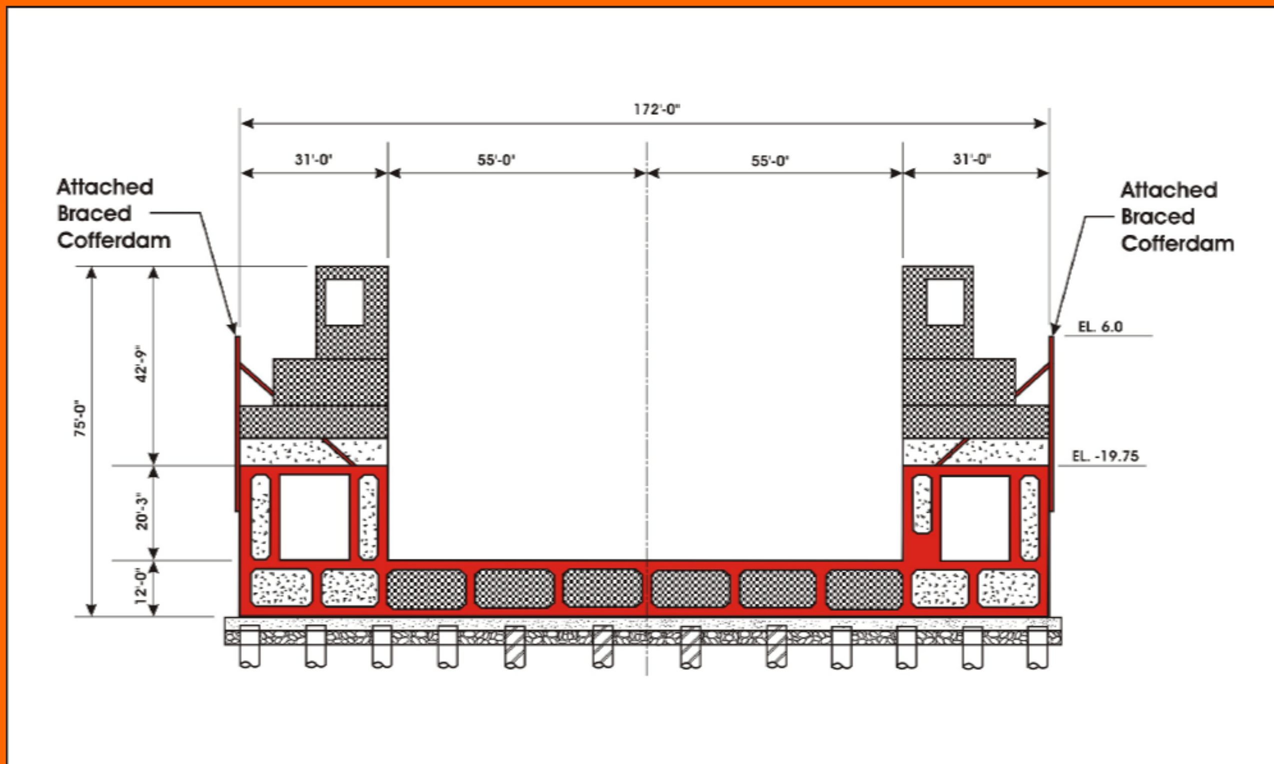
Shallow Draft Chamber Module



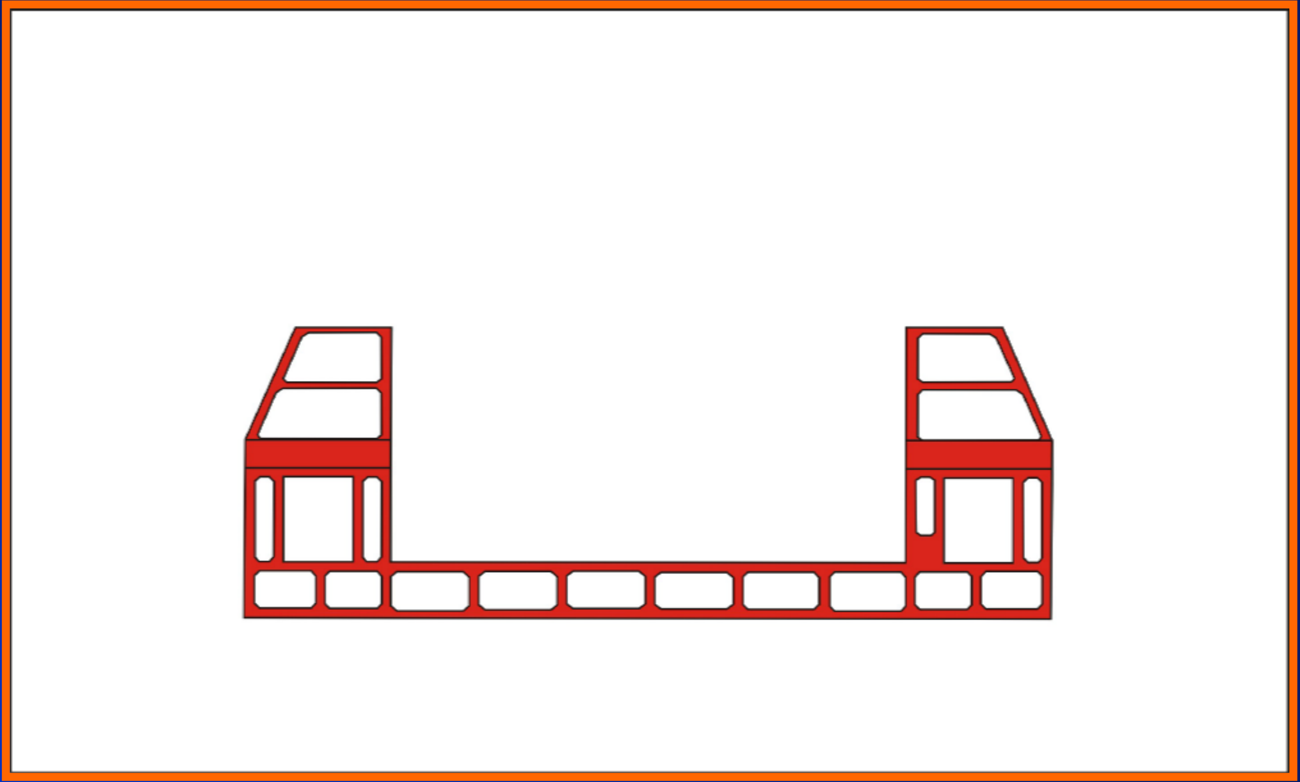
- Red denotes Float-in module built in graving site
- Allowable draft during transport 25’ with 2’ under keel clearance
- Attached cofferdam needed for set down

Shallow Draft Chamber Module



- Red denotes Float-in module built in graving site
- Allowable draft during transport 25' with 2' under keel clearance
- Attached cofferdam needed for set down

Deep Draft Chamber Module



- Red denotes Float-in module built in graving site
- Allowable draft during transport 32' with 2' under keel clearance
- No cofferdam needed for set down

