Design Updates for the

Mississippi River, Baton Rouge to the Gulf Of Mexico Mississippi River-Gulf Outlet,

Louisiana, New Industrial Canal Lock and Connecting Channels Project (also Referenced as “Inner Harbor Navigational Canal Lock”)

December 2024

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TABLES

FIGURES

ABBREVIATIONS AND ACRONYMS

ACRA	Abbreviated Cost Risk Analysis
AASHTO	American Association of State Highways and Transportation Officials
ACE-IT	Army Corps of Engineers Information Technology
ADM	Agency Decision Milestone
A/E	Architect-Engineering Firm
AHP	Above Head of Passes
CDF	Confined Disposal Facility
CECC-R	Corps of Engineers, Office of the Chief Counsel
CSRA	Cost and Schedule Risk Analysis
DMMU	Material Management Units
EC	Engineering Circular
ECB	Engineering and Construction Bulletin
EL	Elevation
ER	Engineering Regulation
EM	Engineering Manual
ERDC	Engineer Research and Development Center
ETL	Engineering Technical Letter
FRR	Flood Risk Reduction
FWOP	Future Without Project
FWP	Future With Project
GIWW	Gulf Intracoastal Waterway
GRR	General Reevaluation Report
IHNC	Inner Harbor Navigational Canal
HQUSACE	Headquarters, U.S. Army Corps of Engineers
HSDRRS	Hurricane and Storm Damage Risk Reduction System
HTRW	Hazardous, Toxic, and Radioactive Waste
HUC	Hydrologic Unit Code
IEPR	Independent External Peer Review
INDC	Inland Navigation Design Center

ITR	Independent Technical Review
LADEQ	Louisiana Department of Environmental Quality
LA-DOTD	Louisiana Department of Transportation and Development
LRD	U.S. Army Corps of Engineers Lakes and River Division
MCACES	Microcomputer Aided Cost Engineering System (MII)
MCX	USACE's Mandatory Center of Expertise
MFR	Memorandum for the Record
MVD	Mississippi Valley Division
MVN	Mississippi Valley Division, New Orleans District
MR&T	Mississippi River and Tributaries
MRL	Mississippi River Levees
MRGO	Mississippi River Gulf Outlet
NAVD88	North American Vertical Datum 1988
NOSWB	New Orleans Sewerage and Water Board
OMRR&R	Operation, Maintenance, Repair, Replacement and Rehabilitation
P&S	Plans and Specifications
PDT	Project Delivery Team
PED	Preconstruction Engineering and Design
RSLC	Relative Sea Level Change
RM	River Mile
RNA	Regulated Navigation Area
RP	Plan 3 - Preferred Plan
SEIS	Supplemental Environmental Impact Statement
TPCS	Total Project Cost Summary

TSP	Tentative Selected Plan
USACE	United States Army Corps of Engineers
USCG	US Coast Guard
VE	Value Engineering
WRDA	Water Resources Development Act

1. Project Purpose and Description

The General Reevalation Report evaluates five action alternatives (referenced as “plans” herein) and the No Action alternative. Plan 3 was selected as the Tentatively Selected Plan in the Draft General Reevaluation Report and integrated Supplemental Environmental Impact Statement (Draft GRR/SEIS) that was released for public review and comment in 2017. In 2024, Plan 3 continues to be the preferred plan. Updates to the design for Plan 3 since 2017 are outlined here. A Supplemental Draft GRR/SEIS will be released for public review and comment in 2025.

The purpose of the proposed lock replacement project is to replace the aging Inner Harbor Navigation Canal lock, and in doing so, to improve navigation vessel transit times and reduce lock shutdowns for repairs in a manner that is environmentally acceptable and economically justified, without inducing a negative impact to the existing flood risk reduction and hurricane storm damage risk reduction structures and their respective authorized levels of risk reduction. Although the lock is located in a polder perimeter with other flood risk reduction features, the lock itself is not considered a flood risk reduction structure. The proposed new lock would be constructed north of the existing lock, and north of Claiborne Avenue Bridge as shown in Figure 1 below.

1.1 PLAN 3 - PREFERRED PLAN

The proposed lock would be a concrete cast-in-place lock with sector gates, a pile foundation and side port culvert filling and emptying system. The dimensions of the new lock chamber for the Plan 3 - Preferred Plan (RP) is 900 ft long by 110 ft wide. It is a shallow draft lock with a sill elevation of (-) 22.0 ft.

Although the lock’s authorized purpose is not flood risk reduction, the river side gatebay provides a continuous line of risk reduction between upstream and downstream Mississippi River Levee (MRL) features. The shift in location of the new lock necessitates adjustment of both Lake Pontchartrain and Vicinity (LPV) and MRL project features to tie into the new lock. Phasing of construction activities and temporary risk reduction measures would be utilized to minimize any impacts on the MRL and LPV Projects with respect to the authorized levels of risk reduction during and after construction of the new lock. The location of the proposed lock was primarily chosen due to its ease of access and little to no obstructions located near the open channel.

Starting on the southwest side of the project, the new floodwall would tie-in into the existing wall on the west of the existing IHNC Lock. The new floodwall would tie to the new lock on the west side. Starting on the southeast side of the project, the new levee would tie into the existing MRL levee on the east side of the existing IHNC Lock and travel to the new lock tie-in wall on the east side. The new floodwall segments under the St. Claude and North Claiborne Ave bridges would tie to the new levees on the east side.

The physical features associated with the construction of the new lock structure are:

- Chamber Concrete Monoliths/Pile Foundation
- Sector Gate Monoliths/Pile Foundation
- Steel Sector Gates
- Timber Guidewalls
- Floating Concrete Guide walls
- End Cell Dolphins
- Cofferdam
- Floodwalls

- Levee
- Maintenance Bulkheads
- Maintenance Bulkhead Storage Platform
- Culvert Roller Gates
- Culvert Bulkheads
- Permanent Mooring Cells Other major project features include:
- Replacement of the St. Claude Avenue Bridge
- Construction of a Bypass Navigation Channel near the new lock
- Construction of a Temporary Demolition Bypass Channel near the existing lock
- Disposal of Dredge Material
- Demolition of the Existing Lock and St. Claude Avenue Bridge
- Two control houses, a maintenance and administration building, a machinery building, a parking lot, a paint shed, an access road and other associated structures and facilities determined to be necessary during PED.

Figure 1: Project Location Map

The updated Preferred Plan eliminates construction of a temporary bridge at St. Claude Avenue during construction of the new St. Claude Avenue Bridge and approaches.

By eliminating the temporary bridge, there are reductions to the overall construction schedule, thus reducing the duration of noise and construction impacts to the nearby community. The new location of the St. Claude Avenue Bridge will affect three residential houses located on the northwest quadrant of the existing St. Claude Avenue Bridge. See Figure 2 for a map of design features for the Preferred Plan 3.