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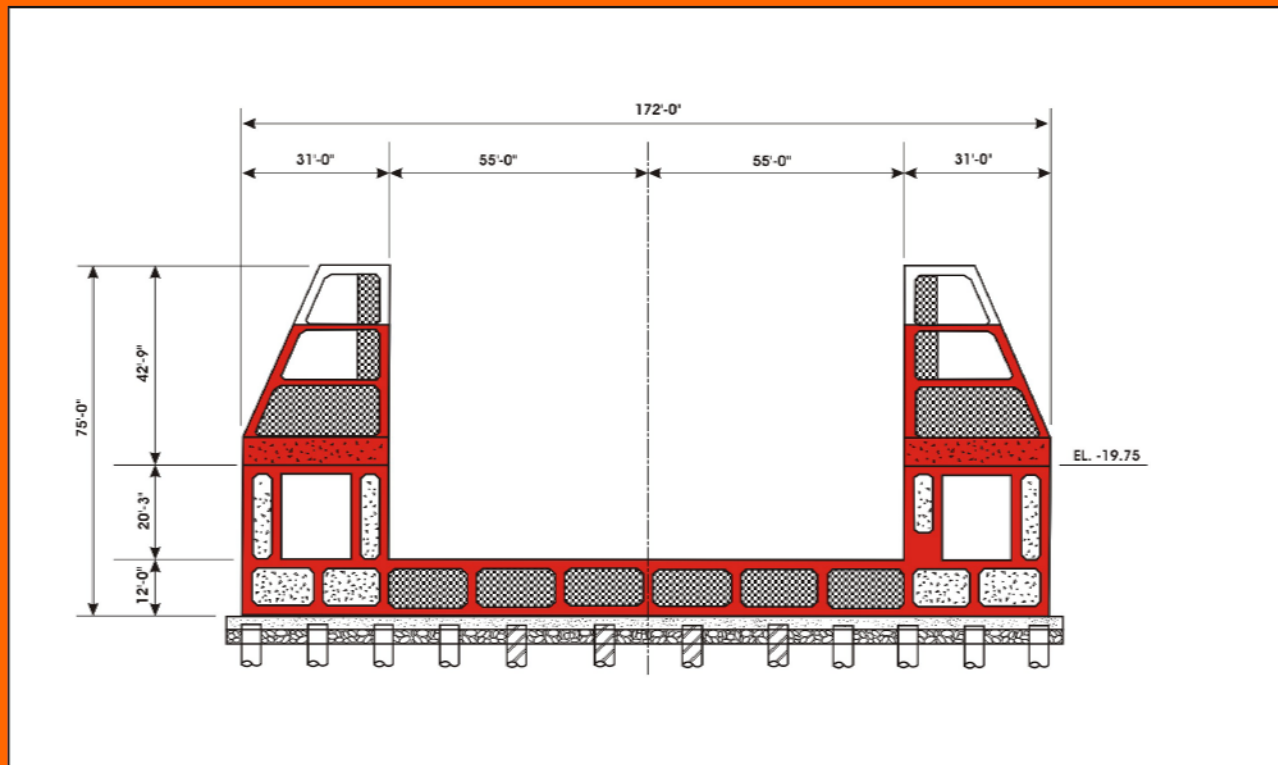
Deep Draft Chamber Module



- Red denotes Float-in module built in graving site
- Allowable draft during transport 32' with 2' under keel clearance
- No cofferdam needed for set down

Draft Study Conclusions

→ Shallow Draft Configuration is Recommended ←

- Shallow draft is $3.2m less expensive
- No dredging required at Florida Ave. bridge
- Less reinforcing due to less hogging and sagging
- Easier to construct and transport
- Less construction time required
- Depth of excavation at graving site more appropriate for soils

Dale Miller, PE - INCA Engineers, Inc

Topics:

Float in Construction Sequence & Design

Lock Construction

- Graving Site
- Transport
- Set down
- Foundation Integration
- Monolith Completion
- Monolith Joints

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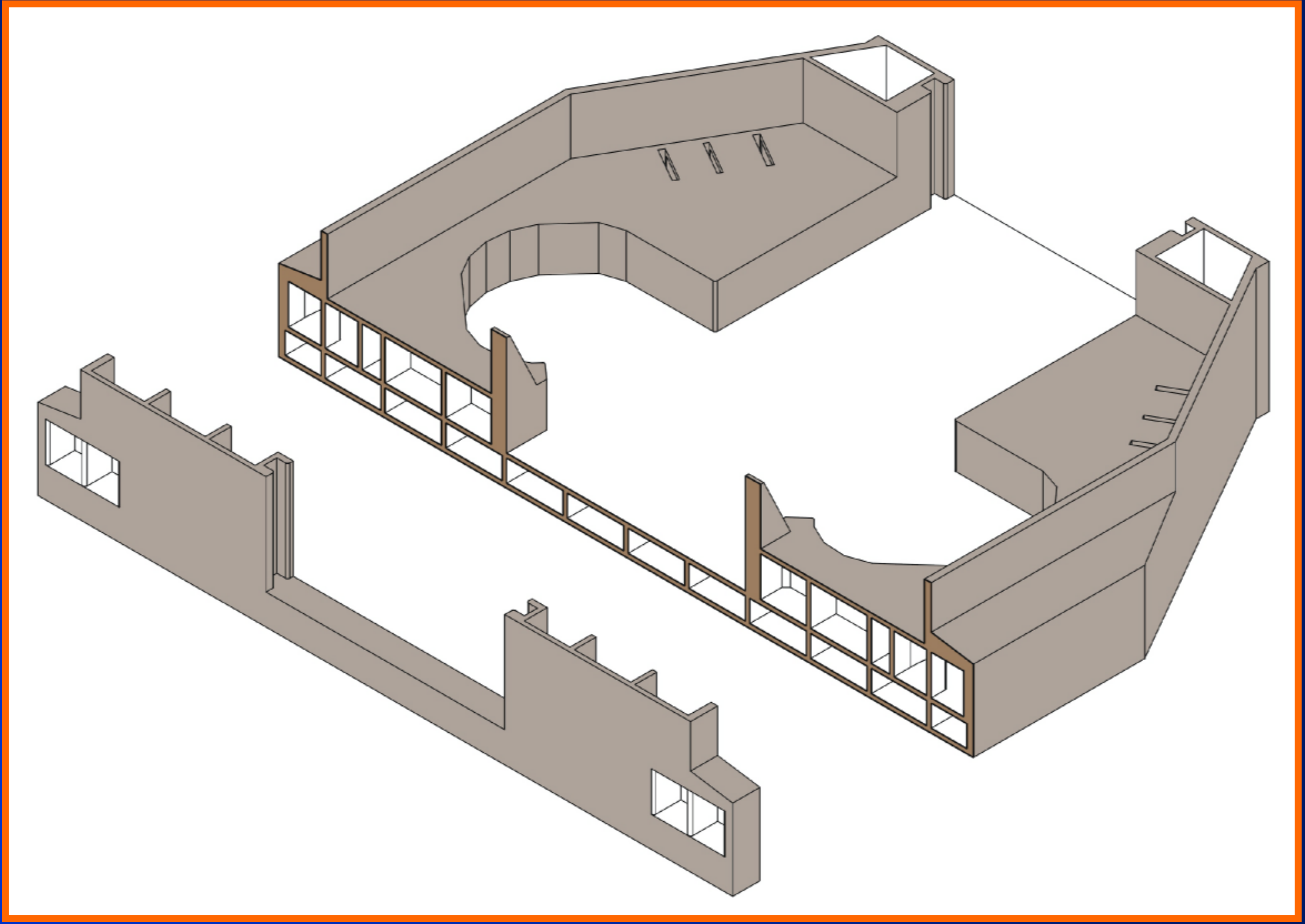
Gate Bay Section Isometric



Concrete Shells

- 12’ to 14’ deep cellular base for transport
- Gatebays: 28’ X 28’ cells with 24” top and bottom slabs
- Chambers: 19’ X 42’ cells with 24” top and bottom slabs
- 24” bottom slab is not adequate to take beam shear from piles
- Considering half height structural infill concrete in cells
- Upper half to be nonstructural infill