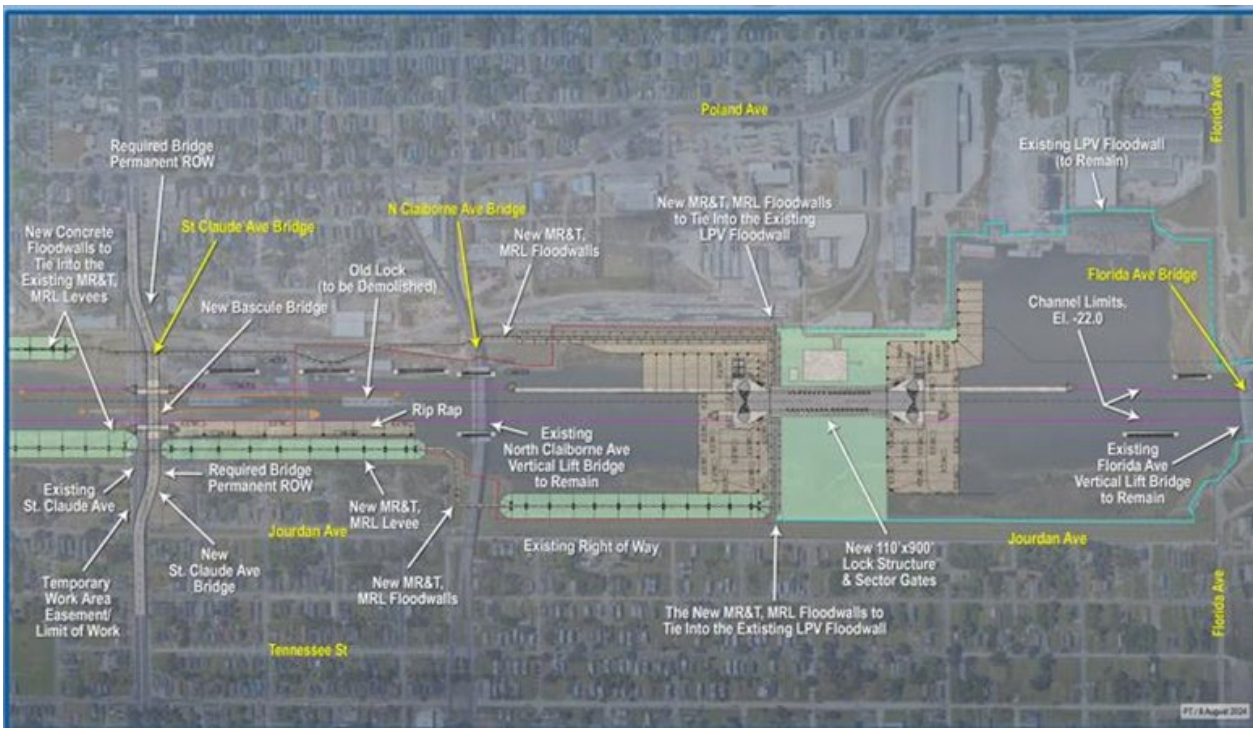

Figure 2: Project Design Features – Preferred Plan 3

The floodwalls for this project would be constructed to El 24.5 to match the required top of wall (TOW) for the lock. Since the floodwalls would be constructed along the IHNC channel, which is subject to high barge traffic, a 500,000-pound barge impact force will be used for design.

The new IHNC floodwalls will extend from the Mississippi River on the west side of the IHNC channel, and tie into the new lock. The length of floodwall assumed was approximately 5,200 ft on the west side of the IHNC Channel. On the east side, there would be two small segments of floodwall under the St. Claude and North Claiborne Ave. bridges, as well as a small segment from the new lock tying into the levee on the east side. Typical floodwall monoliths would be constructed of cast-in-place concrete and will be roughly 60 feet in length, connected with a joint containing a waterstop. Each monolith would be supported with steel piles driven with batters.

Portions of the existing floodwall sections along the IHNC channel require demolition as part of this project. In addition, the existing concrete scour protection would be demolished and replaced with compacted fill embankment. New concrete scour protection would be added after re- grading of this area. The total cubic yards (CY) for demolition of both existing floodwall and scour protection is approximately 13,000 CY.

As part of the new floodwall construction, new floodwall monoliths are required underneath the existing St. Claude Avenue and Claiborne Avenue bridges. The floodwalls required under the St. Claude Avenue Bridge would be coordinated with the new bridge construction. To further note, new floodwalls would be constructed up to the proposed bridge location, prior to removal of the existing bridge. After the existing bridge is removed, the new floodwalls would be tied into the new line of protection.