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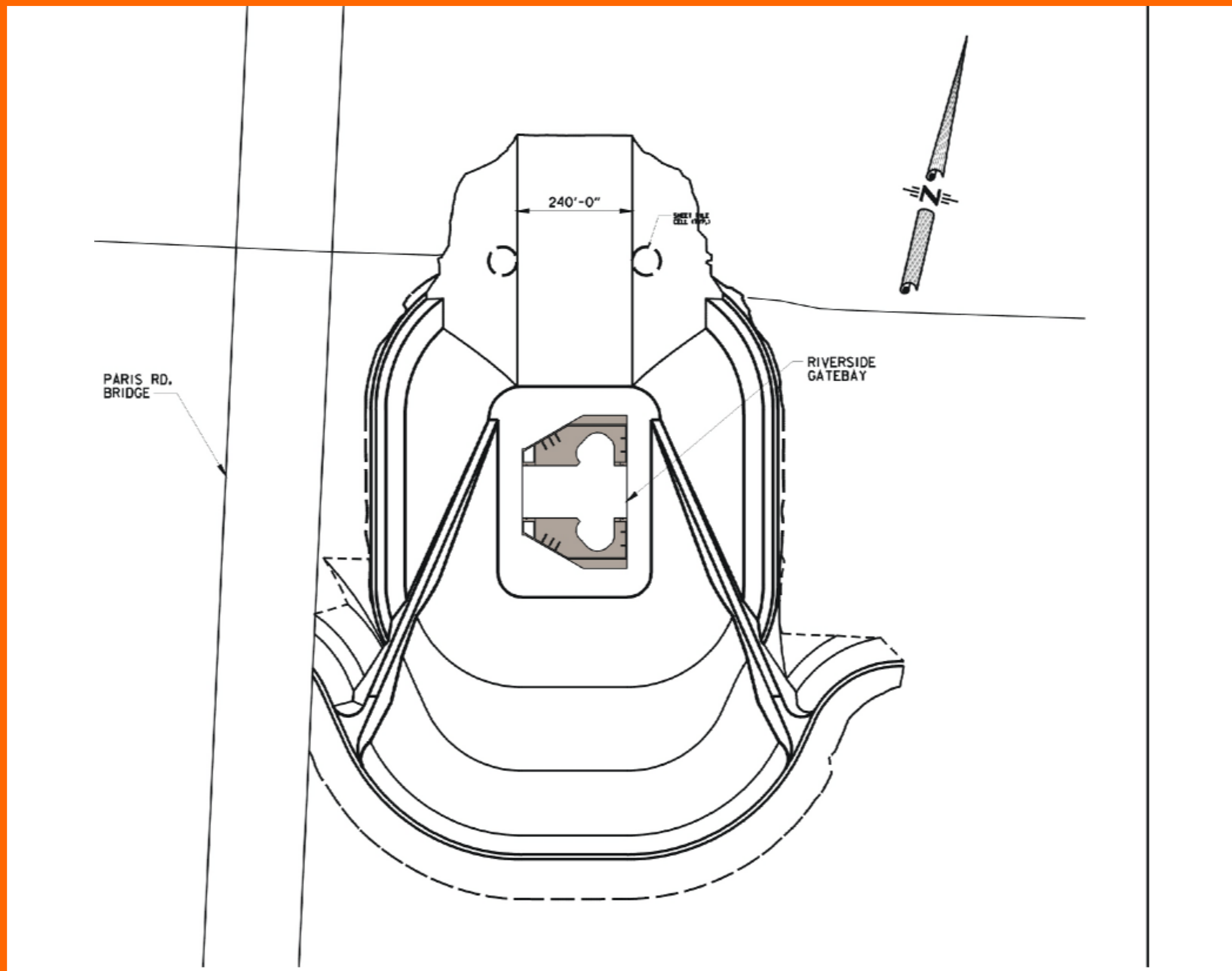
Graving Site



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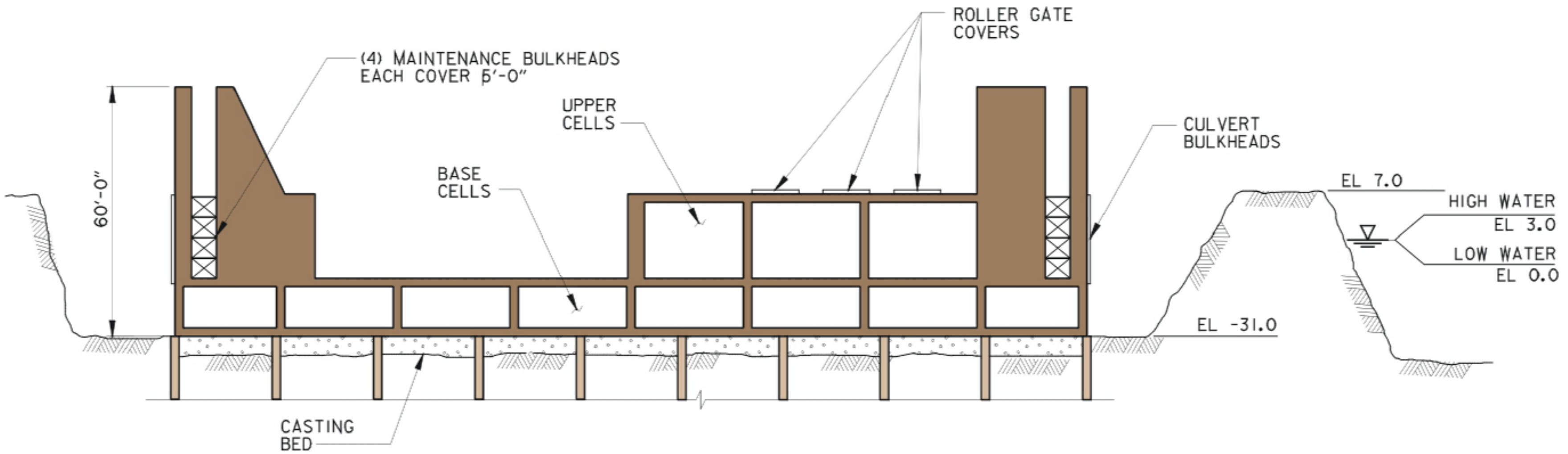
Longitudinal Section Thru Bulkhead Slots



- Grade Beams
- Intermediate Sand Bed

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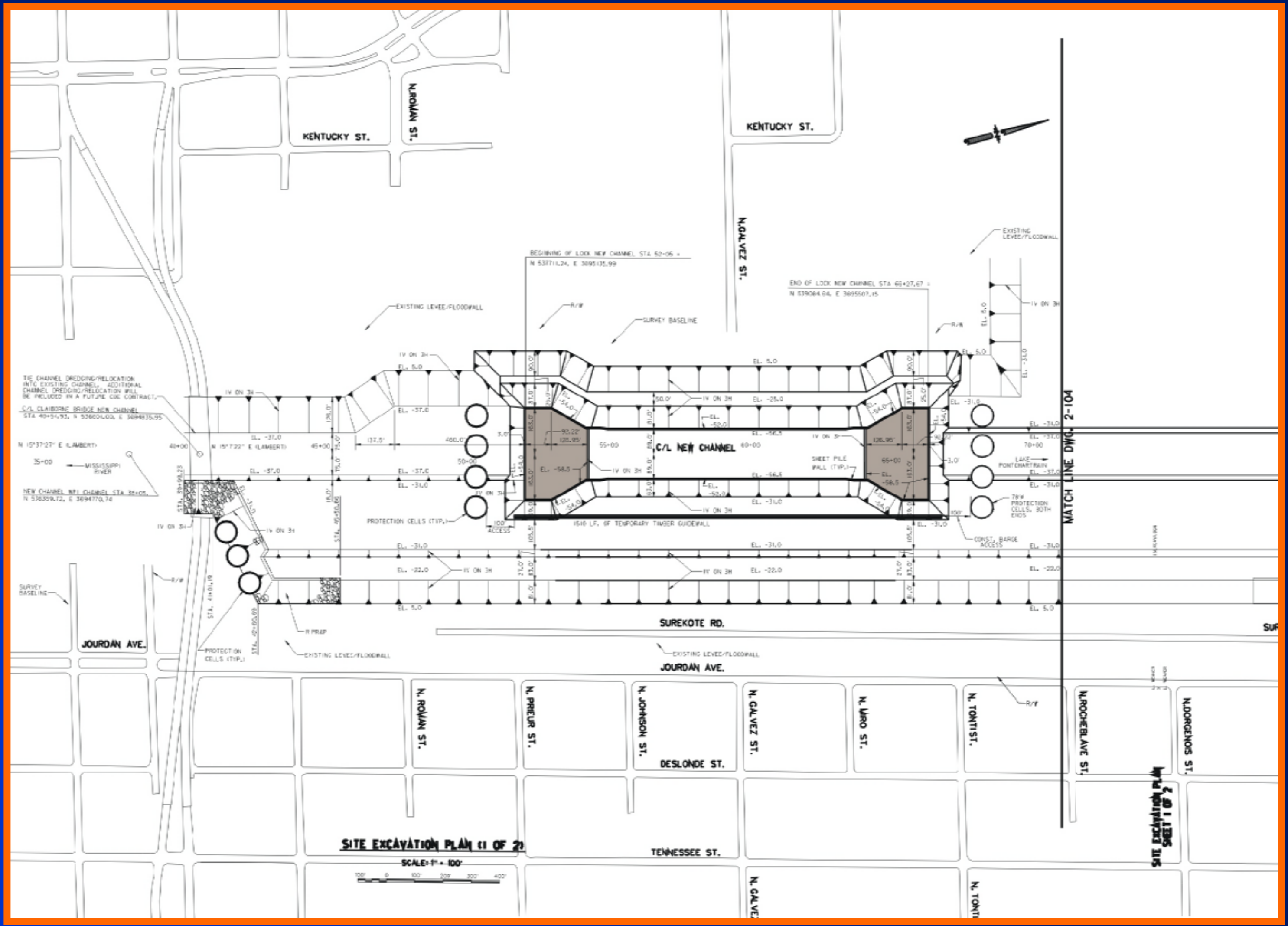
Lock Site



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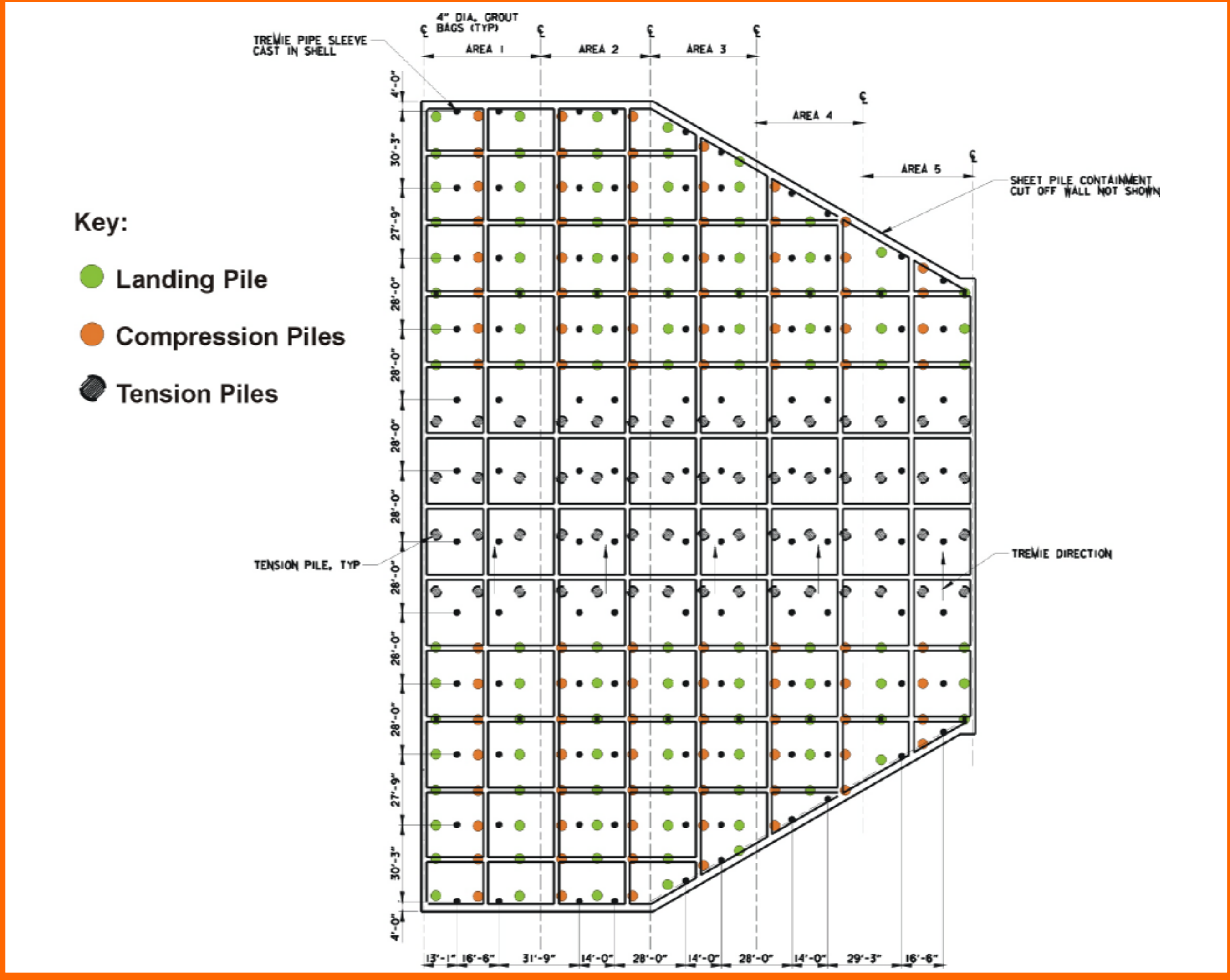
Pile Plan