The new levees for this project would be constructed to El 24.5 to match the required top of wall (TOW) for the lock. The new levee would extend mainly on the east side from the MRL Levee north to the new lock tie-in floodwall, except for the portions of floodwall beneath the St. Claude and North

Claiborne Ave. bridges. The footprint of the levee will extend roughly 300 feet, with a 10-foot crown and 1 foot vertical to 3 feet horizontal side slopes. The new levee will be constructed in two phases, a temporary levee to El. 17.5, and then the final levee to El. 24.5.

The new bridge is 70 ft wide with two (2), 12 ft wide eastbound lanes and two (2), 12 ft wide westbound lanes. Four (4) foot shoulders are provided on the outside and minimum one-foot shoulders are provided on the inside. A 6-ft wide pedestrian/bicycle lane, meeting all required ADA guidelines, is provided on the outside edge of the eastbound lanes, separated by traffic with a concrete barrier. Ingress and egress means are required to meet ADA guidelines. These features would be incorporated in the final design. Further coordination would be required with the Reginal Transit Authority to address any impacts to the bus stops within the limits of the proposed construction. Based on a proposed 7-ft 3-inch spacing between girders and typical 80-ft span between approach pier bents, an AASHTO Type III precast prestressed concrete girder was selected to support the approach decks. Eighteen-inch steel pipe piles were assumed to support the approach piers. Pile capacity curves used for the floodwalls were utilized for the pile tip selection. Initial design and quantities are based on a similar bascule bridge design constructed in another location. The foundation design would be site adapted for this project (pile design, bridge pier design, etc.). Bascule spans were selected to span the existing/future channel alignment and the demolition bypass channel alignment during demolition of the existing lock.

Construction of the new St Claude Avenue Bridge would be phased such that thru traffic along the existing St. Claude Avenue Bridge will be maintained, with the exception of any typical bridge closures to pass navigation, for the entire construction duration. In the event that restriction of thru traffic is required for construction of tie-ins; closures would be minimized to nights and weekends during low traffic volume periods. Additional details regarding traffic control would be developed with the Port of New Orleans, Louisiana Department of Transportation and Development (LA-DOTD) and the City of New Orleans during PED.

Because it is a low-speed urban street, the design speed along St. Claude Avenue is 35 MPH. The speed limit across the proposed bridge would remain the same. The new bridge is proposed to be placed north of the existing bridge deck, due to the necessity of keeping the existing bridge open during construction. Therefore, a series of horizontal curves would be needed to tie into the existing approach ramps to the proposed bridge deck. From the AASHTO Green Book, the minimum radius of curve at 35 MPH is 419 ft at the centerline, which is the radius of all four horizontal curves.

The proposed bridge deck elevation is (+) 39 ft, whereas the existing bridge deck elevation is approximately (+) 20 ft. However, the approach ramps must tie back to the existing tie-ins along St. Claude Avenue at both Poland Avenue and Reynes Street. The approach ramps are steeper in grade than the existing ramps, but with the addition of longer vertical curves, still suitable for traffic. Three existing homes along the west side will require demolition in order to construct the new St. Claude bridge.

1.2 CHANGES IN CONSTRUCTION DURATION

By eliminating the temporary bridge, there are reductions to the overall construction schedule, reducing the duration of noise and construction impacts to the nearby community. The duration savings comparing the original 2017 TSP which consisted of a temporary and permanent St. Claude Avenue Bridge relocation, versus the current Plan 3- preferred plan which consists of a permanent St. Claude Avenue Bridge replacement is a reduction of approximately 2 years in construction duration.

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closures to pass navigation, for the entire construction duration. In the event that restriction of thru traffic is required for construction of tie-ins; closures would be minimized to nights and weekends during low traffic volume periods. Additional details regarding traffic control will be developed with the Port of New Orleans, Louisiana Department of Transportation and Development (LA-DOTD) and the City of New Orleans during PED.