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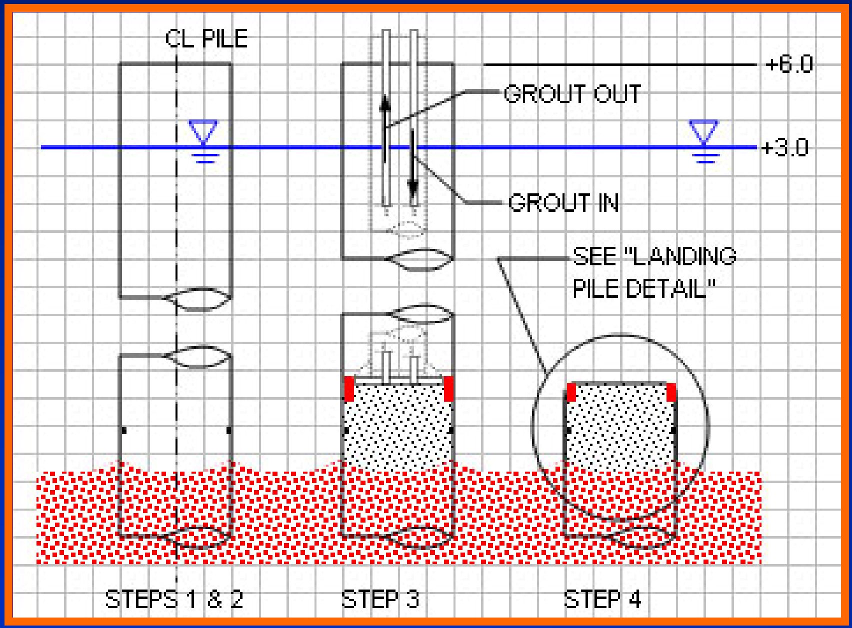
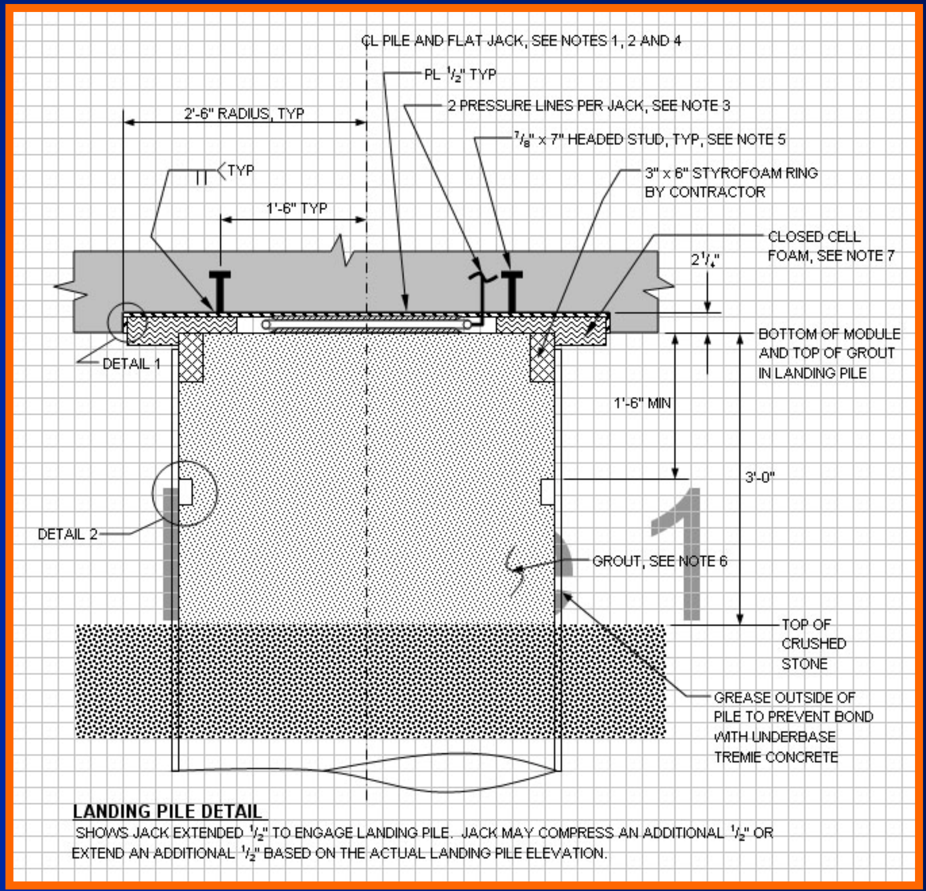
Landing Pile Preparation





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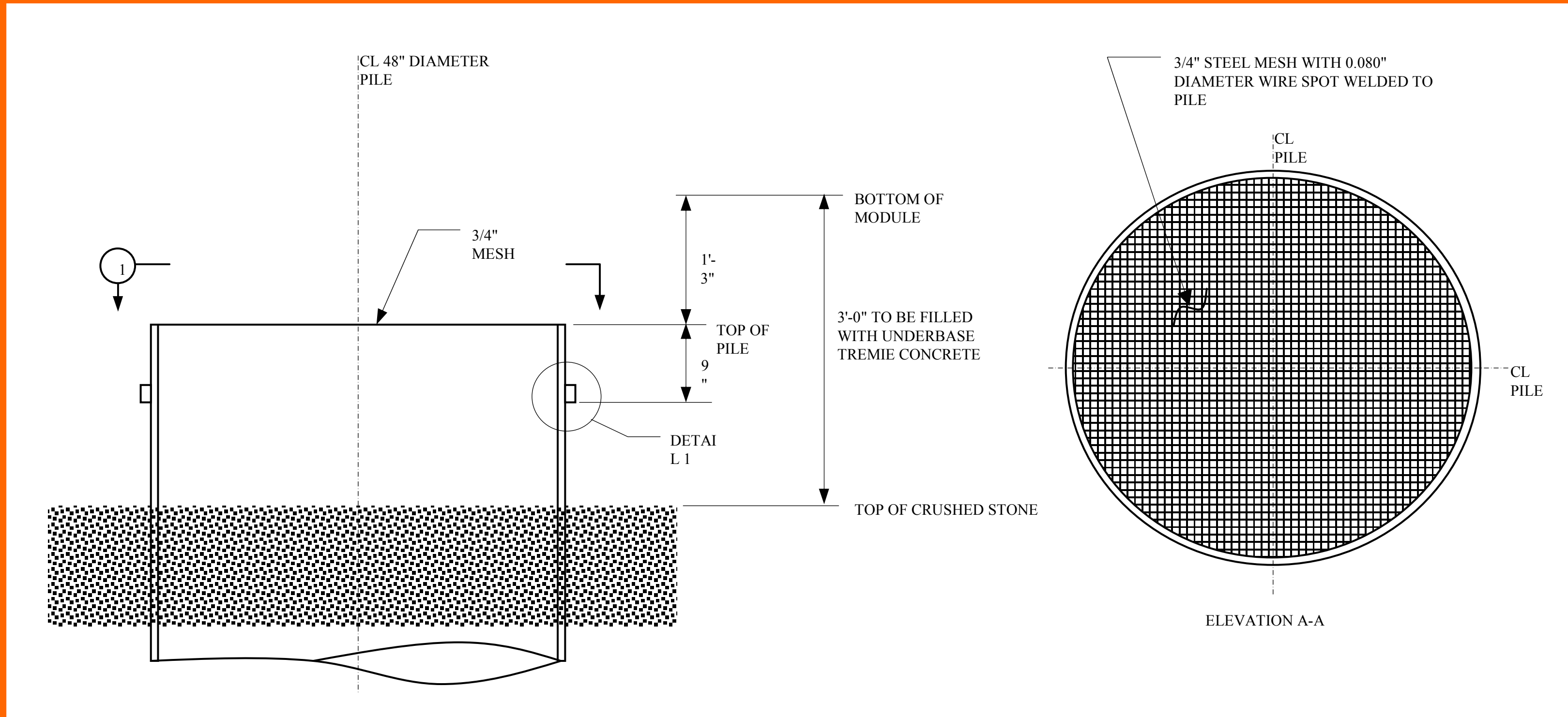
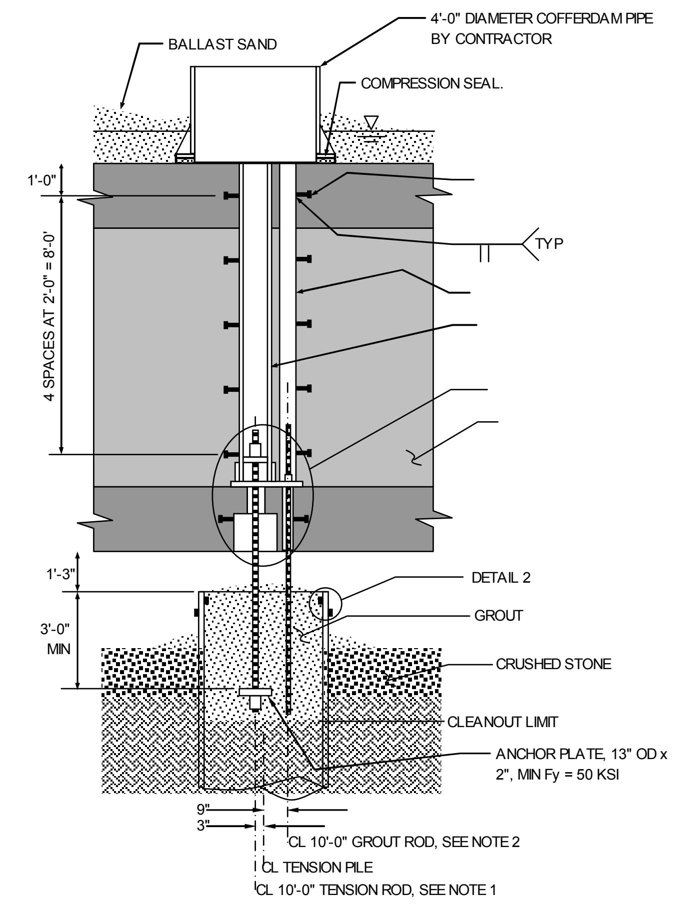
Compression Piles