1.3 CONSTRUCTION SEQUENCING FOR PLAN 3 - PREFERRED PLAN

The overall construction sequencing of the new lock structure, etc. is listed below in Table 5. As part of this GRR, the construction sequencing reflected a cast-in-place (CIP) construction methodology in lieu of float-in-place (FIP) for the lock.

After running the Ship Simulation wherein the bypass channel was tested by the Navigation Industry, it was determined the proposed bypass channel and bridge near the existing lock would have to be modified. The existing lock chamber would be utilized during the demolition sequence and allow for transit of navigation traffic during nighttime hours.

Daytime closures would occur to allow for the removal of the existing lock chamber from the bank and from floating plants. A demolition bypass channel would be required on the east side of the existing lock (after the east wall is demolished) to aid in passing vessels during demolition of the west lock wall and incorporation into the future permanent navigation channel.

The proposed construction sequencing is as follows. Note there are two construction sequences: the first is for the new lock area and adjustments to the existing respective alignments of the MRL/LPV levees and floodwalls as necessary to address the location of the new replacement lock, and the second is for the work at the existing lock area. The existing lock area sequence (second sequence) is to be performed after the construction of the new lock and associated levee/floodwalls re-alignment is completed.

Table 5: Construction Sequence for the RP

New Lock Area and Floodwalls Sequence	
1 – Construct cofferdam (along bypass channel)	
2 – Dredge (bypass and new lock)	
3 – Construct cofferdam (across channel) and protective dolphins	
4 – Unwater, excavate, build lock complex	
5 – Place Embankment, Compacted Fill and construct East and West T-walls inside of the cofferdam.	
6 – Build portion of guide walls (in cofferdam)	
7 – Remove cofferdam	
8 – Build remaining tie-in T-walls, embankment, and permanent levee on east side. Demolish existing east T-walls north of Claiborne Ave. Complete guidewalls, end cells and mooring cells.	
Existing Lock Area Sequence (Revised for New Bridge on North Side of St. Claude Avenue):	
All items below are to be performed after the new lock and floodwalls are completed.	
1 – Build west T-walls (All T-walls except those at the existing and new St. Claude Avenue Bridge can be constructed concurrent with new lock area construction) and east levee sections.	
2 – Build bridge piers/protective dolphins (for lift bridges)	Build bridge approaches concurrent with construction sequence number 1 through 3.
3 – Install steel gates leaves for bascule bridge (shutdown vessel traffic) 30-45 days	*Major portion of the steel gates can be constructed in place in the vertical position.
4 – Complete new bridge and make tie-in to existing road. Include T-wall monoliths underneath new bridge	
5 – Demolish existing St. Claude Bridge	
6 – Construct remaining T-wall under footprint of now demolished old St. Claude Avenue Bridge (risk reduction in place)	
7 –Demolish East Lock (walls only) and excavate demolition bypass channel. Navigational traffic to utilize	*Navigational traffic to use traffic windows at night, lock
demolition bypass channel after removal of the East Lock wall and excavation. Demolition Bypass Channel to become a part of permanent navigation channel after demolition is completed.	demolition activity in main channel in daytime hours
8 – Demolish West lock (walls only)	
9 – Final establishment of channel along existing alignment	

Note:

Construction of the new St Claude Avenue Bridge would be phased such that through vehicular traffic along the existing St. Claude Avenue Bridge will be maintained, with the exception of any typical bridge closures to pass navigation, for the entire construction duration. In the event that restriction of through traffic is required for construction of tie-ins; closures would be minimized to nights and weekends during low traffic volume periods. Additional details regarding vehicular traffic control will be developed with the Port of New Orleans, LA-DOTD and the City of New Orleans during PED. Refer to Annex 11, Sheets CS-101 to CS-115 for construction sequence of the project.