- Mesh to Prevent Excess Tremie Infill
- Compression Load to 3” x 11/2” x Continuous Shear Key

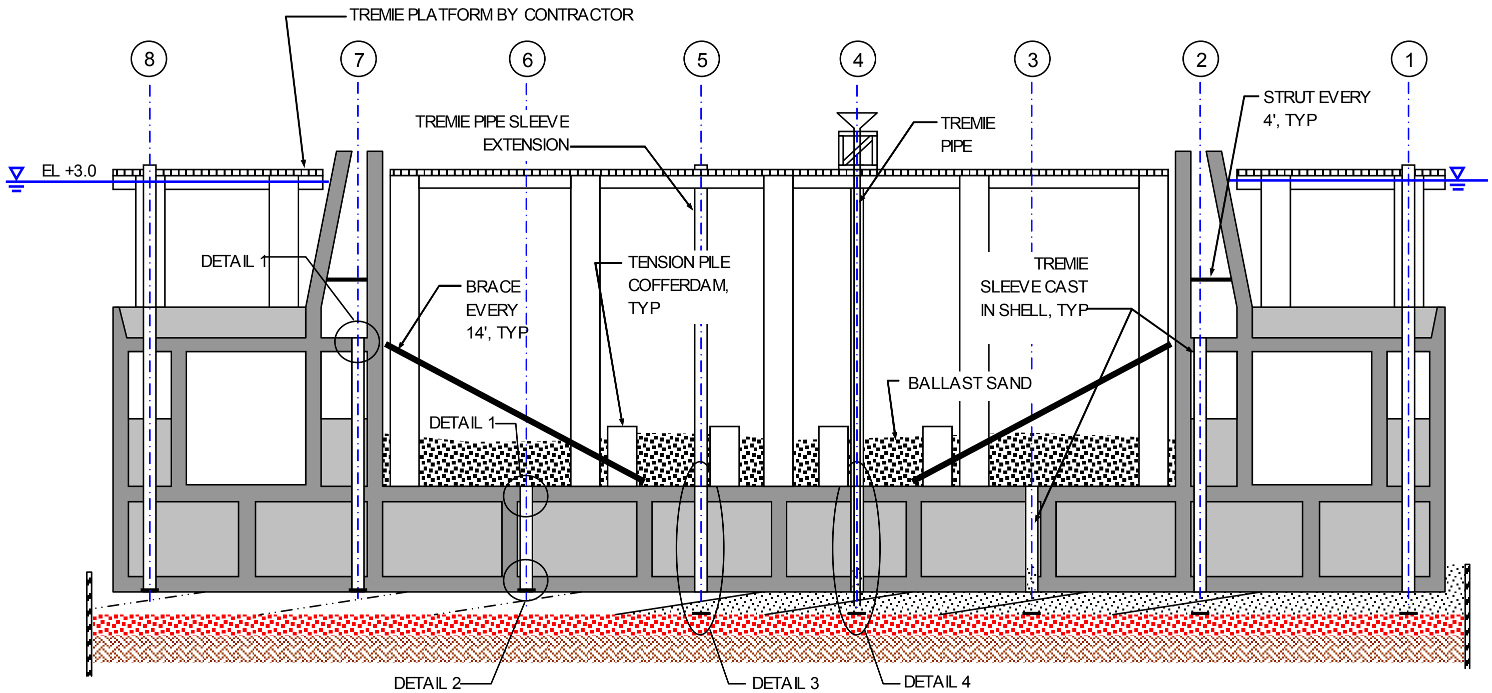
Tension Pile Connection



LOWERED TENSION PILE CONNECTION

- Initially Retracted and Sealed
- Lowered and Grouted

Underbase Tremie Placement



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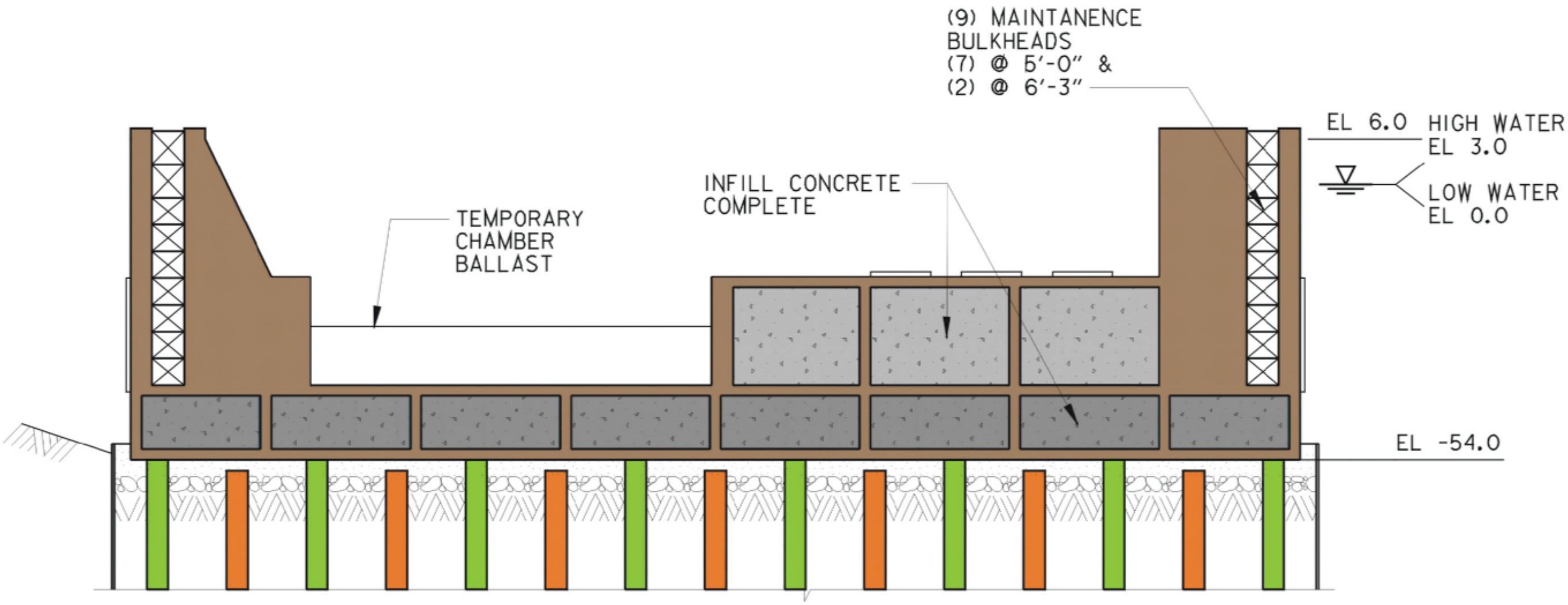
Set-Down



- 5% Negative Buoyancy on Landing Piles

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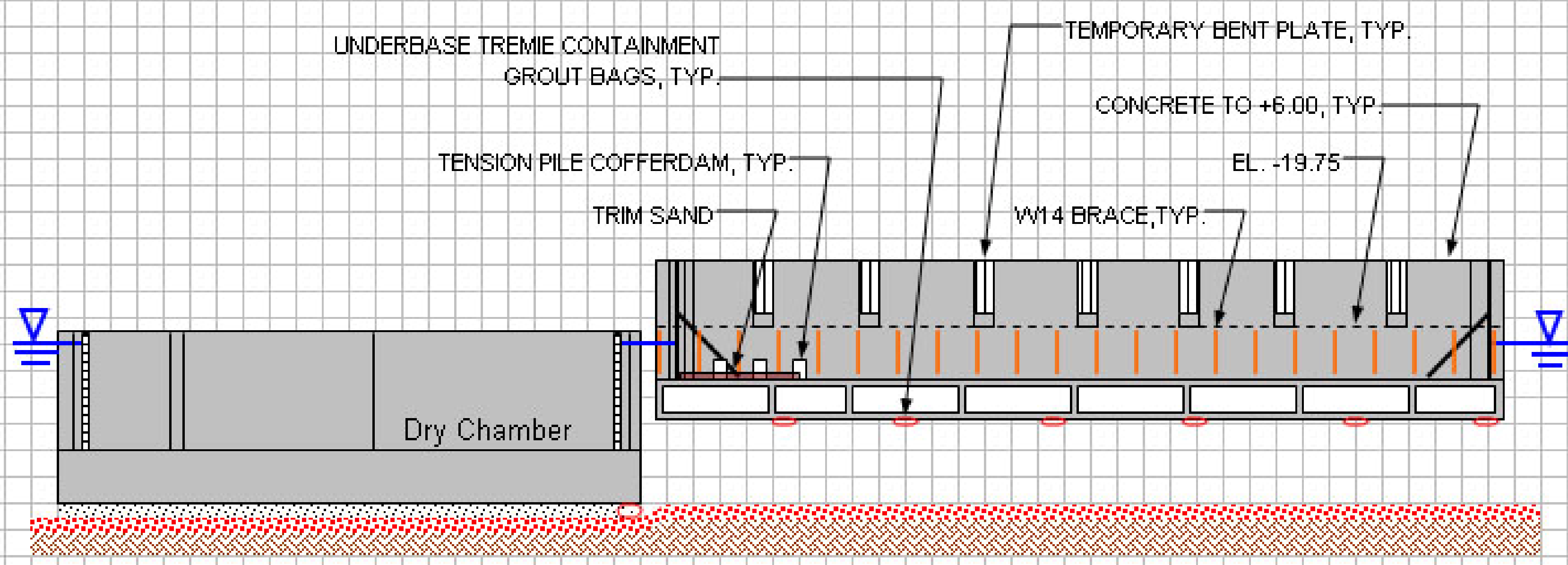
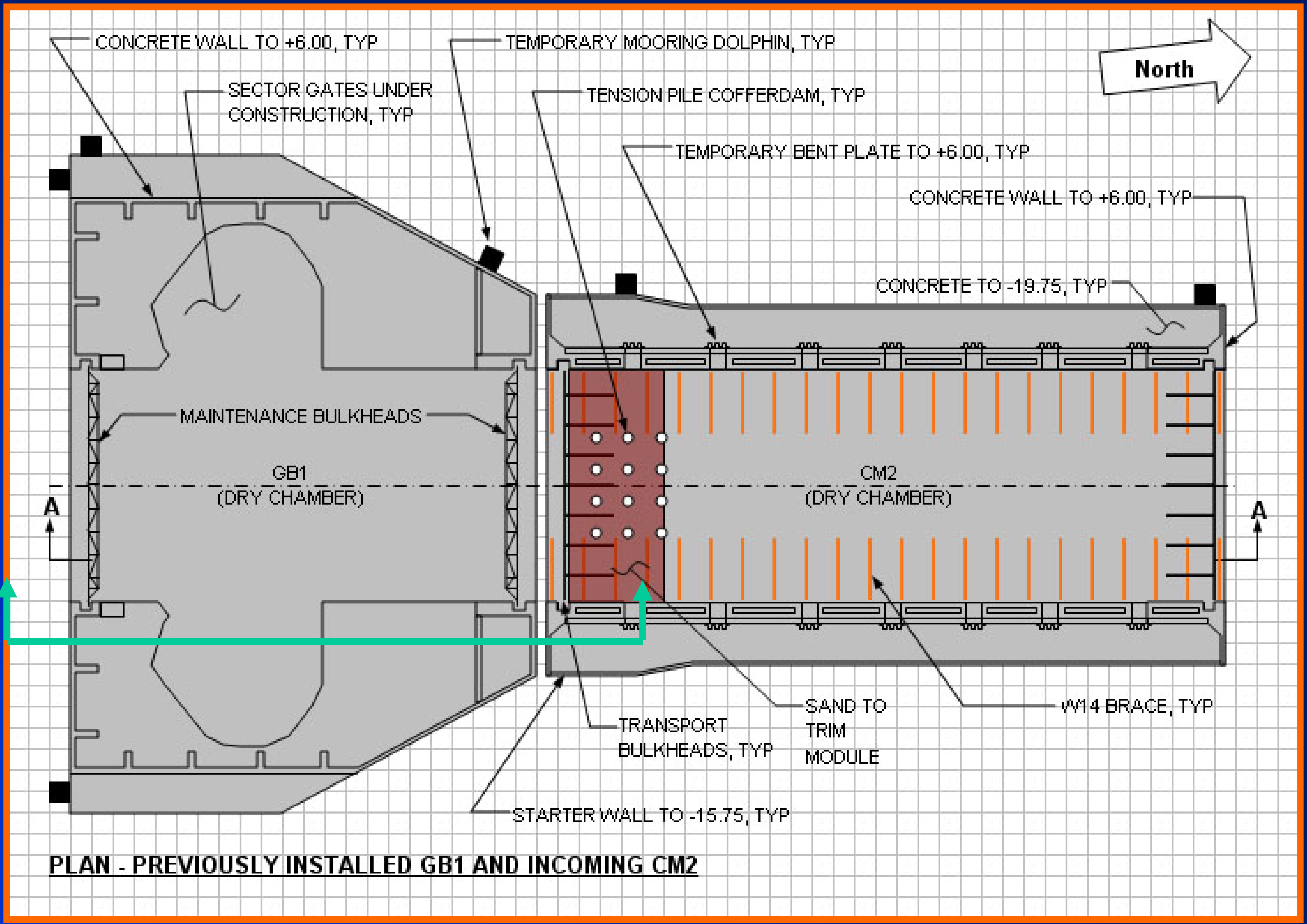
Construction Sequence



SECTION A-A

STEP 1) CM2 ARRIVES AT LOCK SITE AND IS MOORED TO DOLPHINS AND THE PREVIOUSLY INSTALLED GB1. UNDERBASE TREMIE CONTAINMENT GROUT BAGS ARE WRAPPED AROUND THE MODULE.

Construction Sequence



Mark Gonski, PE - New Orleans District

Topics:

Lessons Learned from Harvey Canal, IHNC CIP Study

Lessons From
Harvey Sector
July 2005

Harvey Sector Gate Float-in Low Bid =

- Insert plan of gate

Harvey Sector Gate CIP (rebid) Low Bid =

- Insert plan of gate

Best Value Contracting Method

Best Value Lessons Learned

H.S.G. Summary of Lessons Learned

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INDUSTRIAL CANAL LOCK REPLACEMENT

CIP FEASIBILITY STUDY

U.S. ARMY ENGINEER DISTRICT

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Why is a cast-in-place option being explored?

a.) Harvey Sector Gate

I. $35 million CIP vs. $42 million Float-In.

- $35 million cost could have been further reduced if time had permitted

II. Contractors increase cost for risk and marine costs when bidding on a Float-In construction.

- Braddock and Olmstead costs are also significantly higher than proposed.

b.) Based on Contractor responses to URS A/E Team questionnaire.