1.4 NAVIGATION CONCERNS

Ship simulation modeling was performed in 2008 and again in 2023. The 2008 report was prepared as part of the study for the cast-in-place (CIP) solution with a deep draft (-) 40 ft sill. The 2008 ship simulation model study recommended use of assistance vessels through the temporary bypass channel that would be required during construction. The pilots had difficulties maneuvering the design vessel on the south end of the cofferdam at the Claiborne Avenue Bridge. The cofferdam was wide and located in close proximity to the bridge. With the 2024 design updates, the width of the cofferdam has decreased with the shallower lock sill. Navigation through the temporary bypass channel should therefore improve, but effects on navigation will not be fully determined until the ship simulation model is updated with the new design features.

In the 2023 ship simulation, pilots from the Navigation Industry raised concerns with the safety of the bypass channel near St. Claude Ave. Bridge. Additional tabletop exercises were held, and the plan was revised near the existing lock to accommodate safety concerns with the bypass channel geometry. This work provided verification of final lock position and channel geometry. The next Ship Simulation will be used to model and refine the construction sequence, determine the length of time to navigate through the construction reach, and recommend safety aids during construction which will be implemented to improve transit times. This model will be completed in the PED phase or as soon as funding is available and documented in the Design Documentation Report (DDR).

2. Engineering Assessment of Existing Lock

In 2017, MVN ED prepared an analysis with the details of the current condition and deficiencies of the existing IHNC Lock structures and components. During PI No. 11, engineers performed a close visual examination of the lock. A total of thirty-three (33) deficiencies were found, requiring a remedial action. According to the survey from the most recent PI Report, the existing miter gates are at elevation 15.70 referenced to NAVD88 epoch 2004.65; the authorized flowline elevation is 17.30 referenced to the same datum and epoch. This results in a deficiency of 1.60 ft at the structure because the miter gates are lower than the authorized flowline elevation. The deficiency is not a result of changes based on earlier flowline studies before 1973. The previous studies were not used to establish authorized water surface for the MR&T Project or construct the existing lock. The lock was designed in the early 1900's before the authorized flowline was published. Different design standards and hydrologic conditions were used to design and construct the lock. For this reason, the deficiency is not solely due to settlement or environmental factors; it's also due to the difference in hydrology assumptions and criteria. The existing lock was unwatered in 2016. During this event, the machinery, electrical, and several miter gates were replaced. This unwatering will give the lock additional years of operation but does not address the main structural deficiency which is spalling of the concrete in various locations, and age of steel reinforcement, which could lead to problems in the future.

Additionally, it should be noted that the existing lock is not designed for an unwatering load case. An unwatering event results in unacceptable safety factors for flexure and flotation of the chamber. The lock was designed using now obsolete codes, and the reinforcement is inadequate for modern concrete design. There is a significant wear of the concrete and steel reinforcement due to the age of

the structure. Continued deterioration of the concrete and steel reinforcement may preclude future maintenance unwatering of the chamber. Maintenance unwatering will eventually be unsafe without extensive retrofit of the existing structure. The retrofit of the existing lock would be costly and create additional delays to navigation. Based upon the number of deficiencies, replacement of the lock is recommended.

3. Maintenance Issues with Existing Lock

In 2019, additional maintenance issues with the current lock were discovered. These issues include degradation of the lock valves and water infiltration into and out of the lock through the concrete. Investigations have revealed degradation of the concrete through construction joints at the lock floor, leading to water running into the manways and machinery pits of the locks and causing large sinkholes to form adjacent to the lock walls.

In particular, on the northern end of the structure, two (2) large sink holes have formed along the east and west lock walls. These two sink holes align with each other, indicating a potential continuous seepage connection beneath lock base slab from the east side of the lock to the west side. As the structure's concrete continues to degrade, MVN geotechnical engineers expect additional sink holes to form along the lock walls. At a minimum, increasing maintenance costs will be needed to investigate and repair these issues. Increased repair costs and delays to navigation can be expected to increase as the structure ages. Based on the vast number of documented deficiencies, replacement of the lock is technically merited.