I. Sufficient room for CIP excavation provided cellular cofferdam is furnished on east side (need PM to further explore one-lane north by-pass as suggested by Users)

c.) Cost comparison to float-in.

I. Need unit costs from URS applicable to N.O. area at 95% submittal, of Phase I design

d.) Risk

I. With risks involved, bids may come in significantly higher than anticipated for float-in construction.

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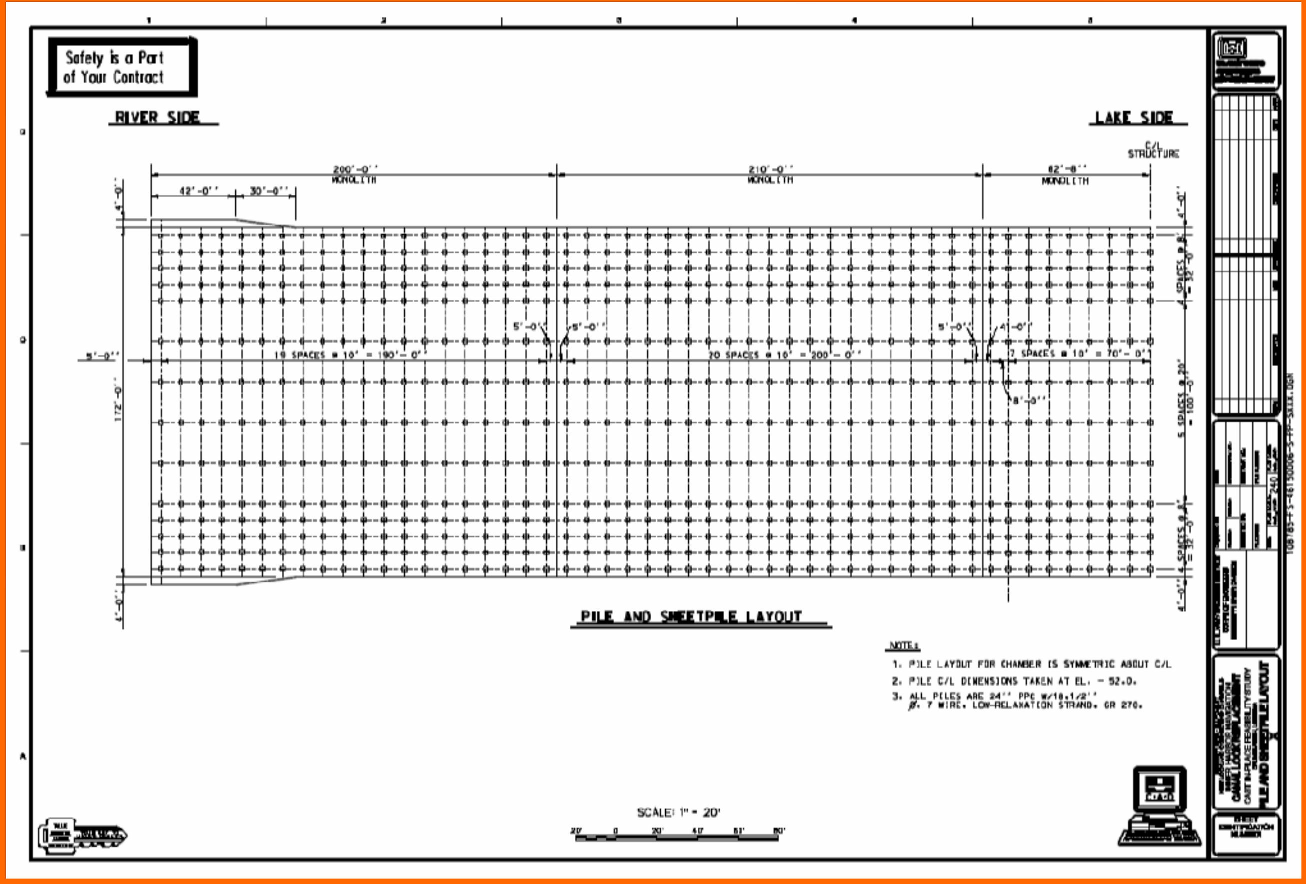
C. Foundation Design

I. Used 24" square PPC piles spaced at 8' (10' in chamber)



II. Gatebay

A. 2D sections taken utilizing flexible base design w/ pile capacities provided by springs.

B. Exterior walls designed as panels fixed on 3 sides and free at the top.

C. Interior walls designed as counterforts. Designed for lateral load from opposing walls and dead and live loads from top slab.

D. A 3D FE model will be developed in SAP2000 for P&S design.

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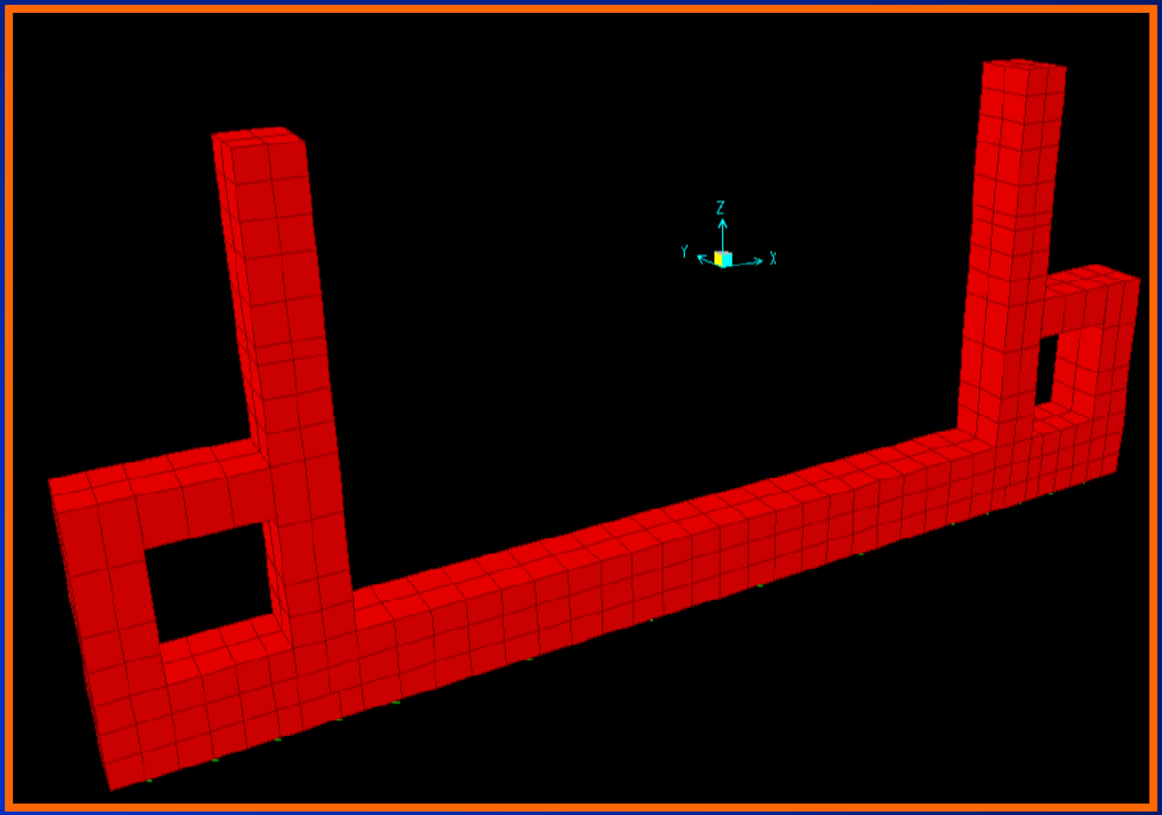
I. Chamber

A. For feasibility level design, 2D analysis was performed using both CWFRAME and SAP2000.



Discuss Advantages & Disadvantages of Float-In

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